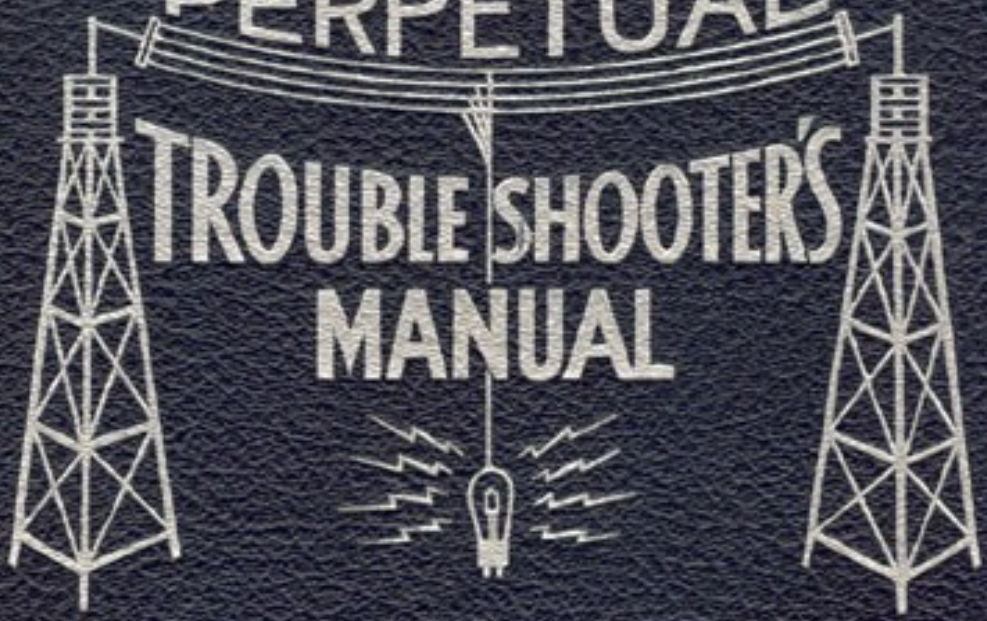
PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

Rider's Perpetual Trouble Shooter's Manual

Volume 22

MODELS 4W18, 4W19, Ch. 4W1; 4T11, Ch. 4T1

REMOVING AND INSTALLING CHASSIS

To remove the chassis from the cabinet, remove the tuning knobs, cabinet bottom (base) and on the 4W1, the metal speaker grille. The speaker grille is removed by pulling it down away from the cabinet.

Release the chassis by removing the two mounting screws located in the top inside of the cabinet just below the handle brackets.

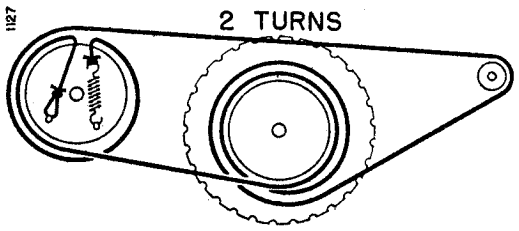
Install the chassis in cabinet in the same manner, being sure that the 1 5/16" diameter fibre washer (sleeve retainer) used on the 4W1 chassis is placed over the volume tuning sleeve just before sliding the 4W1 chassis into the cabinet.

Also, before tightening the two chassis mounting screws adjust the chassis for even spacing between all sides of the dial and the cut-out in the cabinet, otherwise binding may result.

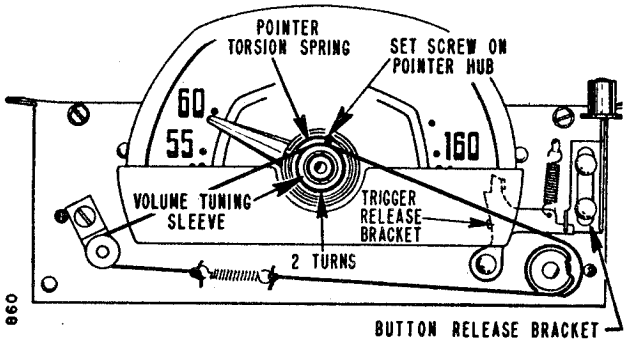
STRINGING VOLUME CONTROL DRIVE

The illustrations below show the volume cord stringing system used on each of the chassis.

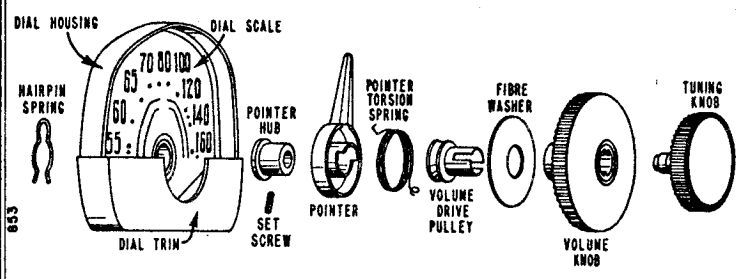
Before restringing the volume cord on these models, rotate volume control fully clockwise and, using a #6 Allen wrench, tighten the set screw on the volume control pulley, first being sure the cut-out slot(s) on the volume control pulley are in the position shown in each illustration. Loop the cord in the cut-out slots, winding 1½ turns around the volume control pulley, and then winding 2 turns around the volume tuning sleeve on the 4W1 chassis or the volume-off knob on the 4T1 chassis. Loop the cord around the fibre pulley at other end of chassis. To prevent slipping, be sure that the volume control turns freely and that the dial cord tension spring has sufficient tension.



Chassis 4T1, Front View Showing Stringing



Chassis 4W1, Front View Showing Stringing



Chassis 4W1, Dial and Tuning Knob Assembly, Exploded View

"HIDE-A-WAY" DIAL ON CHASSIS 4W1

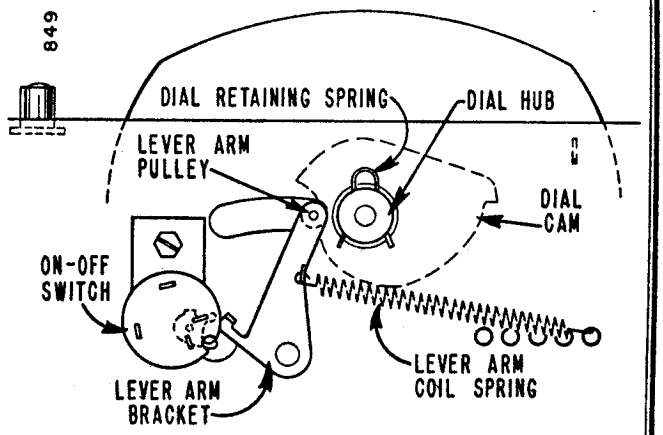
Illustrations below show front, rear and exploded views of dial mechanism. Follow the sequence shown in exploded view for disassembly or reassembly of the knobs, pointer or dial.

The "Hide-A-Way" dial mechanism is operated by the push button which works the trigger release bracket. The trigger bracket releases the dial assembly.

Thrust of the lever arm roller against the cam on back of the dial causes the dial to pop-up while a protruding edge on the lever arm simultaneously trips (turns on) the on-off switch.

Lever arm thrust is adjustable by attaching the far end of the lever arm spring to any of the holes spaced at different distances from the lever arm.

Rotating the dial fully to the left locks the dial into the cabinet and also trips (shuts-off) the on-off switch.

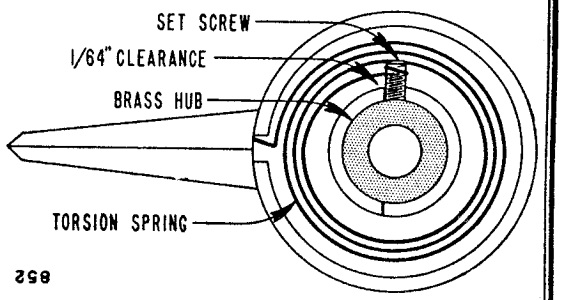


Chassis 4W1, "Hide-A-Way" Dial, Rear View

DIAL POINTER ON CHASSIS 4W1

The illustration shows an exploded view of the dial assembly and the sequence in which the pointer hub and torsion spring are to be assembled. When assembling the pointer torsion spring to the pointer, insert the rectangular end into the base of the pointer; compress the spring from about one-half to one turn in a clock-wise direction. Insert the rounded or looped end of the spring over the top end of the pointer set screw. Allow about 1/64" clearance between the inner turn of the pointer spring and pointer hub, or the pointer may bind or stick.

To adjust pointer, fully close the gang condenser. Set the end of the pointer over the two dots below 55 on the dial and tighten the pointer screw with a #4 Allen wrench. Important: Allow approximately 1/32" clearance between the hub on the pointer and the dial scale.



Chassis 4W1, Dial Pointer and Hub Assembly

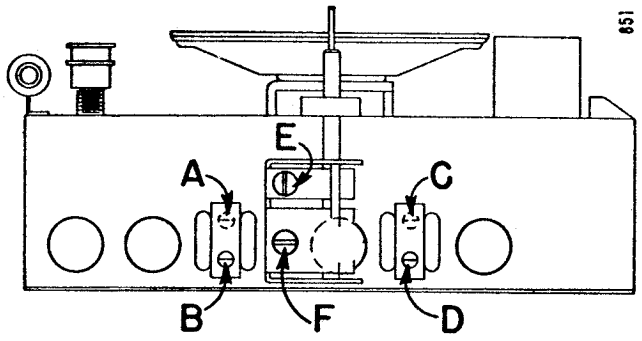
MODELS 4W18, 4W19, Ch. 4W1; 4T11, Ch. 4T1

ALIGNMENT PROCEDURE

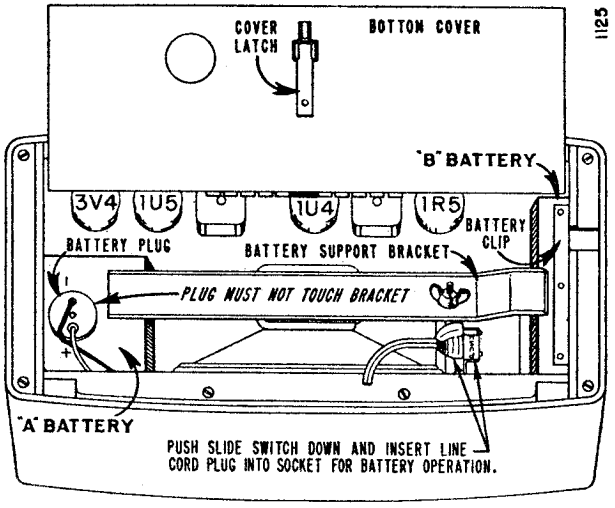
- Use battery power for alignment if fresh batteries are available.
- When using AC power, an isolation transformer should be used if available. If not using an isolating transformer, connect a .1 mfd. condenser in series with the signal generator low side to B minus (pin 7 of 1U5 tube).
- Batteries should be held in chassis during alignment.
- Set volume control full on.
- Connect output meter across speaker voice coil.
- Use lowest setting of signal generator capable of producing adequate output meter indication.
- Use a non-metallic alignment tool for IF transformers.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	.001 mfd. when using A. C. .1 mfd. when using Battery	Antenna stator of tuning condenser	455 KC	Gang fully open	2nd IF 1st IF	*A, B *C, D	Maximum output
2	"	"	1620 KC	"	Oscillator (on gang)	E	"
	Install metal chassis cover.						
3	Loop of several turns of wire, or place generator lead close to receiver for adequate signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna (on gang)	F	"

*Adjustments A and C are made from other side of chassis.



Trimmer Location, Underside of Chassis



Tube and Battery Location

REPLACING OF BATTERIES

Use replacement "A" and "B" batteries of the following types:

A Battery (7½ Volts): General 31, Eveready 717, Burgess C5, Ray-o-Vac 751C or equivalent.

B Battery (67½ Volts): General 108, Eveready 467, Burgess XX45, Ray-o-Vac 4367 or equivalent.

Electrical characteristics of recommended batteries for these models provide for equal life for both the "A" and "B" batteries. "A" batteries may give satisfactory performance as low as 5.5 volts; "B" batteries as low as 49.5 volts. Replace batteries when reception is weak and voltage has dropped below values given above.

To install replacement batteries, slide the cover latch and open the hinged bottom cover. Then remove the wing nut which holds the battery support bracket in place.

Disconnect battery connectors from old batteries. Batteries can easily be removed from the set by grasping them with long nose pliers or if necessary removing the cabinet bottom. Install new batteries so battery connectors are farthest away from the ends of the battery bracket. Batteries may become shorted if bracket touches connectors.

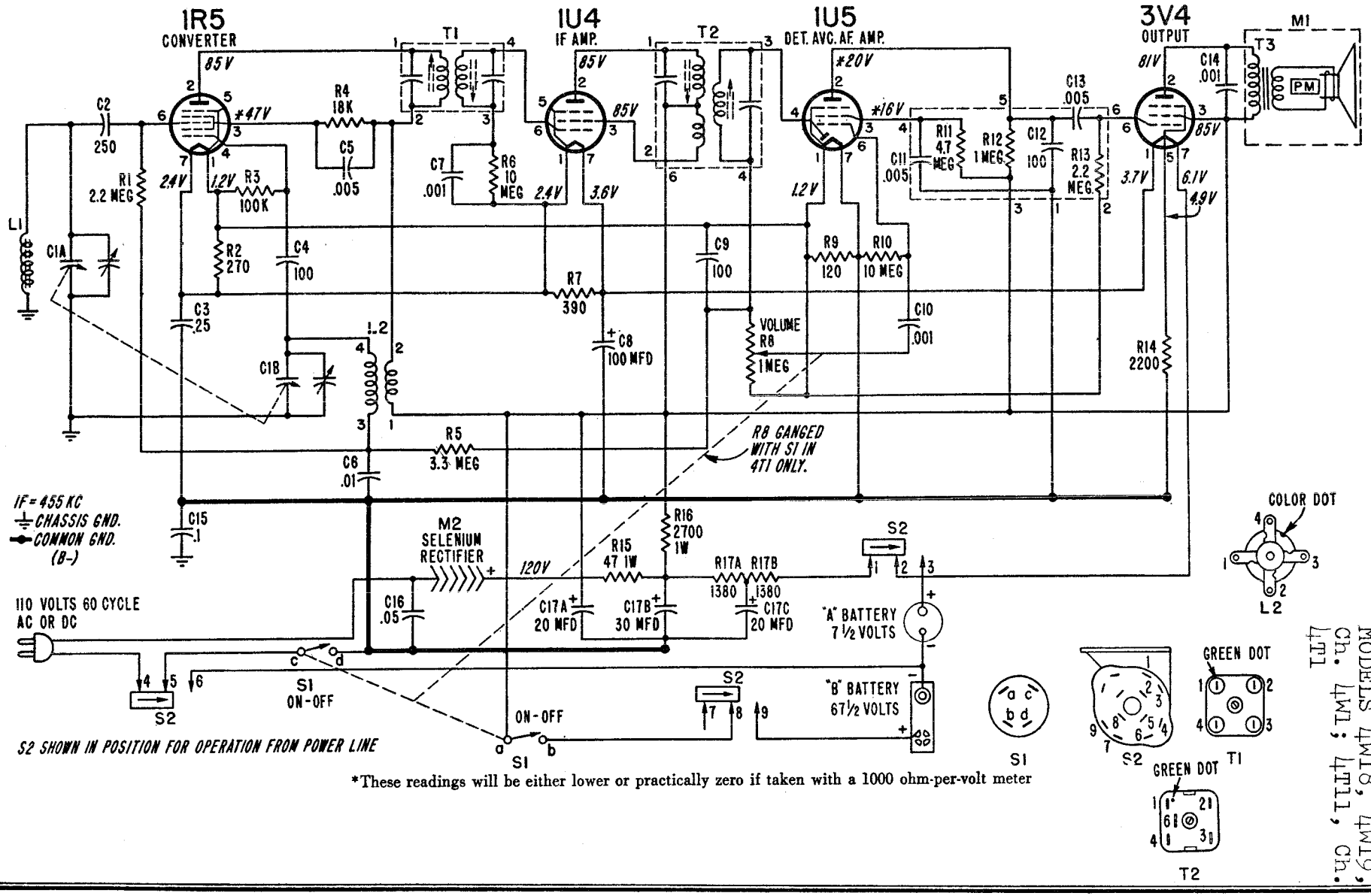
REPLACING TUBES

Tubes can most conveniently be removed or replaced by first removing the batteries and cabinet bottom. A miniature tube puller or extractor will be of help in facilitating tube replacement.

VOLTAGE DATA

Voltages shown on schematic diagram.

- All voltages taken between tube socket terminals and B minus (pin 7 of 1U5 tube).
- Dial turned to low frequency end; volume control at minimum.
- Voltages measured with Vacuum Tube Voltmeter from 117 Volts AC line.

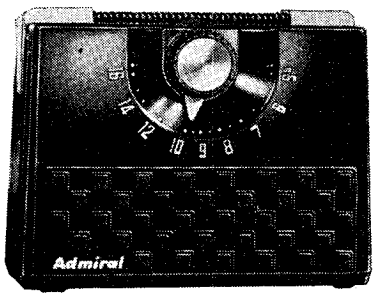


*These readings will be either lower or practically zero if taken with a 1000 ohm-per-volt meter

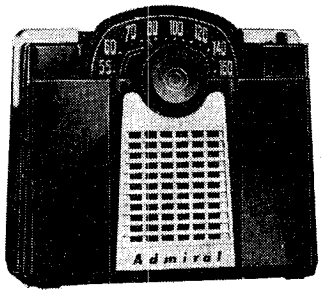
MODELS 4W18, 4W19, Ch. 4W1; 4T11, Ch. 4T1

MODELS 4W18, 4W19, Ch. 4W1; 4T11, Ch. 4T1

4T11



4W18, 4W19



RESISTORS

Symbol	Description	Part No.
R1	2.2 megohms, ½ watt	60B 8-225
R2	270 ohms, ½ watt	60B 8-271
R3	100,000 ohms, ½ watt	60B 8-104
R4	18,000 ohms, ½ watt	60B 8-183
R5	3.3 megohms, ½ watt	60B 8-335
R6	10 megohms ½ watt	60B 8-106
R7	390 ohms, ½ watt	60B 8-391
R8	1 Megohm, Vol. Control for 4T1	75B 1-43
	for 4W1	75B 1-37
R9	120 ohms, ½ watt	60B 8-121
R10	10 megohms, ½ watt	60B 8-106
*R11	4.7 megohms, 1/5 watt	
*R12	1 megohm, 1/5 watt	
*R13	2.2 megohms, 1/5 watt	
R14	2,200 ohms, ½ watt	60B 8-222
R15	47 ohms, 1 watt	60B 14-470
R16	2,700 ohms, 1 watt	60B 14-272
R17A	1380 ohms 5 watt, Tapped	
R17B	1380 ohms Candohm	61A 5-7

CONDENSERS

Symbol	Description	Part No.
C1A	272 mmfd. max., Ant. Gang†	
C1B	107 mmfd. max., Osc. Gang†	
C2	250 mmfd., ceramic	65B 6-5
C3	.25 mfd, 200 volts, paper	64B 1-28
C4	100 mmfd. ceramic	65B 6-3
C5	.005 mfd, ceramic	65A 10-5
C6	.01 mfd, 400 volts, paper	64B 1-25
C7	.001 mfd, min. ceramic	65B 6-41
C8	100 mfd, 25 volts, Elec.	67A 4-6
C9	100 mmfd, ceramic	65B 6-3
C10	.001 mfd, min. ceramic	65B 6-41
*C11	.005 mfd, min. ceramic	
*C12	100 mmfd. ceramic	
*C13	.005 mfd, ceramic	
C14	.001 mfd, min. ceramic	65B 6-41
C15	.1 mfd, 200 volts, paper	64B 1-30
C16	.05 mfd, 400 volts, paper	64B 8-28
C17A	20 mfd, 150 volts	
C17B	30 mfd, 150 volts Elect.	67C 7-41
C17C	20 mfd, 150 volts	

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	Antenna, Rod	69C 120-1
L2	Coil, Oscillator	69A 39-5
T1	Transformer, 1st IF	72B 28-1
T2	Transformer, 2nd IF	72B 28-62
T3	Transformer, Output	98A 21
M1	Speaker (3½" PM) and Output Trans.	78B 58-1
M2	Rectifier, Selenium	93A 1-6
S1	Switch, On-Off, DPST, (less bracket)	77A 23
S2	Switch, Power Change	77A 19-1
	*Couplate (includes R11, R12, R13, C11, C12, C13)	63A 4-3

MISCELLANEOUS PARTS

Description	Part No.
Baffle, Speaker	43A 111
Bracket (4W1 only)	
on-off switch mounting	15A 602
battery support	15A 603
button release	15A 599
trigger release bracket	15A 600
volume pulley and bracket ass'y.	A3316
shield for gang	15A 618
cover for AC switch	15A 595
lever arm assembly	A3254
Carton and Fillers	44B 165
Clip, IF Transformer mounting	72B 28-10
Clip "B" Battery Connector	90A 5-3
Cover, Metal for chassis	14C 70
Drum, Vol. control (4T1 only)	17A 30
Insulator, Fibre (for mtg. rectifier)	32A 137
Customers Instructions	
for 4W18, 4W19	41A 18 42
for 4T11	41A 18-38
Dial Cord (order length needed; 24" required for 4W1, 30" required for 4T1)	50A 1-3
Nut, Wing (#6/32 for battery support bracket)	2A 5-4-71
Plate, Electrolytic Mounting	67A 2-1
Plug, "A" Battery Connector	88A 4-6
Pulley, Brass	
mounts on volume control shaft (4W1 only)	27A 150-1
drive for volume control cord	27A 149-1
riveted to lever arm (4W1 only)	27A 146
Screw, Set	
for volume control pulley (#6-32x3/16)	1A 48-3
Socket, Tube	87A 3-4
Speed Nut, #5/32 (for trigger adjustment bracket)	2B 10-12
Speed Nut, #6 Escutcheon mtg. (4T1 only)	2B 10-9-68
Spring, Coil	
for 4W1 dial relase bracket (½"x3/16" dia.	19B 1-18
for 4W1 lever arm (1¾" long)	19A 64
for 4W1 dial cord (tension) (7/16"x⅛" dia.)	19B 1-16
for 4T1 dial cord (tension) (11/32"x9/64" dia.)	19B 1-17
Washer, Spring (5/16"ODx3/16"ID)	4A 6-13

CABINET PARTS

Description	Part No.
Bottom, Cabinet (Base)	
Ebony for 4T11	
complete with metal door	A3270
plastic frame only	34D 35-2
Green for 4W18	
complete with metal door	A3493
plastic frame only	34D 35-6
Tan for 4W19	
complete with metal door	A3494
plastic frame only	34D 35-8
Bracket, Handle Support (metal ends)	20B 14
Button, Push	
Green for 4W18	33A 61-3
Tan for 4W19	33A 61-4
Cabinet (less bottom)	
Green for 4W18	34D 35-5
Tan for 4W19	34D 35-7
Ebony for 4T11	34D 44-1
Grille Cloth, Speaker (4W1)	36B 3-81
Grille, Plastic (gold) (4W1)	23C 95-1
Grille, Plastic (black) (4T1)	23C 94-1
Handle, Carrying (plastic covering only)	
Ebony for 4T11	33A 58-1
Green for 4W18	33A 58-3
Tan for 4W19	33A 58-4
Hinge, Bottom Cover	37A 33
Knob, Volume	
Green for 4W18	33C 56-8
Tan for 4W19	33C 56-10
Ebony for 4T11	33C 67-1
Knob, Tuning (includes compression ring)	
Green for 4W18	A3491
Tan for 4W19	A3492
Ebony for 4T11	A3473
Pointer, Dial	
for 4T1 chassis	25B 47-1
for 4W1 chassis	25A 40
Ring, Compression (for tuning knob)	
for 4W18, 4W19	19A 31-6
for 4T11	19A 31-7
Ring, Compression (for Pointer, 4T1)	19A 31-2
Rivet, Shoulder	
with 5/64 shoulder	6A 4-2-2
with 7/64 shoulder	6A 4-12-71
with 15/64 shoulder	6A 4-11-2
with 3/32 shoulder	6A 4-7-71
Rubber Strap, for carrying handle	
upper, with 13/32" holes	12A 38
lower, with ¼" holes	12A 38-1
Screw	
#4x⅝ self tapping; for mtg. plastic base to cabinet	1A 69-6-71
#8-32x7/16; for mtg. handle and chassis	280-437-C2-71
Slide Arm (for bottom door)	15A 291
Spring, Support (for carrying handle)	18A 42
Washer	
felt, for 4W1 volume knob	5A 4-17
felt, for 4T1 volume knob	5A 4-8
fibre, for retaining volume knob on 4W1 (15/16"OD x 7/16"ID)	5A 1-17

PARTS FOR "HIDE-A-WAY" DIAL in 4W1 Chassis

Description	Part No.
Dial Scale	
Green for 4W18	22C 25-5
Tan for 4W19	22C 25-7
Housing Assembly, Metal (for dial scale, includes hub and cam)	
Green for 4W18	A3495
Tan for 4W19	A3496
Hub, Brass (for dial pointer)	27A 151
Pointer, Dial	25A 40
Pulley, Brass (volume tuning sleeve)	27A 149-1
Screw (#6x5/6 S.T.B.H.—for mtg. dial trim)	1A 71-9-71
Screw, Set (#4-40x5/16—for dial pointer hub)	1A 43-4
Spring, Hairpin (for mtg. dial assembly)	19A 2-6
Spring, Pointer Torsion	19A 63
Trim, Plastic (front bottom of dial housing)	
Green for 4W18	33B 60-3
Tan for 4W19	33B 60-4

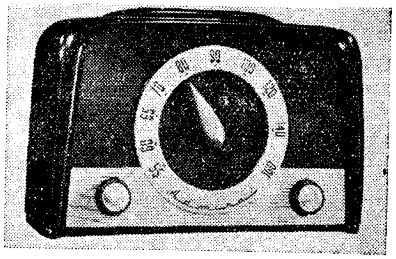
†Use number 68B34-1 gang for 4W1 chassis, and number 68B41 gang for 4T1 chassis. Except for shaft lengths, these gang condensers are identical.

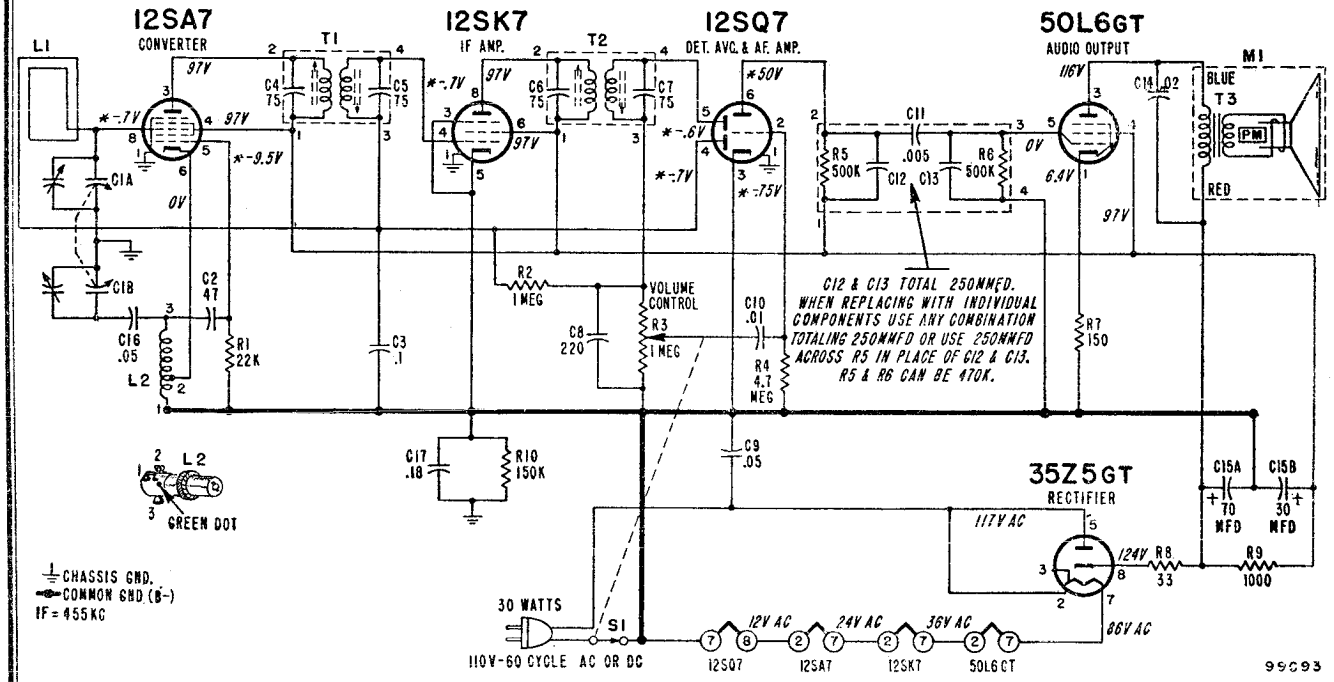
*Part of couplate (part #63A4-3). Replace with exact duplicate or individual components. Note that numbers 1, 2, 3, 4, 5, 6, on schematic correspond to lead numbers printed on face of couplate.

VOLTAGE DATA

Voltages shown on schematic diagram.

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Dial turned to low frequency end; volume control at minimum.
- Measured on 117 Volts AC line.
- Voltages measured with Vacuum Tube Voltmeter.





*These readings will be either lower or practically zero if taken with a 1000 ohm-per-volt meter.

CONDENSERS

C1a	Ant., 420 mmfd. max.	Gang	68B 38
C1b	Osc. 108 mmfd. max.		
	(Dial drum spot welded to gang)		
C2	47 mmfd., ceramic		65C 6-79
C3	.1 mfd., 200 volts, paper		64B 1-30
C4	75 mmfd., 3%		Part of T1
C5	75 mmfd., 3%		Part of T1
C6	75 mmfd., 3%		Part of T2
C7	75 mmfd., 3%		Part of T2
C8	220 mmfd., ceramic		65C 6-80
C9	.05 mfd., 400 volts, paper		64B 1-22
C10	.01 mfd., 400 volts, paper		64B 1-25
†C11	.005 mfd., 400 volts		
†C12	See schematic		
†C13	See schematic		
C14	.02 mfd., 400 volts, paper		64B 1-24
C15a	70 mfd., 150 volts	elect.	67A 1-7
C15b	30 mfd., 150 volts	elect.	67A 1-7
C16	.05 mfd., 400 volts, paper		64B 1-22
C17	.18 mfd., 200 volts, paper		64A 2-2

COILS, TRANSFORMERS, Etc.

L1	Antenna, Loop (mounted on cardboard back)	69C 142
L2	Coil, Oscillator	69A 52-3
T1	Transformer, 1st I.F.	72B 50
T2	Transformer, 2nd I.F.	72B 51
T3	Transformer, Output	98A 4
	Speaker (5" PM) and Output Transformer	78B 62-1
S1	Switch, On-Off	Part of R3
	†Couplate (Includes R5, R6, C11, C12, C13).	63A 5-4

†Part of couplate (part 63A5-4). Replace with exact duplicate or individual components. Note that numbers 1, 2, 3, 4, on schematic correspond to couplate lead numbers printed on face of couplate 63A5-4.

RESISTORS

Symbol	Description	Part No.
R1	22,000 ohms, ½ watt	60B 8-223
R2	1 megohm, ½ watt	60B 8-105
R3	1 megohm, Volume Control and On-Off switch S1	75B 1-40
R4	4.7 megohms, ½ watt	60B 8-475
†R5	500,000 ohms, ½ watt	
†R6	500,000 ohms, ½ watt	
R7	150 ohms, ½ watt	60B 8-151
R8	33 ohms, 1 watt	60B 28-3
R9	1,000 ohms, 1 watt	60B 28-2
R10	150,000 ohms, ½ watt	60B 8-154

MISCELLANEOUS

Description	Part No.
Cabinet	
Ebony (5E21)	34D 39-1
Mahogany (5E22)	34D 39-2
Ivory (5E23)	34D 39-3
Carton and fillers	44B 191
Clip, Elect., mtg.	18A 10-6
Cotter Pin (for carrying handle)	8A 4-5-71
Dial Cord (32" required)	50A 1-3
Drum, Dial Pointer	17A 27
Escutcheon, Dial Scale	23C 77
Grille, Speaker (Metal)	
Ebony (for 5E21)	16A 30-1
Gold (for 5E22, 5E23)	16A 30-2
Handle, Plastic	
Ebony (for 5E21)	37B 36-1
Ivory (for 5E23)	37B 36-3
Mahogany (for 5E22)	37B 36-2
Knob, Tuning	
Ebony (for 5E21)	33A 64-4
Ivory (for 5E23)	33A 64-3
Mahogany (for 5E22)	33A 64-2
Pointer, Dial	
Gold (for 5E21)	25A 45-1
Ivory (for 5E23)	25A 45-3
Mahogany (for 5E22)	25A 45-2
Ring, Dial Pointer Compression	19A 31-2
Shaft, Dial Pointer	28A 42-1
Shaft, Tuning	28A 26-4
Sleeve, Dial Pointer Shaft	27A 124
Sleeve, Tuning Shaft	27A 124-1
Snap Buttons (cabinet back)	13A 1-5
Snap Button, Escutcheon mtg.	13A 1-2-71
Socket, Tube	87A 10-2
Spacer, Tuning Shaft	29A 2-7-71
Speed Nut, Escutcheon Retaining	2B 10-35-68
Speed Nut (for tuning shaft spacer)	2B10-21-59
Spring, Dial Cord Tension	19B 1-5
Spring (for carrying handle)	19A 69
Washer, "C" (tuning shaft)	4A 4-6-0
Washer, Felt (knob)	5A 4-4
Washer, Spring (tuning shaft)	4A 4-6-0

MODELS 5E21, 5E22,
5E23, Ch. 5E2

ALIGNMENT PROCEDURE

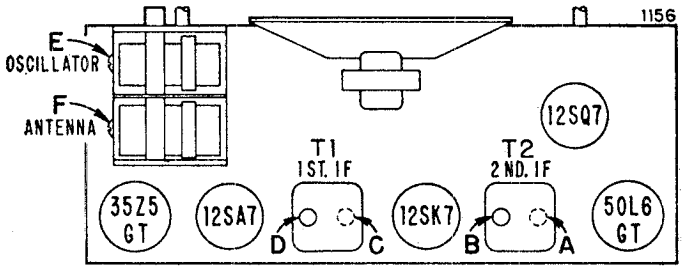
- Connect output meter across speaker voice coil.
- Turn receiver volume control full on.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and connect to chassis.

  Caution: Do not connect a ground wire directly to chassis.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Antenna stator of tuning condenser	455 KC	Gang fully open	2nd IF 1st IF	*A, B *C, D	Maximum Output
2	250 mmfd. condenser	Antenna stator of tuning condenser	1620 KC	Gang fully open	Oscillator (on gang)	E	Maximum Output
3	Loop of several turns of wire or place generator lead close to receiver loop for adequate signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna (on gang)	F	Maximum Output
4	Mount and set dial pointer as shown in Pointer Setting and Dial Cord Stringing Diagram.						

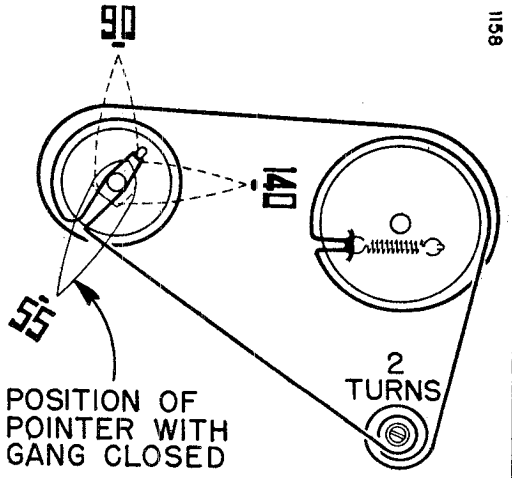
*Adjustments A and C made from the underside of the chassis. If IF transformers have hollow core slugs, these adjustments may all be made from the top of chassis, if you use alignment tool #98A30-7 obtainable from your Admiral distributor. The bottom IF slug adjustment may be reached through the hollow core in the upper slug.

TUBE AND TRIMMER LOCATION



Adjustments A and C are made from underside of chassis.

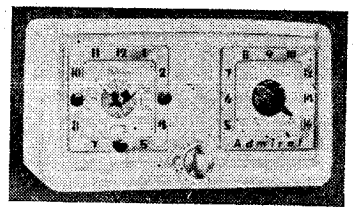
POINTER SETTING AND DIAL CORD STRINGING

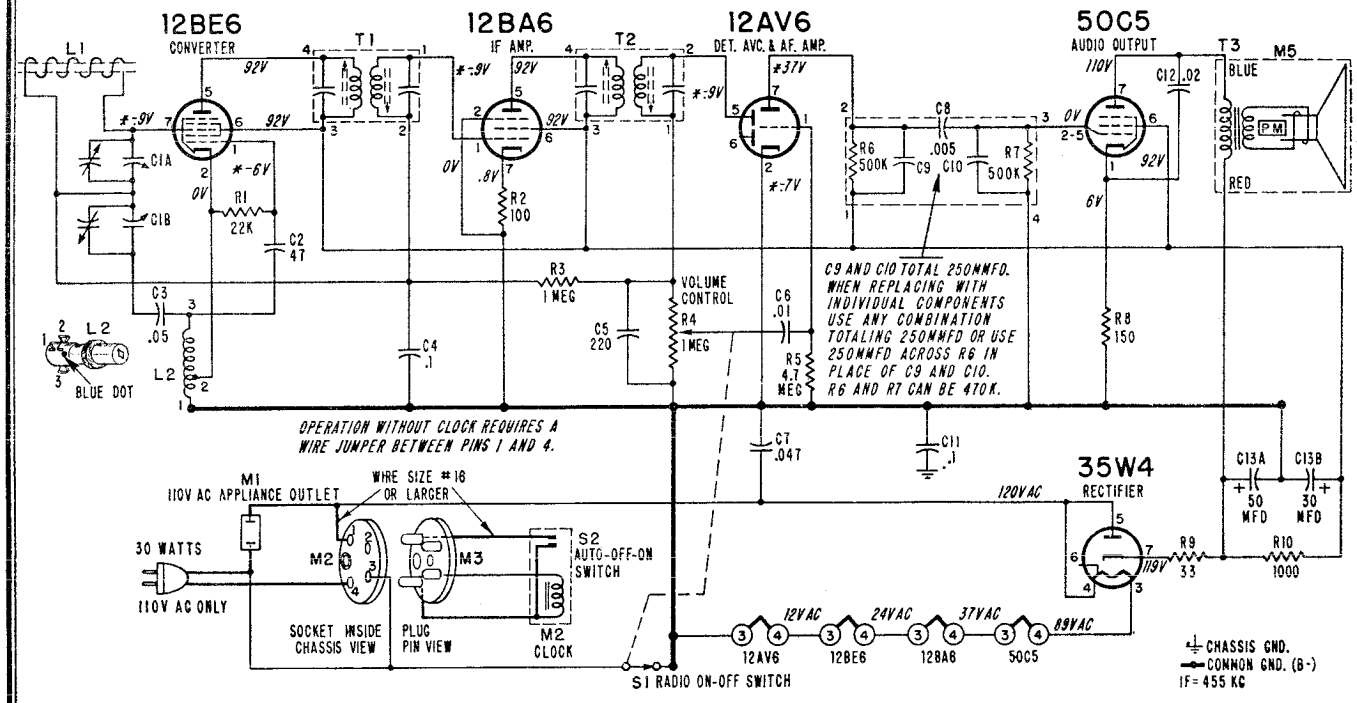


VOLTAGE DATA

Voltages shown on schematic diagram

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low frequency end.
- Voltages measured with Vacuum Tube Voltmeter.





*These readings will be either lower or practically zero if taken with a 1000 ohm-per-volt meter.

CLOCK PARTS

M2	Socket, Clock, 4 contact	87A 6-3
M3	Plug, Clock, 4 pin	88B 22-5
	Shell and Insulator for plug M3	88B 22-3
M4	Clock, Complete	
	60 cycle, for 5G21, 5G22	**91C 4-1
	60 cycle, for 5G23	91C 4-2
	50 cycle, for 5G21/15, 5G22/15	**91C 4-3
	50 cycle, for 5G23/15	91C 4-4
	Background, Clock Dial Bezel	22A 27
	Bezel, Clock (Frame)	
	gold spray finish	91C 4-12
	polished brass finish	91C 4-13
	Field and Coil Assembly	
	for 110 V. 60 cycles	91C 4-15
	for 110 V. 50 cycles	91C 4-17
	Glass, Window	91C 4-11
	Knobs, Clock (Mahogany)	91C 4-10
	Rotor	
	for 110 V. 60 cycles	91C 4-16
	for 110 V. 50 cycles	91C 4-18

**Specify whether bezel is gold spray finish or polished brass finish.

CONDENSERS

Symbol	Description	Part No.
C1A, C1B	290 mmfd. max., Ant. / 104 mmfd. max., Osc. (Dial drum spotwelded to gang)	Gang 68B 39
C2	47 mmfd. ceramic	65C 6-79
C3	.05 mfd, 400 volts, paper	64B 1-22
C4	.1 mfd, 200 volts, paper	64B 1-30
C5	220 mfd, ceramic	65C 6-80
C6	.01 mfd, 400 volts, paper	64B 1-25
C7	.047 mfd, 400 volts, paper	64B 8-28
§C8	.005 mfd, 450 volts.	
§C9, §C10	See Schematic	
C11	.1 mfd, 200 volts, paper	64B 1-30
C12	.02 mfd, 150 volts, paper	64B 1-24
C13A, C13B	50 mfd, 150 volts / 30 mfd, 150 volts	Elect. 67A 22-1

§Part of couplate (part #63A5-4). Replace with exact duplicate or individual components. Note that numbers 1, 2, 3, 4, on schematic correspond to lead numbers printed on face of couplate.

MISCELLANEOUS PARTS

Description	Part No.
Bracket, Tuning Shaft	15A 698
Carton and Fillers	44B 214
Clamp, for Line Cord	11A 9-4
Clip, IF Transformer mtg.	72B 28-10
Compression Ring (for pointer)	19A 31-2
Dial Cord (30" length needed)	50A 1-3
Drum, Dial Pointer	17A 27
Grommet, Rubber (Gang mtg.)	12A 1-19
Line Cord and Plug	89A 34-1
Manual	
Customer Instructions	41A 18-41
Service Manual	S407
Socket, Tube	
plain type	87A 24-2
with grounding strap	87A 24-3
Plate, Pointer Support	15A 498
Pointer, Dial	25A 46-1
Sleeve, for pointer shaft	27A 124
Sleeve, Tuning (Brass)	27A 157
Speed Nut (for mtg. pointer shaft sleeve)	2B 10-28-59
Spring, Dial Cord Tension	19B 1-5
Washer, "C" (for pointer drum)	4A 4-6

RESISTORS

Symbol	Description	Part No.
R1	22,000 ohms, ½ watt	60B 8-223
R2	100 ohms, ½ watt	60B 8-101
R3	1 megohm, ½ watt	60B 8-105
R4	1 megohm, Volume Control (includes Radio On-Off Switch S1)	75B 1-41
R5	4.7 megohms, ½ watt	60B 8-475
§R6	500,000 ohms, ¼ watt	
§R7	500,000 ohms, ¼ watt	
R8	150 ohms, ½ watt	60B 8-151
R9	33 ohms, 1 watt	60B 28-3
R10	1,000 ohms, 1 watt	60B 28-2

CABINET PARTS

Description	Part No.
Background, Tuning Dial Bezel	22A 27
Bezel, Tuning Dial (Frame)	
polished brass finish	23A 85-2
gold spray finish	23A 85-1
Cabinet, Plastic	
Ebony (5G21, 5G21/15)	34D 43-1
Mahogany (5G22, 5G22/15)	34D 43-2
Ivory (5G23, 5G23/15)	34D 43-3
Grille, Speaker (plastic)	36A 22
Knob	
Radio Off-Volume, Gold	33D 55-25
Tuning, Ebony	33D 55-24
Tuning, Mahogany	33D 55-23
Tuning, Ivory	33D 55-26
Washer, Felt (for tuning knobs)	5A 4-18

COIL, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	Rod Antenna & Cabinet Back	69C 143
L2	Coil, Oscillator	69A 52-4
T1	Transformer, 1st IF	72B 28-7
T2	Transformer, 2nd IF	72B 28-7
T3	Transformer, Output	98A 21
M1	Appliance Outlet	87A 21-1
M5	Speaker (4" PM) and Output Trans.	78B 65-1
S1	Switch, Radio On-Off	Part of R4
S2	Switch, Auto-Off-On (part of M4)	91C 4-14

MODELS 5G21, 5G21/15, 5G22, 5G22/15, 5G23, 5G23/15, Ch. 5G2

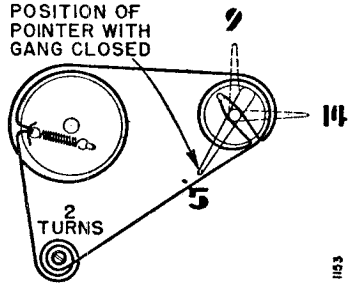
ALIGNMENT PROCEDURE

- Connect a wire jumper between pins 1 and 4 on clock plug (M2) as shown in illustration below.
- Turn receiver volume control full on (fully clockwise).
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and connect to chassis.
  Caution: Do not connect a ground wire directly to chassis.
- Connect output meter across speaker voice coil.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and proceed in the following sequence.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Antenna stator of tuning condenser	455 KC	Gang fully open	2nd IF 1st IF	*A, B *C, D	Maximum output
2	250 mmfd. condenser	Antenna stator of tuning condenser	1620 KC	Gang fully open	Oscillator	E	Maximum output
Mount and set dial pointer to horizontal position with tuning condenser tuned to 1400 KC generator signal; see illustration below.							
3	Loop of several turns of wire, or place generator lead close to receiver loop for adequate* signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna	F	Maximum output

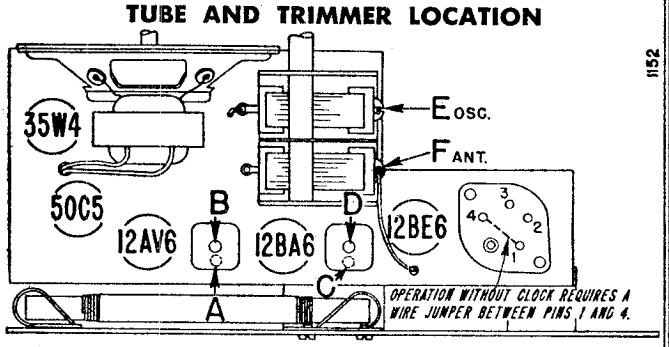
*Adjustments A and C made from the underside of the chassis. If IF transformers have hollow core slugs, these adjustments may all be made from the top of the chassis, if you use alignment tool #98A30-7 obtainable from your Admiral distributor. The bottom IF slug adjustment may be reached through the hollow core in the upper slug.

DIAL STRINGING AND POINTER SETTING



Dial stringing and pointer with solid lines shown with gang closed. Dashed line pointer positions (1400 KC and 900 KC) shown when tuning condenser is tuned to generator signal.

TUBE AND TRIMMER LOCATION



Adjustments A and C made from underside of chassis.

TO REMOVE CLOCK from CABINET

(Radio chassis need not be removed when removing clock)

1. Remove the back from radio cabinet.
2. Remove the clock plug from the socket on top of the radio chassis, by removing screw from top of plug and gently prying plug out from socket.
3. Turn the slumber switch to the "60" position.
4. Remove the 3 nuts which hold the clock back cover to the clock.
5. Carefully pull the clock through the front of the cabinet while twisting it slightly to eliminate binding.

OPERATING RADIO MANUALLY

To operate the radio manually, the "Auto-Off-On" switch must be in the "On" position or the radio will not operate.

The radio on-off switch will turn the radio on or off, but will have no control over the appliance or the clock.

TO REMOVE FIELD and COIL ASSEMBLY or TO REMOVE ROTOR

The field and coil assembly and the rotor can be easily removed after the two screws which mount the nameplate are removed.

Note that when the rotor is replaced, the gear on the rotor must drop into the hole in the center of the gear plate and mesh with the clock gear.

MODELS 5J12, 5J13, Ch. 5J1

CIRCUIT

5 tube AC-DC Superheterodyne covering two bands, (540 KC—1730 KC) and (5.8 MC—18MC).

OPERATING VOLTAGE

110-120 Volts AC or 110-120 Volts DC. It can be operated on 220 Volts AC or DC only if a special line resistance cord is used. (See Parts List.)

ALIGNMENT PROCEDURE

- Connect output meter across voice coil.
- Turn receiver volume control full on.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and attach to B minus of chassis.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

NOTE

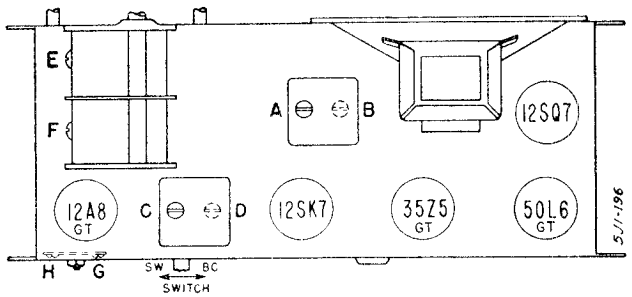
To avoid splitting the slotted head of powdered iron core tuning slugs in I.F. transformers, use an alignment tool having a blade 1/8" wide.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Band Switch Position	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Grid Cap 12A8 Tube	B.C.	455 K.C.	Gang fully open	2nd IF 1st IF	A, B* C, D*	Maximum Output
2	250 mmfd. condenser	End of Ant. Wire	B.C.	1730 K.C.	Gang fully open	B.C. Oscillator (on gang)	E	Maximum Output
3	250 mmfd. condenser	End of Ant. Wire	B.C.	1400 K.C.	Tune in generator signal	B.C. Antenna (on gang)	F	Maximum Output
4	250 mmfd. condenser	End of Ant. Wire	B.C.	600 K.C.	Tune in generator signal	B.C. pad	G	Maximum Output. Rock gang while adjusting
Recheck alignment at 1400 K.C. (in step 3 above)								
5	400 ohm carbon resistor	End of Ant. Wire	S.W.	15 M.C.	Tune in generator signal	S.W. Antenna	H (see caution below)	Maximum Output. Rock gang while adjusting

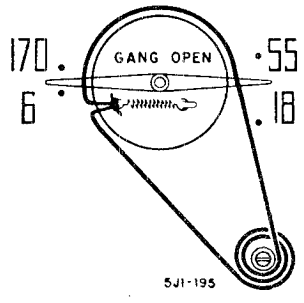
*Adjustments B and D are made from underside of chassis.

Caution: Be sure that trimmer "H" is aligned on correct frequency and not on image which is approximately 910 K.C. lower in frequency as indicated on dial.

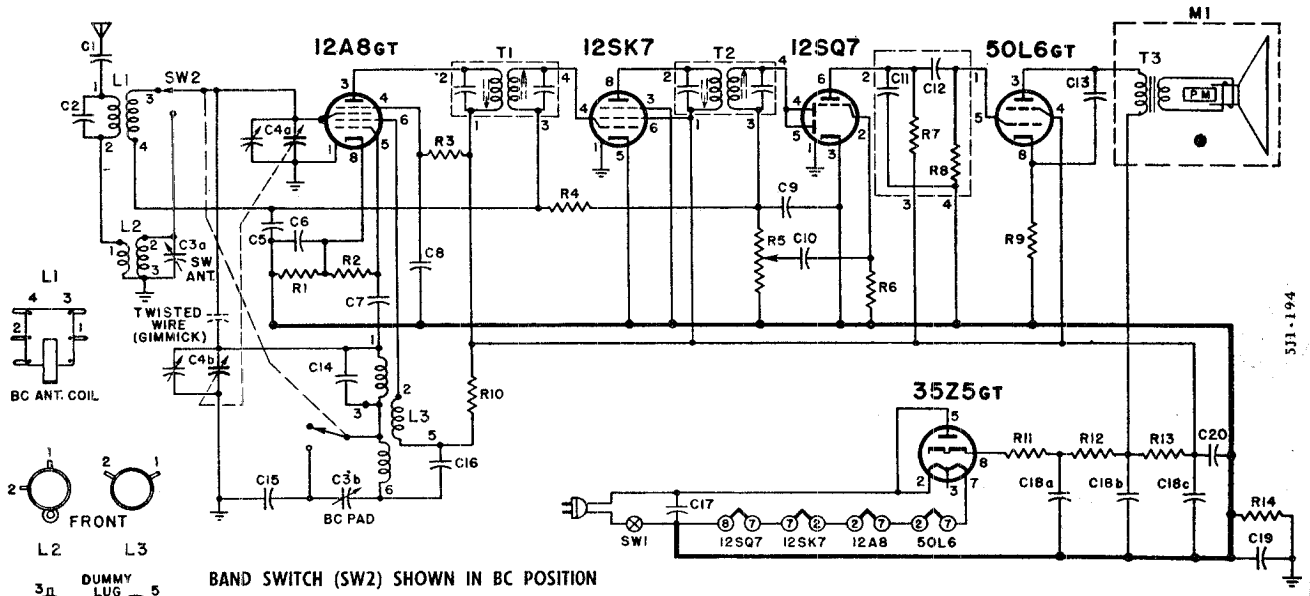
TUBE AND TRIMMER LOCATION



POINTER SETTING AND DIAL CORD STRINGING



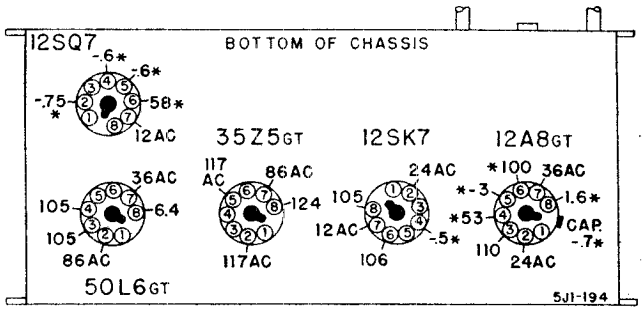
MODELS 5J12, 5J13, Ch. 5J1



BAND SWITCH (SW2) SHOWN IN BC POSITION

VOLTAGE DATA

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Dial turned to low frequency end; volume control at minimum.
- Band switch set in "BC" position.
- Measured on 117 Volts AC line. When measured from DC line, voltages may be slightly lower.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1,000 ohm per volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.



* If taken with a 1000 ohm-per-volt meter, readings will either be lower or practically zero.

RESISTORS

Symbol	Description	Part No.
R1	330 ohms, ½ Watt	60B 8-331
R2	47,000 Ohms, ½ Watt	60B 8-473
R3	39,000 ohms, ½ Watt	60B 8-393
R4	2.2 Megohms, ½ Watt	60B 8-225
R5	1 Megohm Volume Control	75B 1-25
R6	4.7 Megohms, ½ Watt	60B 8-475
*R7	470,000 ohms, ½ Watt	
*R8	470,000 ohms, ½ Watt	
R9	220 ohms, ½ Watt	60B 8-221
R10	3,300 ohms, ½ Watt	60B 8-332
R11	33 ohms, 1 Watt	60B 28-3
R12	150 ohms, 1 Watt	60B 28-1
R13	1,000 ohms, 1 Watt	60B 28-2
R14	150,000 ohms, ½ Watt	60B 8-154

CONDENSERS

Symbol	Description	Part No.
C1	.001 mfd., 400 Volts, Paper	65A 2-6
C2	50 mmfd., Mica	65B 5-11
C3a	3 to 30 mmfd. } Dual Trimmer	66A 23-4
C3b	450 to 510 mmfd. }	
C4a	0 to 420 mmfd. } Gang	68B 22
C4b	0 to 420 mmfd. }	
	Dial drum spotwelded to gang	
C5	.05 mfd., 400 Volts, Paper	65A 2-9
C6	.05 mfd., 400 Volts, Paper	65A 2-9
C7	100 mmfd., 10%, —.00075 Temp. Coeff., Ceramic	65B 6-19
C8	.05 mfd., 400 Volts, Paper	65A 2-9
C9	250 mmfd., Ceramic	65B 6-5
C10	.01 mfd., 400 Volts, Paper	65A 2-18
*C11	250 mmfd., 500 Volts	
*C12	.01 mfd., 400 Volts	
C13	.01 mfd., 400 Volts, Paper	65A 2-18
C14	10 mmfd., 10%, Zero Temp. Coeff., Ceramic	65B 6-44
C15	.003 mfd., 3%, Silver Mica	65B 1-6
C16	.005 mfd. min., Ceramic Disc	65A 10-1
C17	.05 mfd., 400 Volts, Paper	65A 2-9
C18a	30 mfd., 150 Volts } Elect	67A 8
C18b	30 mfd., 150 Volts }	
C18c	20 mfd., 150 Volts }	
C19	.18 mfd., 200 Volts, Paper	65A 2-27
C20	.05 mfd., 400 Volts, Paper	65A 2-9

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	Coil, Antenna BC	69A 74
L2	Coil, Antenna SW	69A 75
L3	Coil, Oscillator BC and SW	69A 76
T1	Transformer, 1st IF	72B 50
T2	Transformer, 2nd IF	72B 51
T3	Transformer, Output	98A 4
SW1	Switch, On-Off	Part of R5
SW2	Switch, Band	77B 1-12
MI	Speaker (5" PM) and Output Trans.	78B 26-1
*Couplate		63A 5-1

* C11, C12, R7, and R8 are contained in a multiple-unit component called a couplate (part number 63A5-1). Although a defective section of the couplate can sometimes be replaced by individual components, we strongly recommend replacing the entire couplate. Note that numerals 1, 2, 3, 4, shown at schematic connections correspond to couplate lead numbers printed on face of couplate.

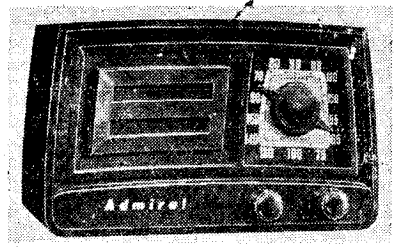
MISCELLANEOUS

Description	Part No.
Antenna Hank (20')	89A 4-2
Cabinet	
Mahogany (5J12)	34D 22-6
Ivory (5J13)	34D 22-7
Carton and Fillers	44B 110
Dial Cord	50A 1-3
Felt Washer (Knob)	5A 4-3
Felt Washer (Pointer)	5A 4-8
Knob	
Ivory	33A 32-5
Walnut	33A 32-4
Pointer	
Ivory	25A 31-2
Walnut	25A 31-1
Ring, Pointer Compression	19A 31-1
Shaft, Tuning	28A 26-1
Spacer, Tuning Shaft	29A 2-7-21
Speed Nut, Tuning Shaft	2B 10-19-59
Spring, Dial Cord Tension	19B 1-2
Washer, "C" (Tuning Shaft)	4A 4-6-0
Washer, Spring (Tuning Shaft)	4A 6-3-0
Resistance Cord, for 220 V. operation	
With American Male Plug	89A 14
With Continental Male Plug	89A 14-1

VOLTAGE DATA

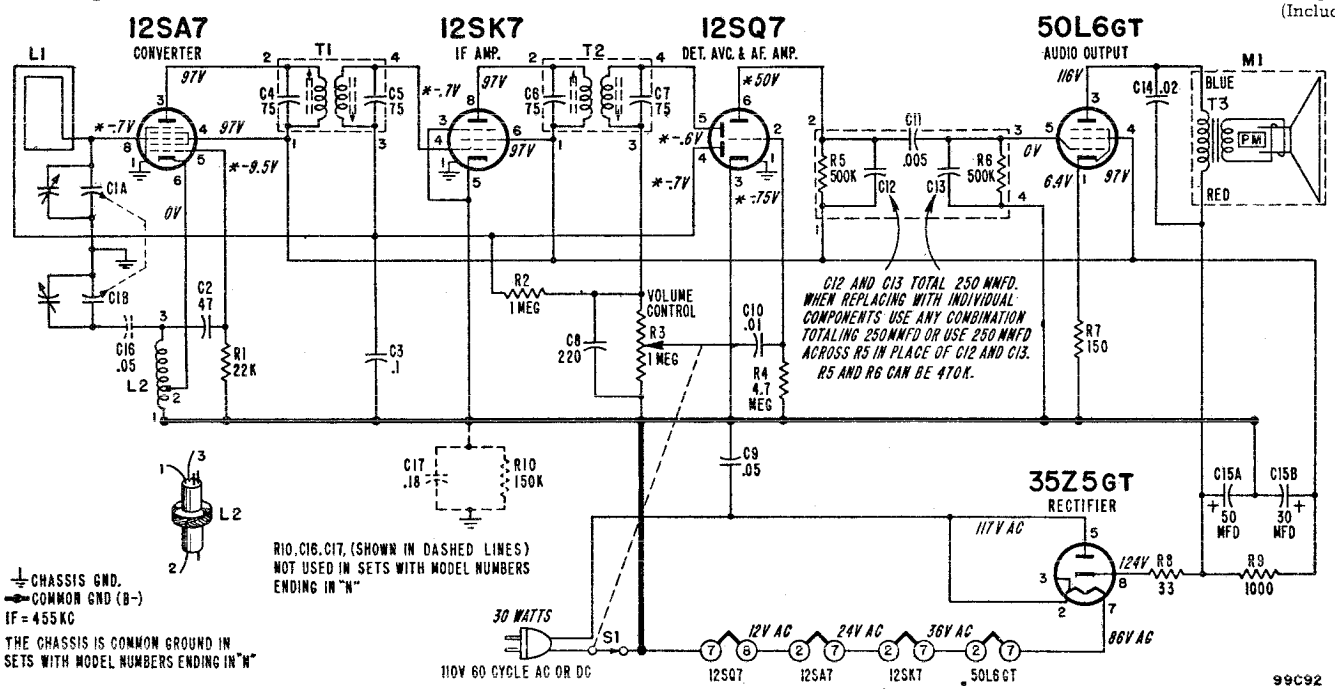
Voltages shown on schematic diagram.

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Dial turned to low frequency end; volume control at minimum.
- Measured on 117 Volts AC line.
- Voltages measured with Vacuum Tube Voltmeter.



CONS, TRANSFORMERS, Etc.

L1	Antenna, Loop (mounted on cardboard back)	69C 60
L2	Coil, Oscillator	69A 20-2
T1	Transformer, 1st I.F.	72B 50
T2	Transformer, 2nd I.F.	72B 51
T3	Transformer, Output	98A 4
	Speaker (5" PM) and Output Transformer	78B 26-1
S1	Switch, On-Off	Part of R3
	†Couplate (Includes R5, R6, C11, C12, C13)	63A 5-4



*These readings will be either lower or practically zero if taken with a 1000 ohm-per-volt meter.

MISCELLANEOUS

Description	Part No.
Cabinet	
Ebony (5J21)	34D 26-9
Mahogany (5J22)	34D 26-10
Ivory (5J23)	34D 26-11
Carton and fillers	44B 210
Clip, Electrolytic Mounting	18A 10-6
Dial Cord	50A 1-3
Dial Crystal	23B 82
Escutcheon, Dial Scale	23B 57
Knob, Tuning	
Ebony (5J21)	33A 39-7
Ivory (5J23)	33A 39-9
Mahogany (5J22)	33A 39-10
Pointer, Dial	
Mahogany	25A 31-5
Ivory	25A 31-6
Ebony	25A 31-7
Ring, Pointer Compression	19A 31-1
Shaft, Tuning	28A 26-1
Socket, Tube	87A 10-2
Spacer, Tuning Shaft	29A 2-1-71
Speed Nut (for tuning shaft spacer)	2B 10-19-2
Spring Dial Cord Tension	19B 1-2
Washer, "C" (tuning shaft)	4A 4-6-0
Washer, Spring (tuning shaft)	4A 6-3-0

RESISTORS

Symbol	Description	Part No.
R1	22,000 ohms, ½ watt	60B 8-223
R2	1 megohm, ½ watt	60B 8-105
R3	1 megohm, Volume Control and On-Off switch S1	75B 1-25
R4	4.7 megohms, ½ watt	60B 8-475
†R5	500,000 ohms, ½ watt	
†R6	500,000 ohms, ½ watt	
R7	150 ohms, ½ watt	60B 8-151
R8	33 ohms, 1 watt	60B 28-3
R9	1,000 ohms, 1 watt	60B 28-2
R10	150,000 ohms, ½ watt. R10 not used in sets with model numbers ending in "N"	60B 8-154

CONDENSERS

C1a	Ant., 420 mmfd., max.	Gang 68B 28-1
C1b	Osc., 108 mmfd., max. (Dial drum spot welded to gang)	
C2	47 mmfd., ceramic	65C 6-79
C3	.1 mfd., 200 volts, paper	64B 1-30
C4	75 mmfd., 3%	Part of T1
C5	75 mmfd., 3%	Part of T1
C6	75 mmfd., 3%	Part of T2
C7	75 mmfd., 3%	Part of T2
C8	220 mmfd., ceramic	65C 6-80
C9	.05 mfd., 400 volts, paper	64B 1-22
C10	.01 mfd., 400 volts, paper	64B 1-25
†C11	.005 mfd., 400 volts	
†C12 †C13	See schematic	
C14	.02 mfd., 400 volts, paper	64B 1-24
C15a	50 mfd., 150 volts elect.	67A 10
C15b	30 mfd., 150 volts elect.	
C16	.05 mfd., 400 volts, paper	64B 1-22
C17	.18 mfd., 200 volts, paper (C16, 17 not used in sets with model numbers ending in "N".)	64A 2-2

†Part of couplate (part 63A 5-4). Replace with exact duplicate or individual components. Note that numbers 1, 2, 3, 4, on schematic correspond to couplate lead numbers printed on face of couplate 63A 5-4.

MODELS 5J21, 5J22,
5J23, Ch. 5J2

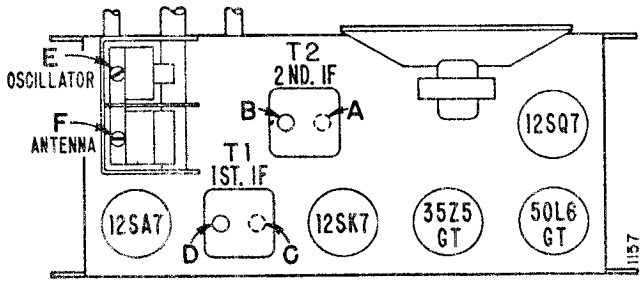
ALIGNMENT PROCEDURE

- Connect output meter across speaker voice coil.
- Turn receiver volume control full on.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and connect to chassis.
  Caution: Do not connect a ground wire directly to chassis.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Antenna stator of tuning condenser	455 KC	Gang fully open	2nd IF 1st IF	*A, B *C, D	Maximum Output
2	250 mmfd. condenser	Antenna stator of tuning condenser	1620 KC	Gang fully open	Oscillator (on gang)	E	Maximum Output
3	Loop of several turns of wire or place generator lead close to receiver loop for adequate signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna (on gang)	F	Maximum Output
4	Mount and set dial pointer as shown in Pointer Setting and Dial Cord Stringing Diagram.						

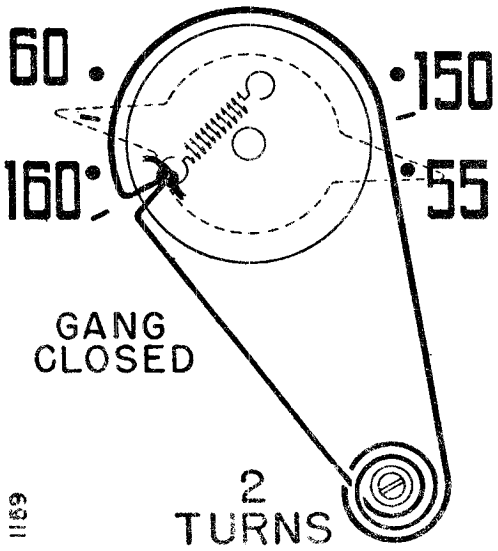
*Adjustments A and C made from the underside of the chassis. If IF transformers have hollow core slugs, these adjustments may all be made from the top of chassis, if you use alignment tool #98A30-7 obtainable from your Admiral distributor. The bottom IF slug adjustment may be reached through the hollow core in the upper slug.

TUBE AND TRIMMER LOCATION

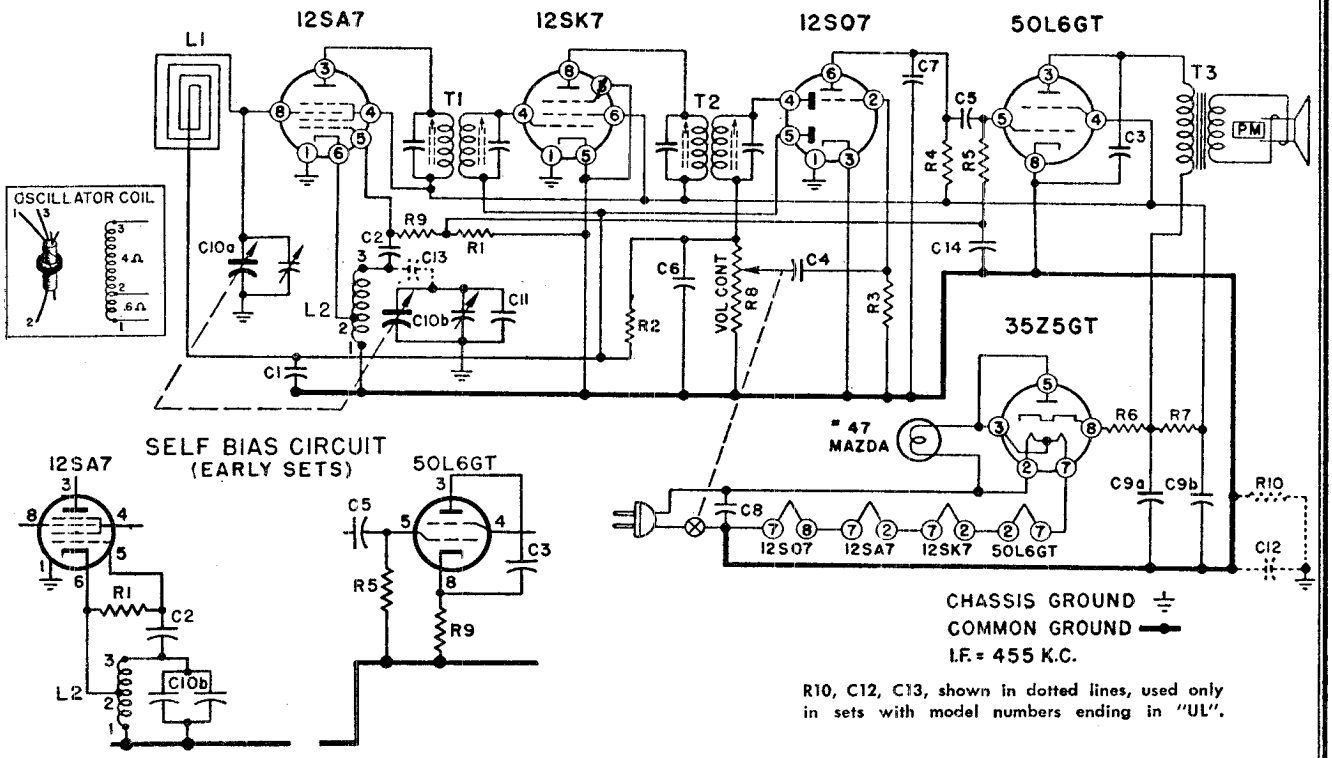


Adjustments A and C are made from underside of chassis.

POINTER SETTING AND DIAL CORD STRINGING



MODELS 5K11, 5K12, 5K13, 5K14; 7T10, 7T14, 7T15, Rev.; Ch. 5K1



Loctal tubes 14B6, 50A5, 35Y4 used as alternates for 12SQ7, 50L6, 35Z5 respectively. See tube manual for pin numbers.

ALIGNMENT PROCEDURE

1. Check pointer setting: With gang closed, the pointer should be horizontal.
2. Connect Output Meter across Voice Coil.
3. Turn Receiver Volume Control full on.
4. Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as outlined in chart below.
5. Repeat adjustments to insure good results.

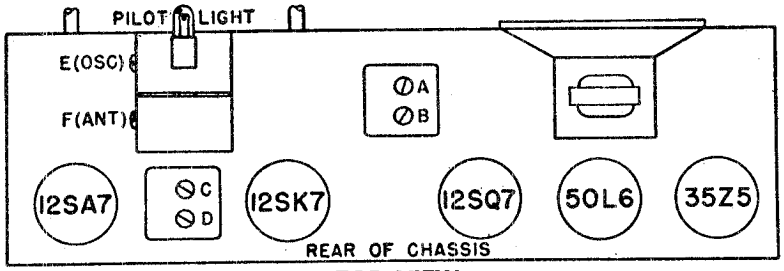
Connect Signal Generator to—	Dummy Antenna Between Radio and Generator	Set Generator Frequency to—	Set Receiver Dial Frequency to—	Adjust Following Trimmers	Type of Adjustment
Tuning Condenser Antenna Stator	250 mmfd. Condenser	455 K.C.	High frequency end of Dial	A-B—2nd I. F. C-D—1st I. F. (See note below)	Adjust to maximum Output
Tuning Condenser Antenna Stator	250 mmfd. Condenser	1630 K.C.	High frequency end of Dial	E—Osc.	Adjust to maximum Output
Loop radiator (or place lead from generator close to loop of set to obtain adequate signal).	No actual connection between set and generator.	1400 K.C.	Tune in generator signal	F—Ant.	Adjust to maximum Output

Note: In some sets, the B and D adjustments must be made from the underside of the chassis.

MODELS 5K11, 5K12, 5K13, 5K14; 7T10, 7T14, 7T15, Rev.; Ch. 5K1

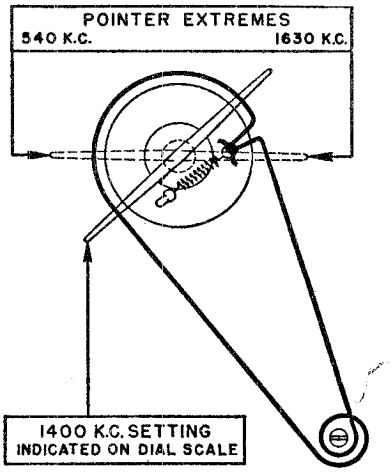
TUBE AND TRIMMER LOCATION

Loctal tubes 14B6, 50A5, 35Y4 used as alternates for 12SQ7, 50L6, 35Z5 respectively. See tube manual for pin numbers.

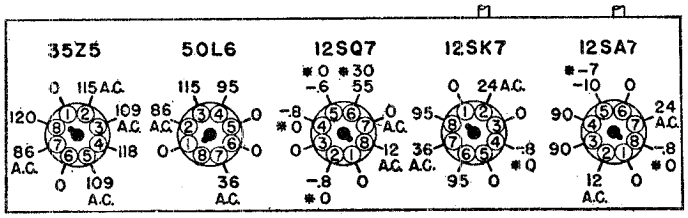


TOP VIEW

DIAL CORD STRINGING



VOLTAGE DATA



***Indicates second reading taken with 1000 ohm-per-volt meter.**

- All readings made between tube socket terminals and B minus (Terminal of on-off switch).
- Voltages measured on a 117 Volt A.C. line.
- Dial turned to low frequency end, no signal.
- Voltages measured with a vacuum-tube voltmeter. A second voltage reading (marked with an asterisk *) indicates readings made with a 1000 ohm-per-volt meter when use of this instrument would result in appreciably lower readings.

RESISTORS

Symbol	Description	Part No.
†R1	12,000 ohms, ½ watt	60B8-123
R2	1 Megohm, ½ Watt	60B 8-105
R3	4.7 Megohms, ½ Watt	60B 8-475
R4	470,000 Ohms, ½ Watt	60B 8-474
†R5	150,000 Ohms, ½ watt	60B8-154
R6	33 Ohms, 1 Watt	60B 28-3
R7	1000 Ohms, 1 Watt	60B 28-2
R8	1 Megohm Volume Control and Switch	75B 1-16
†R9	12,000 Ohms, ½ watt	60B8-123
R10	150,000 Ohms, ½ watt	60B 8-154
	(R10 used only in sets with model numbers ending in "UL".)	

†R1 was 22,000, R5 was 470,000 and R9 was 150 ohms when self-bias circuit was employed. See schematic inset.

CONDENSERS

C1	.1 mfd., 200 Volts, Paper	64B 1-30
C2	50 mmfd., ±20%, Ceramic	65B 6-4
C3	.02 mfd., 400 Volts, Paper	64B 1-24
C4	.01 mfd., 400 Volts, Paper	64B 1-25
C5	.01 mfd., 400 Volts, Paper	64B 1-25
C6	250 mmfd., ±20%, Ceramic	65B 6-5
C7	500 mmfd., ±20%, Ceramic	65B 6-6
C8	.05 mfd., 400 Volts, Paper	64B 1-22
C9a	50 mfd., 150 Volts } Elec	67A 10
C9b	30 mfd., 150 Volts }	
C10a } C10b }	O-420 mmfd } Stamped O-162 mmfd } 68B5 or O-420 mmfd } Stamped O-108 mmfd } 68B19	A1460 68B19
	(Drums are spotwelded to gangs.)	
C11	20 mmfd., ±20%, Ceramic	65B 6-26
	(Used in early sets only.)	

CONDENSERS

Symbol	Description	Part No.
C12	.18 mfd., 200 Volts, paper	64A2-2
C13	.05 mfd., 400 Volts, paper	64B1-22
	(C12 and C13 used only in sets with model numbers ending in "UL".)	
C14	500 mmfd., ±20%, Ceramic	65B6-6
	(Added in later production to prevent R.F. oscillation.)	

COILS, TRANFORMERS, ETC.

L1	Antenna, Loop	69C 19
L2	Coil, Oscillator for gang stamped 68B5 for gang stamped 68B19	69A20 69A20-2
T1	Transformer, 1st I.F. Alternates 72B31 and 72B33 also used. Order part number stamped on original part.	72B50
T2	Transformer, 2nd I.F. Alternates 72B32 and 72B34 also used. Order part number stamped on original part.	72B51
T3	Transformer, Output Speaker (5" PM) and Output Transformer	98A 4 78B 26-1
SW1	Switch, On-Off	Part of R8

MISCELLANEOUS

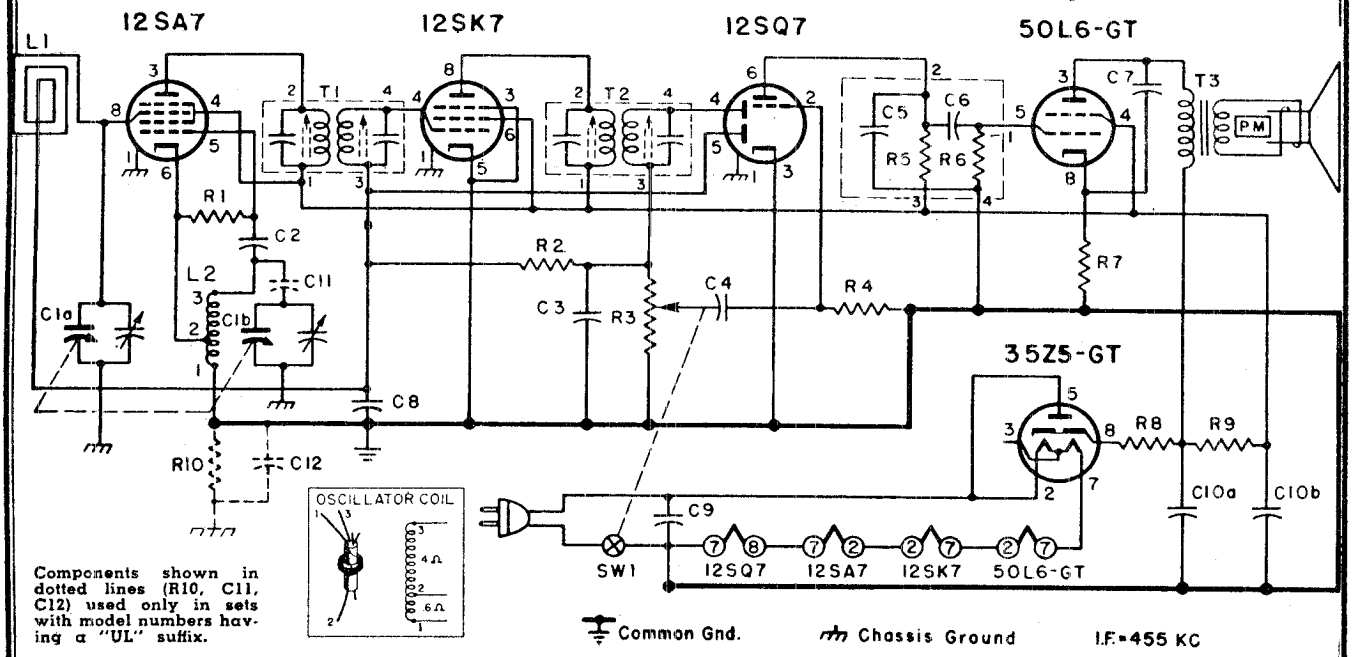
Cabinet	
Plastic Ebony (7T10E)	34D 14-1
Plastic Mahogany (7T10M)	34D 14-2
Plastic Ivory (7T10C)	34D 14-3
Wood (7T15)	*
Plastic Ebony (5K11)	34D 18-1
Plastic Mahogany (5K12)	34D 18-2
Plastic Ivory (5K13)	34D 18-3
Plastic Mahogany & Gold (5K14)	34D 18-4

MISCELLANEOUS

Description	Part No.
Carton and Fillers	44B 98
Dial Background	15B 180
Dial Cord	50A 1-3
Dial Crystal for 7T10, 7T14, 7T15	24A 4
for 5K11, 5K12, 5K13, 5K14	24A 8
Dial Drum	See C10
Dial Light (#47 Mazda)	81A 1-8
Dial Light Socket and Leads	82A 7-2
Dial Scale	21B 39-1
Knob	
Plastic Ebony (7T10E)	33A 18-6
Plastic Mahogany (7T10M)	33A 18-4
Plastic Ivory (7T10C)	33A 18-5
Plastic Ebony (5K11)	33A 32-3
Plastic Mahogany (5K12)	33A 32-1
Plastic Mahogany & Gold (5K14)	33A 32-7
Plastic Ivory (5K13)	33A 32-2
Pointer, for 7T10, 7T14, 7T15	25A 26
Pointer, for 5K11, 5K12, 5K13, 5K14	
Brown	25A 30-1
Brown and Gold	25A 30-2
Shaft, Tuning	28A 11-3
Snap, Buttons (For dial scale)	13A 1-3-47
Snap Button, for dial crystal	13A 1-1-47
Snap Ring (For pointer)	19A 31-1
Socket, Tube	87A 10-2
Spring, Tension	19B 1-2
Washer, 'C' (for tuning shaft)	4A 4-1
Washer, Felt (for knobs)	5A 4-3
Washer, Fibre	5A 2-1
Washer, Spring (for tuning shaft)	4A 6-3-0

*No longer available. Order plastic cabinet.

MODELS 5R10, 5R11, 5R12, 5R13, 5R14, Ch. 5R1



5R1-143

ALIGNMENT PROCEDURE

- Connect output meter across voice coil.
- Turn receiver volume control full on.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and attach to B minus of chassis.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

NOTE

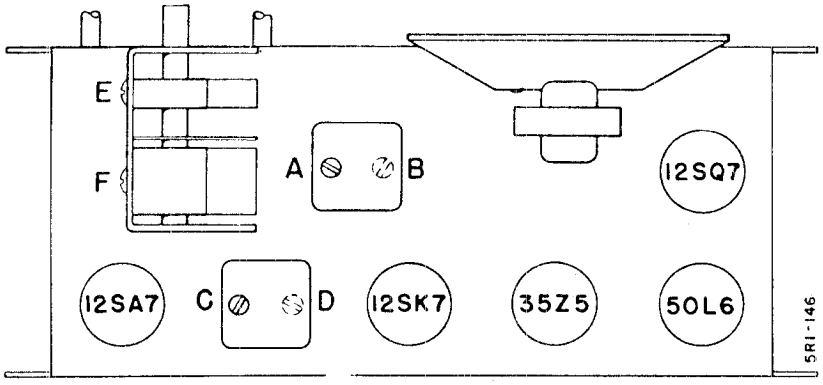
To avoid splitting the slotted head of powdered iron core tuning slugs in I.F. transformers, use an alignment tool having a blade 1/8" wide.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Tuning condenser Antenna stator	455 KC	Gang fully open	2nd IF 1st IF	A, B C, D	Maximum Output
2	250 mmfd. condenser	Tuning condenser Antenna stator	1620 KC	Gang fully open	Oscillator (on gang)	E	Maximum Output
3	Loop of several turns of wire (or place generator lead close to receiver loop for adequate signal)	No physical connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna (on gang)	F	Maximum Output
4	Upon completion of alignment, install chassis in cabinet. Mount and set dial pointer as shown in Dial Stringing and Pointer Setting Diagram.						

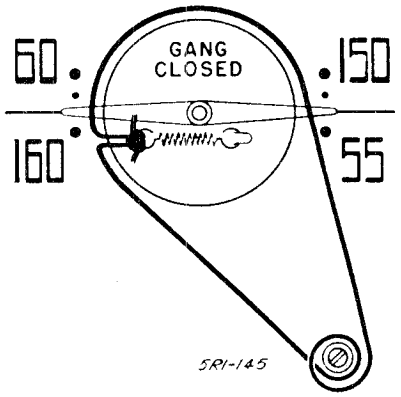
NOTE: Adjustments B and D are made from underside of chassis.

MODELS 5R10, 5R11,
5R12, 5R13, 5R14,
Ch. 5R1

TUBE AND TRIMMER LOCATION

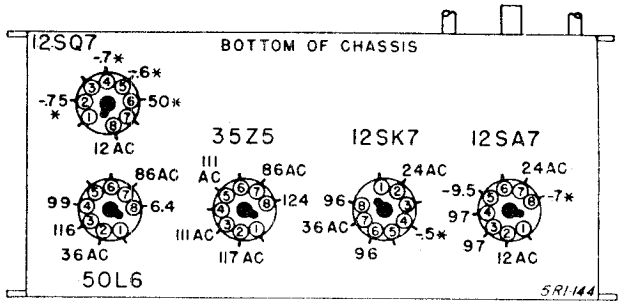


POINTER SETTING AND DIAL CORD STRINGING



VOLTAGE DATA

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Dial turned to low frequency end; volume control at minimum.
- Measured on 117 Volts AC line. When measured from DC line, voltages may be slightly lower.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1,000 ohm per volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.



RESISTORS

Symbol	Description	Part No.
R1	22,000 Ohms, ½ Watt	60B 8-223
R2	1 Megohm, ½ Watt	60B 8-105
R3	1 Meghom Volume Control and On-Off switch SW1	75B 1-25
R4	4.7 Megohms, ½ Watt	60B 8-475
*R5	470,000 Ohms, ½ Watt	
*R6	470,000 Ohms, ½ Watt	
R7	150 Ohms, ½ Watt	60B 8-151
R8	33 Ohms, 1 Watt	60B 28-3
R9	1,000 Ohms, 1 Watt	60B 28-2
R10	150,000 Ohms, ½ Watt	60B 8-154

CONDENSERS

Symbol	Description	Part No.
C1a	Gang, 0 to 420 mmfd.	68B 19
C1b	Gang, 0 to 162 mmfd. (Spot welded to drum)	68B 19
C2	50 mmfd., Ceramic	65B 6-4
C3	250 mmfd., Ceramic	65B 6-5
C4	.01 mfd., 400 Volts, Paper	64B 1-25
*C5	250 mmfd., 500 Volts	
*C6	.01 mfd., 400 Volts	
C7	.02 mfd., 400 Volts, Paper	64B 1-24
C8	.1 mfd., 200 Volts, Paper	64B 1-30
C9	.05 mfd., 400 Volts, Paper	64B 1-22
C10a	50 mfd., 150 Volts	Elect. 67A 10
C10b	30 mfd., 150 Volts	
C11	.05 mfd., 400 Volts, Paper	64B 1-22
C12	.18 mfd., 200 Volts, Paper	64A 2-2

COILS, TRANSFORMERS, Etc.

Symbol	Description	Part No.
L1	Antenna, Loop (mounted on cardboard back)	69C 60
L2	Coil, Oscillator	69A 20-2
T1	Transformer, 1st I.F.	72B 50
T2	Transformer, 2nd I.F.	72B 51
T3	Transformer, Output	98A 4
	Speaker (5" PM) and Output Transformer	78B 26-1
SW1	Switch, On-Off	Part of R3
	*Couplate (Includes R5, R6, C5, C6)	63A 5-1

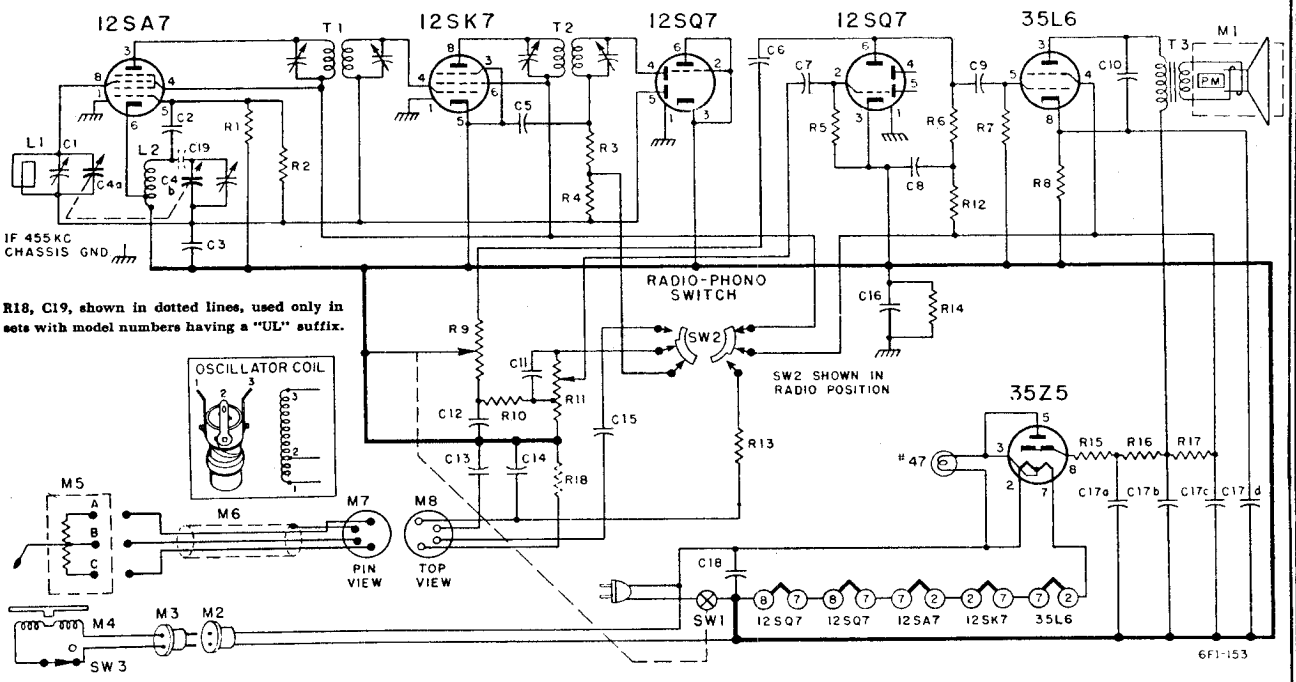
* C5, C6, R5, and R6 are contained in a multiple-unit component called a couplate (part number 63A5-1). Although a defective section of the couplate can sometimes be replaced by individual components, we strongly recommend replacing the entire couplate.

Note that numerals 1, 2, 3, 4, shown at schematic connections correspond to couplate lead numbers printed on face of couplate.

MISCELLANEOUS

Description	Part No.
Cabinet	
Ebony	34D 22-1
Mahogany	34D 22-2
Ivory	34D 22-3
Walnut and Gold	34D 22-4
Cartons and fillers	44B 110
Dial Cord	50A 1-3
Felt Washer (Knob)	5A 4-3
Felt Washer (Pointer)	5A 4-8
Knob	
Ebony	33A 32-6
Ivory	33A 32-5
Walnut	33A 32-4
Walnut and Gold	33A 32-7
Pointer	
Ebony	25A 31-3
Ivory	25A 31-2
Walnut	25A 31-1
Ring, Pointer Compression	19A 31-1
Shaft, Tuning	28A 26-1
Spacer, Tuning Shaft	29A 2-7
Speed Nut, Tuning Shaft	2B10-19
Spring, Dial Cord Tension	19B1-2
Washer, "C" (tuning shaft)	4A4-6-0
Washer, Spring (tuning shaft)	4A6-3-0

MODELS 6F10, 6F11, 6F12, Ch. 6F1



ALIGNMENT PROCEDURE

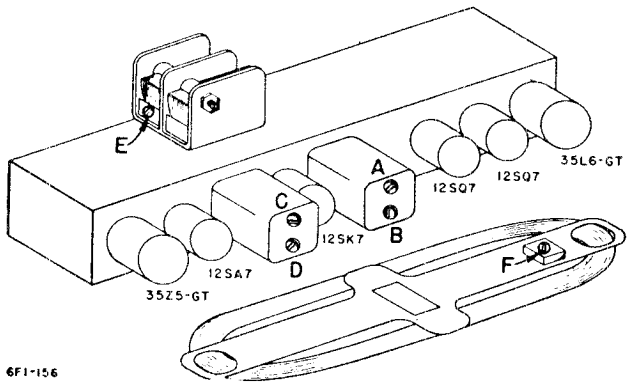
- Check pointer position. With tuning gang closed, the tip of the pointer clip should be over the 1/16" circular punch at the extreme left end of the dial background (see stringing diagram).
- Connect output meter across voice coil.
- Turn receiver volume control full on; set tone control at full treble.
- Loop antenna must be connected and placed in the same relative position to the chassis as when in cabinet.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and attach to B minus of chassis.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and proceed in the following sequence.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Tuning condenser, antenna stator	455 KC	Gang fully open	2nd IF 1st IF	A, B C, D	Maximum output
2	250 mmfd. condenser	Tuning condenser, antenna stator	1630 KC	Gang fully open	Oscillator	E	Maximum output
3	Loop of several turns of wire, or place generator lead close to receiver loop for adequate signal.	No physical connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna	F (see note below)	Maximum output

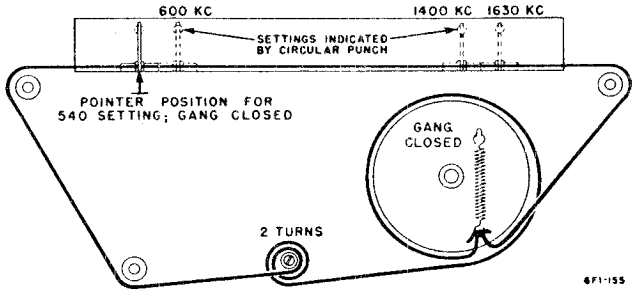
NOTE: Antenna Trimmer "F" must be aligned after chassis and loop are mounted in cabinet. Loop trimmer adjustment is located at the rear of the cabinet.

MODELS 6F10, 6F11, 6F12, Ch. 6F1

TUBE AND TRIMMER LOCATION



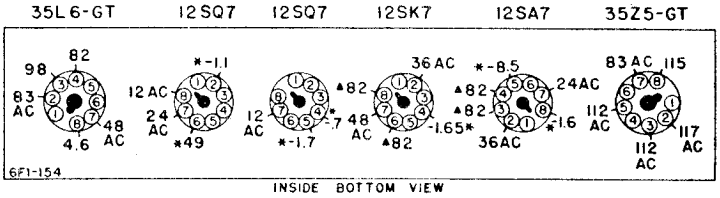
DIAL STRINGING AND POINTER SETTING



With the gang fully closed, the tip of the pointer clip should be in line with the 1/16" circular punch at the extreme left end of the dial background.

VOLTAGE DATA

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Switch in "Radio" position.
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low frequency end.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1000 ohm-per-volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.



*** If taken with a 1000 ohm-per-volt meter, readings will be lower or practically zero.**

▲ On "Phono" these voltages will be zero. All other DC readings may be slightly higher.

RESISTORS

Symbol	Description	Part No.
R1	22,000 Ohms, ½ Watt	60B 8-223
R2	10 Megohms, ½ Watt	60B 8-106
R3	100,000 Ohms, ½ Watt	60B 8-104
R4	1 Megohm, ½ Watt	60B 8-105
R5	4.7 Megohms, ½ Watt	60B 8-475
R6	470,000 Ohms, ½ Watt	60B 8-474
R7	470,000 Ohms, ½ Watt	60B 8-474
R8	150 Ohms, ½ Watt	60B 14-151
R9	2 Megohms Tone Control and On-Off Switch SW1	75B 1-12
R10	27,000 Ohms, ½ Watt	60B 8-273
R11	1 Megohm Volume Control	75B 2-6
R12	47,000 Ohms, ½ Watt	60B 8-473
R13	22,000 Ohms, ½ Watt	60B 8-223
R14	150,000 Ohms, ½ Watt	60B 8-154
R15	33 Ohms, 1 Watt	60B 28-3
R16	220 Ohms, 1 Watt	60B 28-7
R17	1,000 Ohms, 1 Watt	60B 28-2
R18	33,000 Ohms, ½ Watt (R18 used only in sets with model numbers having a "UL" suffix)	60B 8-333

CONDENSERS

C1	Trimmer, 3 to 30 mmfd.	Part of L1
C2	50 mmfd., Ceramic	65B 6-4
C3	.1 mmfd., 200 Volts, Paper	64B 1-30
	Gang-0 to 420 mmfd. Gang-0 to 162 mmfd.	A1654
C4a C4b	(This gang stamped 68B5 or 68B20) OR Gang-0 to 420 mmfd. Gang-0 to 108 mmfd.	A1726
	(This gang stamped 68B20-1)	
	Note—Gang spot welded to dial drum.	
C5	250 mmfd., Ceramic	65B 6-5
C6	.002 mfd., 600 Volts, Paper	64B 1-14
C7	.01 mfd., 400 Volts, Paper	64B 1-25
C8	.1 mfd., 200 Volts, Paper	64B 1-30
C9	.01 mfd., 400 Volts, Paper	64B 1-25
C10	.03 mfd., 400 Volts, Paper	64B 1-23
C11	500 mmfd., Ceramic	65B 6-6
C12	.01 mfd., 400 Volts, Paper	64B 1-25
C13	.05 mfd., 400 Volts, Paper	64B 1-22
C14	.18 mfd. 200 Volts, Paper	64A 2-2
C15	.001 mfd., 600 Volts, Paper	64B 1-15
C16	.18 mfd., 200 Volts, Paper	64A 2-2
C17a C17b C17c C17d	30 mfd., 150 Volts 30 mfd., 150 Volts 20 mfd., 150 Volts 20 mfd., 25 Volts	Elect 67A 14-1
C18	.05 mfd., 400 Volts, Paper	64B 1-22
C19	.02 mfd., 400 Volts, Paper (Used only in sets with model numbers having a "UL" suffix.)	64B 1-24

COILS, TRANSFORMERS, Etc.

L1	Antenna and Trimmer, Loop	69B 13
L2	Coil, Oscillator (Use with gang stamped 68B5 or 68B20)	69A 14
	Coil, Oscillator (Use with gang stamped 68B20-1)	69A 52
T1	Transformer, 1st IF	72B 3
T2	Transformer, 2nd IF	72B 4
T3	Transformer, Output	79A 11-2
M1	Speaker (5") with Output Trans. attached	78B 19-2
	Speaker (5") without output Trans. (Use when output trans. is mounted on chassis)	78B 39-1
M2	Socket, Phono input	88A 8-6
SW1	Switch, On-Off	Part of R9
SW2	Switch, Radio-Phono	77A 16-4

PHONOGRAPH PARTS

Note—See RC180 Record Changer Manual for complete parts list.

M3	Plug, AC Phono Motor	88A 8-1
M4	Motor, 60 Cycles, 115 Volts AC	407B 3-2
M5	Cartridge and Needle, Pickup	A1372-13
M6	Cable, Pickup (3 conductor)	89A 18-4
M7	Plug, Pickup Cable	88A 8-5
SW3	Switch, Motor On-Off (See caution in changer manual)	408A 1
	Centerpost (includes speed-nut)	G400B 137-1
	Idler Wheel (407B 3-2 Motor)	G400A 23
	Idler Wheel (407B 1-2 Motor)	G400A 57

CABINET PARTS

Description	Part No.
Bracket, Dial Scale Mtg.	15A 169
Cabinet, Plastic	
Bottom Less Lid (Mahog. 6F11)	34D 11-12
Lid only (Mahogany 6F11)	34D 11-13
Bottom Less Lid (Ebony 6F10)	34D 11-14
Lid only (Ebony 6F10)	34D 11-15
*Cabinet, Wood	
*Complete (Walnut 6F12)	35D 81-1
Lid only (Walnut 6F12)	98A 43-1
Dial Scale, Glass	21B 35-2
Escutcheon Overlay	23C 23-1
Grille Cloth and Baffle	A1688
Hinge, Butt (for Walnut 6F12)	98A 43-3
Knobs, Radio	
"Volume" and "Tone" (Mahog. or Wal.)	33A 21-5
"Volume" and "Tone" (Ebony)	33A 21-6
"Tuning" (Mahog. or Wal.)	33B 34-2
"Tuning" (Ebony)	33B 34-4
"Radio-Phono" (Mahog. or Wal.)	33B 34-1
"Radio-Phono" (Ebony)	33B 34-3
Rubber Strip, Dial Scale Mtg. (8½")	12A 9-3
Stay Arm (For Walnut 6F12)	98A 43-2

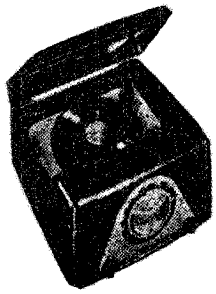
MISCELLANEOUS

Background, Dial	22B 9-1
Bracket, Tuning Sleeve	15A 289
Bracket, Dial Light	15A 156
Cartons and Fillers	
Models 6F11 and 6F10	44B 112
Model 6F12	44B 116
Pilot Light No. 47	81A 1-8
Pilot Light Socket and Leads	82A 2-4
Pointer, Dial	25A 21
Sleeve, Tuning (Brass)	27A 61
Spring, Dial Drum Tension	19B 1-3
Washer, Felt ("Volume" and "Tone")	5A 4-8
Washer, Felt (Center Knob)	5A 4-9

*** Supplied only if old cabinet cannot be repaired. When ordering, describe condition of old cabinet in detail.**

MODELS 6J21, 6J22, Ch. 6J2

RECORD CHANGER SERVICE DATA



The changer model number will be found stamped at the top rear of the changer base and also on the changer model label

RECORD CHANGER: See Model RC550, Pgs. RCD.CH.21-9 to RCD.CH.21-16.

ALIGNMENT PROCEDURE

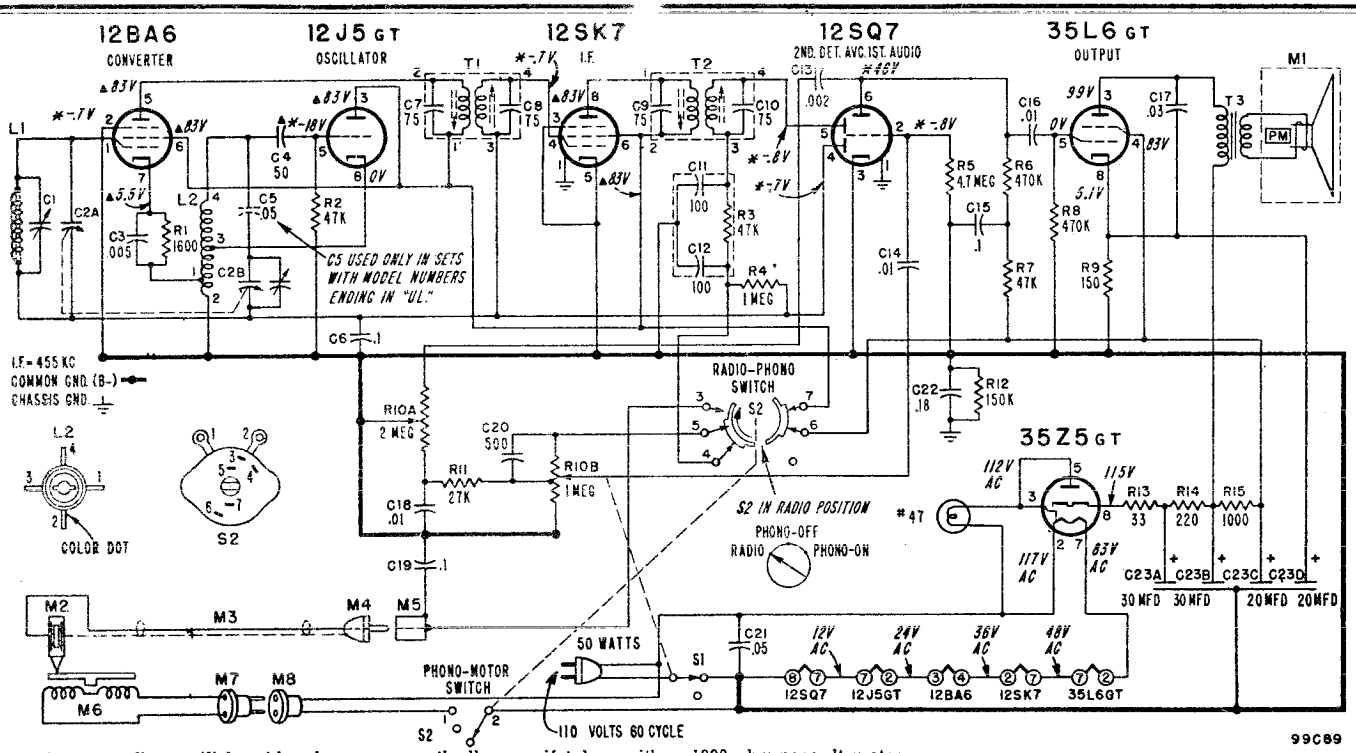
- Turn receiver volume and tone controls full on.
- Antenna must be connected and placed in the same relative position to the chassis as when in cabinet.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and connect to chassis. Caution: Do not connect a ground wire directly to chassis.
- Connect output meter across speaker voice coil.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and proceed in the following sequence.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Tuning condenser, antenna stator	455 KC	Gang fully open	2nd IF 1st IF	*A, B *C, D	Maximum output
2	250 mmfd. condenser	Tuning condenser, antenna stator	1620 KC	Gang fully open	Oscillator	F	Maximum output

Mount dial pointer. Set pointer to horizontal position with tuning condenser tuned to 1400 KC generator signal (see illustration below). Rotate the tuning condenser until the pointer is in a vertical position (900 KC), then slip chassis in cabinet, carefully guiding the pointer so that it locates between the dial escutcheon and the cabinet. Install antenna and chassis mounting bolts. The pointer and escutcheon may be mounted after installing the chassis in cabinet as follows: Set pointer to horizontal position with gang tuned to 1400 KC signal. Place escutcheon on cabinet. With long nose pliers slip the hairpin ends of the escutcheon mounting springs in holes of escutcheon tabs.

3	Loop of several turns of wire, or place generator lead close to receiver antenna for adequate signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna	†F	Maximum output

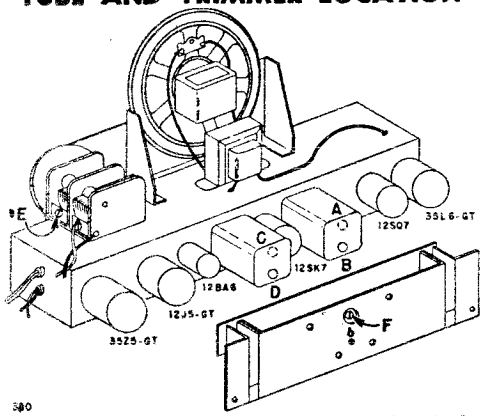
*Adjustments A and C made from the underside of the chassis. If IF transformers have hollow core slugs, these adjustments may all be made from the top of chassis, if you use alignment tool #98A30-7 obtainable from your Admiral distributor. The bottom IF slug adjustment may be reached through the hollow core in the upper slug.
† Antenna Trimmer "F" should be aligned after chassis and antenna are mounted in cabinet.



99C89

*These readings will be either lower or practically zero if taken with a 1000 ohm-per-volt meter.
▲ These readings will be zero on "Phono"; all other DC readings may be slightly higher.

TUBE AND TRIMMER LOCATION



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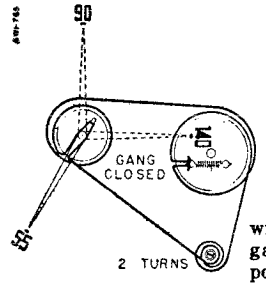
Adjustments A and C made from underside of chassis.

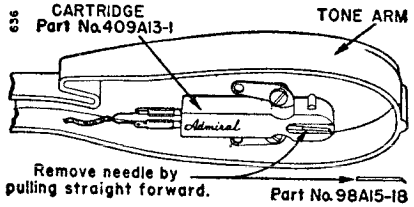
DIAL STRINGING AND POINTER SETTING

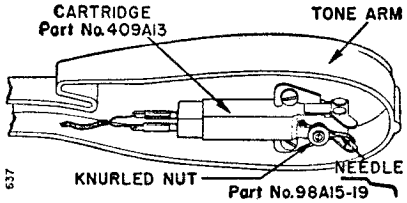


Dial stringing and pointer with solid lines shown with gang closed. Dashed line pointer positions (1400 KC and 900 KC) shown when tuning condenser is tuned to generator signal.

Cartridge and Needle

As shown in the illustrations, alternate cartridges may be used. Cartridges are interchangeable when complete with needle.





VOLTAGE DATA

Voltages given on schematic diagram.

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Range Switch in "Radio" position.
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low end.
- Voltages measured with Vacuum Tube Voltmeter.

CABINET PARTS

Cabinet, Plastic	
Bottom, less lid (Ebony 6J21)	34D 28-3
Bottom, less lid (Mahogany 6J22)	34D 28-5
Lid only (Ebony 6J21)	34D 28-4
Lid only (Mahogany 6J22)	34D 28-6

PHONOGRAPH PARTS

Symbol	Description	Part No.
M2	Cartridge Pickup (includes needle)	409A 13
M3	Cable, Shielded Pickup (includes plug)	413A 11-1
M4	Plug, Pickup Cable	88A 2-3
M6	Motor, Phono (3 speed)	407B 19
M7	Plug, Motor (Male)	88A 8-1
	Adapter, 45 RPM (envelope of 12)	48A 8-1
	Button, Snap-in Plug	13A 2-8-57
	Centerpost, Record	G400B 505-1
	Idler Wheel (Includes tire)	G400A 279
	Needle, Pickup	
	for 409A13 cartridge	98A 15-19
	for 409A13-1 cartridge	98A 15-18
	Needle Retaining Nut (for 409A13 cartridge)	98A 54-2
	Service Manual, RC550 Changer	S327
	Screw and Washer, Changer Mounting (10-32x1¼ RH MS)	AA210
	Spring, Changer Float	19A 10-3

RESISTORS

Symbol	Description	Part No.
R1	1,600 ohms, ½ watt, 5%	60B 7-162
R2	47,000 ohms, ½ watt	60B 8-473
†R3	47,000 ohms, ¼ watt	
R4	1 megohm, ½ watt	60B 8-105
R5	4.7 megohms, ½ watt	60B 8-475
R6	470,000 ohms, ½ watt	60B 8-474
R7	47,000 ohms, ½ watt	60B 8-473
R8	470,000 ohms, ½ watt	60B 8-474
R9	150 ohms, 1 watt	60B 14-151
R10A	2 megohms, tone	75B 11-8
R10B	1 megohm, volume	
R11	27,000 ohms, ½ watt	60B 8-273
R12	150,000 ohms, ½ watt	60B 8-154
R13	33 ohms, 1 watt	60B 28-3
R14	220 ohms, 1 watt	60B 28-7
R15	1,000 ohms, 1 watt	60B 28-2

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
§L1	Rod Antenna (includes board and Cl)	
L2	Coil, Oscillator	69A 113-1
T1	Transformer, 1st IF	72B 50
T2	Transformer, 2nd IF	72B 51
T3	Transformer, Output	79A 11-3
M1	Speaker, (5" pm)	78B 39-3
M5	Socket, Phono input	88A 1
M8	Socket & Leads, Motor	89A 6-3
S1	Switch, On-Off	Part of R10
S2	Switch, Radio-Phono	77A 28-1
S3	Switch, Phono Motor	Part of S2
	†Diode Filter	63A 3-1

CONDENSERS

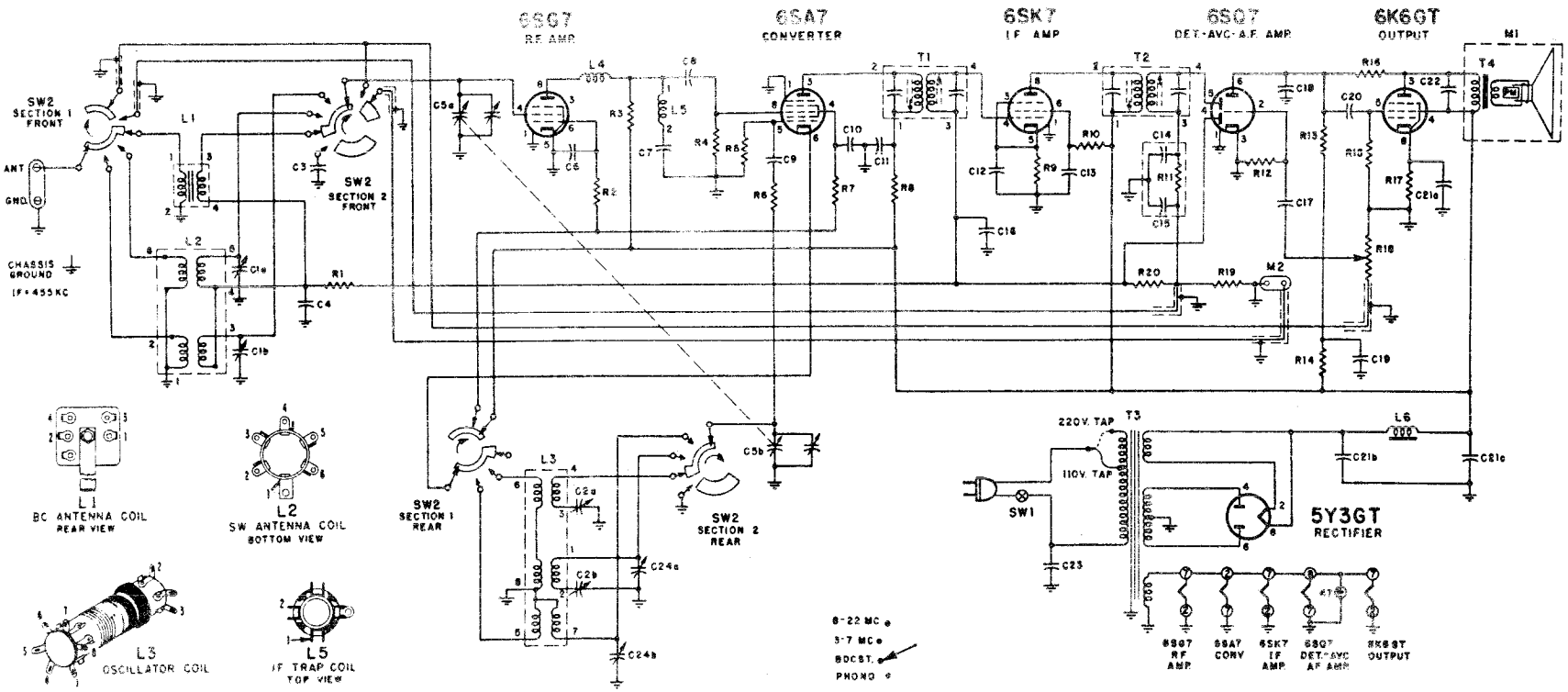
Symbol	Description	Part No.
C1	Trimmer, 3 to 30 mmfd.	Part of L1
§C2	Antenna and Oscillator gang	
C3	.005 mfd., min., Ceramic	65A 10-1
C4	50 mmfd., Ceramic	65B 6-4
C5	.05 mfd., 400 volts, paper	64B 1-22
C6	.1 mfd., 200 volts, paper	64B 1-30
C7	75 mmfd., 3%, Ceramic	Part of T1
C8	75 mmfd., 3%, Ceramic	Part of T1
C9	75 mmfd., 3%, Ceramic	Part of T2
C10	75 mmfd., 3%, Ceramic	Part of T2
†C11	100 mmfd., Ceramic	
†C12	100 mmfd., Ceramic	
C13	.002 mfd., 600 volts, paper	64B 1-14
C14	.01 mfd., 400 volts, paper	64B 1-25
C15	.1 mfd., 200 volts, paper	64B 1-30
C16	.01 mfd., 400 volts, paper	64B 1-25
C17	.03 mfd., 400 volts, paper	64B 1-23
C18	.01 mfd., 400 volts, paper	64B 1-25
C19	.1 mfd., 200 volts, paper	64B 1-30
C20	500 mmfd., Ceramic	65B 6-6
C21	.05 mfd., 400 volts, paper	64B 1-22
C22	.18 mfd., 200 volts, paper	64A 2-2
C23a	30 mfd., 150 volts	Elect. 67A 14-1
C23b	30 mfd., 150 volts	
C23c	20 mfd., 150 volts	
C23d	20 mfd., 25 volts	

MISCELLANEOUS

Description	Part No.
Carton and Fillers	44B 145
Clip, Electrolytic Mounting	18A 10-6
Speed Nut (esc. mtg.)	2B 10-35-68
Dial Cord	50A 1-3
Drum, Pointer	17A 27
Gasket, Sponge Rubber (mounts on Speaker)	12B 43
Grommet, Rubber (gang mtg.)	12A 1-2
Insulator, Phono Receptacle	32A 46
Manual	
Customer Instruction	41A 18-33
Service, for RC550 Changer	S327
Pilot Light, #47	81A 1-8
Pilot Light Socket and Leads	82A 2-2
Plate, Pointer Support	15A 498
Pointer, Dial	25A 35-1
Shaft, Pointer	28A 42
Shield, Pilot Light	82A 15-1
Sleeve, Pointer Shaft	27A 162-1
Sleeve, Tuning (Brass)	27A 123
Spacer, "T" (gang condenser mtg.)	29A 2-1-71
Spring, Dial Cord Tension	19B 1-5
Socket, Tube (12BA6)	87A 33-2
Washer, "C" (for pointer drum)	4A 4-6
Washer, Spring	4A 6-10-0
Clamp, Cable	11A 2-2
Escutcheon, Dial	23C 81-1
Escutcheon Ring (Gold trim)	23A 53
Hinge	37A 8-1
Hinge Screw (6/32x¼ BH MS)	365-250-C2-58
Hinge Stud	27A 17-1
Jewel, Pilot Light	82A 14-2
Knobs, Radio, for Ebony 6J21	
"Tuning" (outer knob)	33C 55-15
"Radio-Phono" (inner knob)	33C 55-16
"Off-On Volume" (inner knob)	33C 55-18
"Tone" (outer knob)	33C 55-17
Knobs, Radio, for Mahogany 6J22	
"Tuning"	33C 55-19
"Radio-Phono"	33C 55-20
"Off-On Volume"	33C 55-22
"Tone"	33C 55-21
Rubber Bumper	
for cabinet bottom	12A 3-4
for cabinet top	12A 9-8
Stay Arm and Plate	37A 9-1
Washer, Felt (for tuning knobs)	5A 4-9

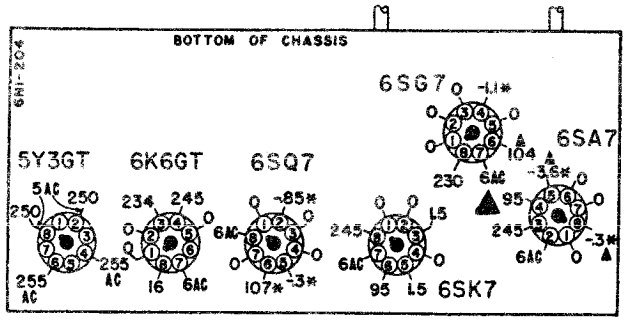
† Part of Diode Filter 63A3-1. This unit consisting of C11, C12 and R3 may be replaced with individual components.

§ Early sets used part number 68B30 gang (antenna 420 mmfd. max., oscillator 108 mmfd. max.) with part number 69B141 rod antenna. Late sets use part number 68B30-1 gang (antenna 324 mmfd. max., oscillator 108 mmfd. max.) with part number 69B144 rod antenna; the model label on these sets is stamped "RUN 2". Interchangeable only as sets; part numbers are stamped on gang and board.



VOLTAGE DATA

- Measured on 117 Volts AC line.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1,000 ohm per volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.
- All readings made between tube socket terminals and chassis ground, unless otherwise indicated.
- Dial turned to low frequency end; volume control at minimum.
- Band switch set in "BC" position.



* If taken with a 1000 ohm-per-volt meter, readings will be lower or practically zero.

▲ On "Phono" these voltages will be zero. All other DC readings may be slightly higher.

MODELS 6N12, 6N13, Ch. 6N1

ALIGNMENT PROCEDURE

- Be sure both set and signal generator are thoroughly warmed up before starting alignment.
- Turn gang condenser to wide open position and make sure that dial pointer is at position shown in illustration below.
- Connect output meter across voice coil.
- Turn receiver volume control full on.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

NOTE

To avoid splitting the slotted head of powdered iron core tuning slugs in I.F. transformers, use an alignment tool having a blade 1/8" wide.

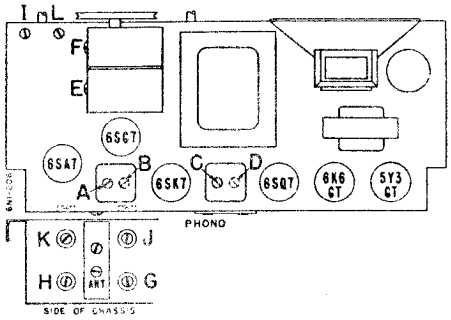
Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Band Switch Position	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	.02 mfd. condenser	†Pin No. 8 of 6SA7	Broadcast	455 KC	Gang fully open	2nd IF 1st IF	A, B* C, D*	Maximum Output
2	200 mmfd. condenser	Antenna Terminal	Broadcast	1730 KC	Gang fully open	B.C. Oscillator (on gang)	E	Maximum Output
3	200 mmfd. condenser	Antenna Terminal	Broadcast	1400 KC	Tune in generator signal	B.C. Antenna (on gang)	F	Maximum Output
4	200 mmfd. condenser	Antenna Terminal	Broadcast	600 KC	Tune in generator signal	B.C. pad	G	Maximum Output. "Rock" gang while adjusting
Recheck alignment at 1400 KC (in step 3 above)								
5	400 ohm carbon resistor	Antenna Terminal	Medium	7.5 MC	Gang fully open	M.B. Osc. Trimmer	H**	Maximum Output
6	400 ohm carbon resistor	Antenna Terminal	Medium	6.2 MC	Tune in signal	M.B. Ant. Trimmer	I	Maximum Output
7	400 ohm carbon resistor	Antenna Terminal	Medium	3.2 MC	Tune in signal	M.B. Osc. Pad	J	Maximum Outut "Rock" gang while adjusting
Recheck alignment in step 5 and 6								
8	400 ohm carbon resistor	Antenna Terminal	Short Wave	23 MC	Gang fully open	S.W. Osc. Trimmer	K**	Maximum Output
9	400 ohm carbon resistor	Antenna Terminal	Short Wave	18 MC	Tune in signal	S.W. Ant. Trimmer	L	Maximum Output "Rock" gang while adjusting

* Adjustments B and D are made from underside of chassis.

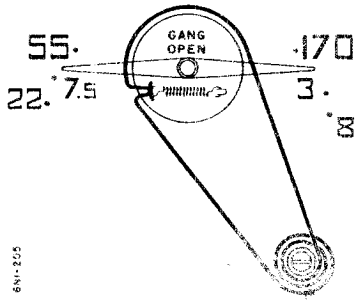
† If IF adjustments are very far off alignment, it may be necessary to feed signal through pin #4 of 6SK7, then through pin #8 of 6SA7.

** Be sure that trimmer is aligned at correct frequency and not on image which should be approximately 910 KC lower than correct frequency, as indicated on the dial. Check to see that image appears 910 KC lower than alignment frequency.

TUBE AND TRIMMER LOCATION



POINTER SETTING AND DIAL CORD STRINGING



MODELS 6N12, 6N13, Ch. 6N1

RESISTORS

Symbol	Description	Part No.
R1	270,000 ohms, ½ Watt	60B 8-274
R2	47,000 ohms, ½ Watt	60B 8-473
R3	2,200 ohms, ½ Watt	60B 8-222
R4	100,000 ohms, ½ Watt	60B 8-104
R5	22,000 ohms, ½ Watt	60B 8-223
R6	100 ohms, ½ Watt	60B 8-101
R7	15,000 ohms, ½ Watt	60B 8-153
R8	1,000 ohms, ½ Watt	60B 8-102
R9	100 ohms, ½ Watt	60B 8-101
R10	47,000 ohms, ½ Watt	60B 8-473
*R11	47,000 ohms, ¼ Watt	
R12	4.7 megohms, ½ Watt	60B 8-475
R13	270,000 ohms, ½ Watt	60B 8-274
R14	33,000 ohms, ½ Watt	60B 8-333
R15	470,000 ohms, ½ Watt	60B 8-474
R16	1 Megohm, ½ Watt	60B 8-105
R17	560 ohms, 1 Watt	60B14-561
R18	2 Megohm, Volume Control and On-Off Switch SW1	75B 1-29
R19	680,000 ohms, ½ Watt	60B 8-684
R20	2.2 Megohms, ½ Watt	60B 8-225

CONDENSERS

C1a	3 to 40 mmfd } Dual Trimmer	66A 23-7
C1b	3 to 40 mmfd }	
C2a	410 to 500 mmfd } Dual	
C2b	1700 to 3100 mmfd } Trimmer	66A 23-5
C3	.01 mfd., 450 Volts, Ceramic	65A 10-3
C4	.05 mfd., 400 Volts, Paper	65A 2-9
C5a	0 to 420 mmfd., Ant. } Gang	68B 23
C5b	0 to 420 mmfd., Osc. }	
	(Dial drum spotwelded to gang)	
C6	.05 mfd., 400 Volts, Paper	65A 2-9
C7	60 mmfd., ±5%, —.00075 Temp. Coeff., Ceramic	65B 6-8
C8	100 mmfd., Mica	65B 5-17
C9	50 mmfd., Mica	65B 5-11
C10	.05 mfd., 400 Volts, Paper	65A 2-9
C11	.05 mfd., 400 Volts, Paper	65A 2-9
C12	.05 mfd., 400 Volts, Paper	65A 2-9
C13	.05 mfd., 400 Volts, Paper	65A 2-9
*C14	100 mmfd., Ceramic	
*C15	100 mmfd., Ceramic	
C16	.05 mfd., 400 Volts, Paper	65A 2-9
C17	.01 mfd., 400 Volts, Paper	65A 2-8
C18	250 mmfd., Ceramic	65B 6-5
C19	.05 mfd., 400 Volts, Paper	65A 2-9
C20	.01 mfd., 400 Volts, Paper	65A 2-8
C21a	20 mfd., 25 Volts } Elect	67C 6-25
C21b	30 mfd., 350 Volts }	
C21c	30 mfd., 350 Volts }	
C22	.005 mfd., 400 Volts, Paper	65A 2-17
C23	.01 mfd., 400 Volts, Paper	65A 2-8
C24a	3 to 40 mmfd. } Dual Trimmer	66A 23-6
C24b	3 to 30 mmfd. }	

* Part of Diode Filter Unit 63A3-1. This unit consists of R11, C14, C15 (see schematic). If a section of the unit becomes defective, replace with exact duplicate or individual components of proper value.

CIRCUIT

Six tube AC operated Superhetrodyne receiver, covering three bands. Broadcast: 540 KC—1730 KC. Medium: 2.75 MC—7.5 MC. Short Wave: 7.2 MC to 23 MC. A phono-jack has been provided on rear of set to plug in phonograph.

ANTENNA

Since this set is highly sensitive, for best results do not use an antenna longer than necessary.

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	Coil, Antenna (BC)	69A 78
L2	Coil, Antenna (MB and SW)	69A 79
L3	Coil, Osc. (BC, MB and SW)	69A 67
L4	Coil, Peaking (RF)	69A 80
L5	Coil, Trap (455 KC)	69A 77
L6	Filter Choke	74A 10
T1	Transformer, 1st IF	72B 71
T2	Transformer, 2nd IF	72B 72
T3	Transformer, Power (117 V and 220 V)	80B 14
T4	Transformer, Speaker Output	98A 55-1
M1	Speaker (5" PM) with Output Transformer	78B 42
M2	Jack, Phono Input	86A 1
SW1	Switch, On-Off	Part of R18
SW2	Band Switch	76B 15
	Diode Filter	63A 3-1

DIAL PARTS

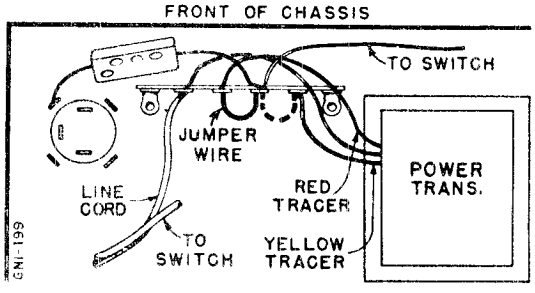
Bracket, Dial Background	15A 180-1
Dial Cord	50A 1-3
Dial Crystal	24A 8
Dial Scale	21B 53
Pilot Light #47	81A 1-8
Pointer, Dial	25A 30-1
Ring, Compression (Pointer)	19A 31-1
Sleeve, Tuner (Brass)	27A 93
Snap Button (for mtg. dial crystal)	13A 1-1-47
Snap Button (for mtg. dial scale)	13A 1-3-47
Socket and Leads, Pilot Light	82A 7-2
Spring, Tension (Dial Cord)	19B 1-2

MISCELLANEOUS

Back, Cabinet	43B 63
Bag, Waxed Paper Shipping	45A 4-12
Bracket, Band Switch	15A 393
Cabinet, Plastic	
Ivory (6N13)	34D 18-3
Mahogany (6N12)	34D 18-2
Carton and Fillers	44B 133
Decal, Band Switch	26A 26
Knobs	
"Band Switch" (Mahog., 6N12)	33B 38-11
"Band Switch" (Ivory, 6N13)	33B 38-12
"On-Off Volume" (Mahog., 6N12)	33B 38-6
"On-Off Volume" (Ivory 6N13)	33B 38-9
"Station Selector" (Mahog., 6N12)	33B 38-5
"Station Selector" (Ivory, 6N13)	33B 38-8
Screw, Mounting (for cabinet back, #6x¼ ST)	1A 51-2-21
Socket Tube (Octal)	87A 10-2
Terminal Board, Antenna	10A 6-2
Washer, Felt (for knobs)	5A 4-10

OPERATING VOLTAGE

110-120 Volts AC, 50 or 60 cycle. 220 Volts AC may be used by changing the connection on terminal strip (see illustration).



For 220 Volt operation, move jumper wire as indicated by dotted line connection.

MODELS 6RT44, 6RT44A, Ch. 7B1

ALIGNMENT PROCEDURE

1. Loop must be connected during alignment.
   Check the set screws that hold the tuning drum to the shaft to see that they are tight and that the drum has not slipped on the shaft. The correct position of the drum can be seen on the stringing diagram.
2. In the closed position the stop on the rear of the dial drum must be against the stop post.
3. With the gang wide open, all slugs should be 1⅜ inches out of their coil forms. If there is any serious deviation or if there has been any tampering, turn the adjusting screws until this distance is correct.
4. Be sure both the set and the signal generator are thoroughly warmed up before starting alignment.
5. Turn receiver Volume Control full on.
6. Use lowest output setting of signal generator that gives a satisfactory reading on meter.
7. Proceed in sequence as outlined below.

Step	Connect Signal Generator To	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Tuning Gang Setting	Adj. Trimmers in Following Order to Max.
1	Set Band Change Switch to Broadcast Position. 6SA7 Grid (Pin #8)	.1 MFD.	455 K.C.	Set Pointer to Upper Limit	A, B, C, D
2	Before proceeding to step 3 check pointer travel as outlined under paragraph below headed "Pointer Adjustment."				
3	Black Loop Lead	20 MMFD. If not available wrap several turns of the generator lead around the black loop lead.	1605 K.C.	Set Pointer to Upper Limit	E, F, G
4	Black Loop Lead		1300 K.C.	Set Pointer to 1300 Mark on Slide Rail	H, I, J
5	Set Band Change Switch to Short Wave Position.				
6	Black Loop Lead	400 Ohms	12.5 M.C.	Set Pointer to Upper Limit	K, L, M
7	Black Loop Lead	400 Ohms	12.0 M.C.	Set Pointer to 1300 Mark on Slide Rail	N, O, P

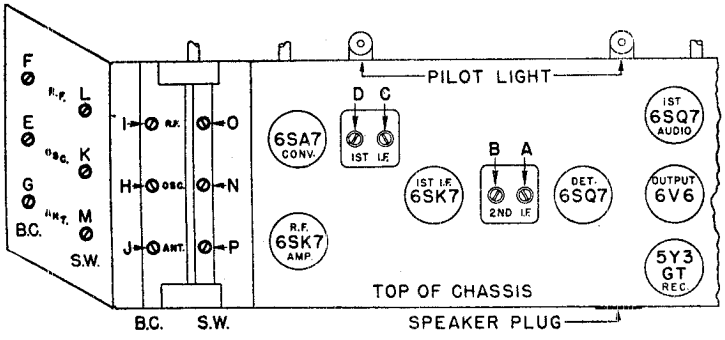
POINTER ADJUSTMENT

Move the dial pointer by means of the tuning control knob to see that it reaches the upper and lower limits as shown on the stringing diagram. In the upper limit position measure the distance D-E and in the lower limit position measure the distance A-B. The distance from A and B must be the same as the distance from D to E. If these distances are not equal, unclamp and move the pointer slide on the string until they are the same. The pointer should be checked again at the upper and lower limit to be sure that it is right. Take care to see that the pointer does not slip during this operation. Reclamp the pointer slide tightly to the string and seal with any quick-drying cement. Set the tuning gang wide open and proceed with operation 3.

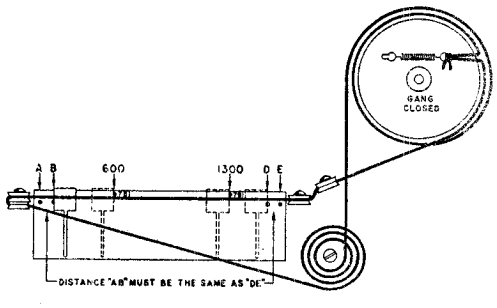
REPLACING TUNING SLUG

If it becomes necessary to change a tuning slug proceed in the following manner: Set the gang to its wide open position, unsolder and remove the old slug. Set the slug adjusting screw about half way down. Place the new slug in such a position that 1⅜ inches of its length is above the coil form. Solder it in this position making sure that it does not slip during the operation and that the slug wire is straight. Proceed to realign the set as shown in the chart.

TUBE AND TRIMMER LAYOUTS



STRINGING DIAGRAM



RESISTORS

Symbol	Description	Part No.
R1	12,000 Ohms 5 Watt	61A1-1
R2	150,000 Ohms ½ Watt	60B8-154
R3	470,000 Ohms ½ Watt	60B8-474
R4	10,000 Ohms 2 Watt	60B20-103
R5	22,000 Ohms ½ Watt	60B8-223
R6	10 Megohms ½ Watt	60B8-106
R7	1 Megohm ½ Watt	60B8-105
R8	2 Megohms, Tone Control	75B1-5
R9	27,000 Ohms ½ Watt ,	60B8-273
R10	1 Megohm, Volume Control Tapped at Approx. 500,000 ohms	75B2-1
R12	270,000 Ohms ½ Watt	60B8-274
R13	470,000 Ohms ½ Watt	60B8-474
R14	1 Megohm ½ Watt	60B8-105
R15	390 Ohms 1 Watt	60B14-391
R16	10 Megohms ½ Watt	60B8-106
R17	100 Ohms ½ Watt	60B8-101
R18	47,000 Ohms ½ Watt	60B8-473
R19	100,000 Ohms ½ Watt	60B8-104
R20	270,000 Ohms ½ Watt	60B8-274
R22	100 Ohms ½ Watt	60B8-101

CONDENSERS

Symbol	Description	Part No.
C1	1,000 Mmfd., Mica	65B7-33
C2	140 Mmfd., Silver Mica 3%	65B1-26
C3	25 Mmfd., Silver Mica 3%	65B1-28
C4	100 Mmfd., Mica	65B7-17
C5	50 Mmfd., Mica	65B5-11
C6	.05 Mfd., 400 Volts	64B1-22
C7	65 Mmfd., Silver Mica 3%	65B1-27
C8	420 Mmfd., Silver Mica 2%	65B1-13

CONDENSERS (Cont'd)

Symbol	Description	Part No.
C10	20 Mmfd., Mica	65B7-5
C11	65 Mmfd., Silver Mica 3%	65B1-27
C12	200 Mmfd., Silver Mica 2%	65B1-14
C13	.1 Mfd., 400 Volts	64B1-20
C14	250 Mmfd., Mica	65B7-22
C15	1,000 Mmfd., Mica	65B7-33
C16	.02 Mfd., 400 Volts	64B1-24
C17	.01 Mfd., 400 Volts, Condenser	64B1-25
C18	.01 Mfd., 400 Volts, Condenser	64B1-25
C19	.01 Mfd., 600 Volts, Condenser	64B1-10
C20a	30 Mfd., 350 Volts	67C6-25
C20b	30 Mfd., 350 Volts	
C20c	20 Mfd., 25 Volts	
C21a	3-40 Mmfd. Trimmer	66A1-5
C21b	3-40 Mmfd. Trimmer	
C22a	3-40 Mmfd. Trimmer	66A1-5
C22b	3-40 Mmfd. Trimmer	
C23a	3-40 Mmfd. Trimmer	66A1-5
C23b	3-40 Mmfd. Trimmer	
C24	100 Mmfd., Mica	65B7-17
C26	1,200 Mmfd., Mica	65B5-34
C27	100 Mmfd., Mica	65B7-17

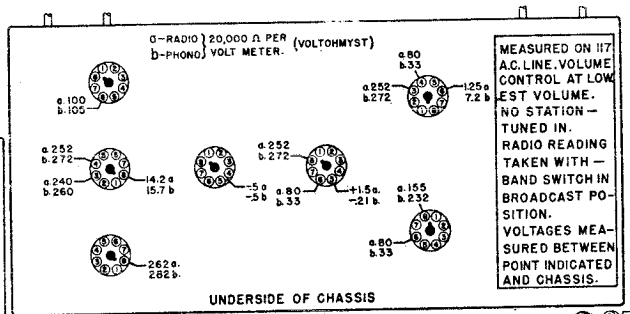
TRANSFORMERS and COILS

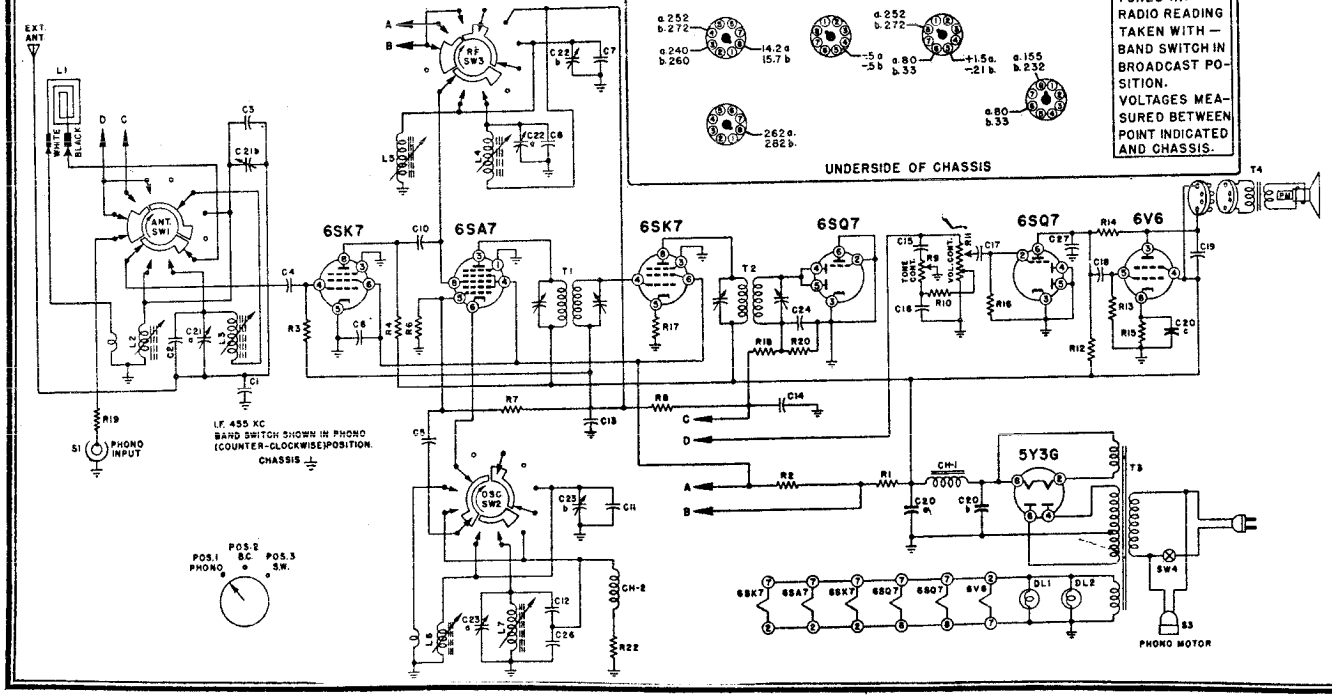
Symbol	Description	Part No.
L1	Antenna, Loop	AC104
L2	Coil, S.W. Antenna	AD116-1
L3	Coil, B.C. Antenna	AB100-2
L4	Coil, B.C. R.F.	AB100-1
L5	Coil, S.W. R.F.	AD116-2
L6	Coil, S.W. Oscillator	AD116-3
L7	Coil, B.C. Oscillator	AC101-1
T1	Transformer, 1st I.F.	72B7
T2	Transformer, 2nd I.F.	72B8
T3	Transformer, Power	80B1
T4	Transformer, Output	98B6-1
CH1	Choke, Filter	74A3
CH2	Choke, Oscillator Cathode	AB103-1

SWITCHES, PLUGS and SOCKETS

Symbol	Description	Part No.
S1	Socket, Phono	88A1
S2	Socket, Speaker	87A6-1
S3	Socket and Cord, Phono Motor	89A6-3
SW1	Switch, Antenna	76B1-3
SW2	Switch, Oscillator	76B1-2
SW3	Switch, R.F.	76B1-1
SW4	Switch (on-off) S.P.S.T.	77B1-44

VOLTAGE CHART





MISCELLANEOUS

Description	Part No.
Background, Dial	22B7-1
Bulb, Pilot Light No. 47	81A1-8
Button (For Phono switch button)	33A8-1
Cable and Plug, Shielded	89A5-1
Cord, Dial (64" approx.)	50A1-3
Drum, Dial	17A3
Escutcheon, Dial	21C7-1
Escutcheon, Switch	26A7-1
Knob, Tuning	33B9-1
Knob, SW, B.C., Phono	33B9-2
Knob, Tone	33B9-3
Knob, Volume	33B9-4
Pin Tip, Antenna (Large)	86A2-1
Pin Tip, Antenna (Small)	86A2-2
Plug, Speaker	88A4-4
Plug, Phono Output	88A2-1
Pointer, Dial	25A3
Slug, B.C. Tuning—Specify color code when ordering	71B1-3
Slug, S.W. Tuning—Specify color code when ordering	71B1-9
Socket, Dial Light	82A2-1
Socket, Speaker	87A6-1
Speaker	78B7
Spring, Drum Tension	19B1-7
Stud, Slug adjusting	27A4

PHONOGRAPH PARTS

See Record Changer Service Manual for Detailed Parts List.

Description	Part No.
Centerpost	G400A12
Crystal Cartridge	409A1
Idler Wheel (407B3 Motor)	G400A23
Idler Wheel (407B2 Motor)	G400A59
Idler Wheel (407B1 Motor)	G400A57
Motor, 60 cycle 115 volt, A.C. (Types 407B1 & 407B2 also used)	407B3

MODELS 6T01,
6T04X, Ch. 5A1

CIRCUIT

Chassis 5A1—A.C.-D.C. 5 tube Superheterodyne covering two bands, (540 K.C.—1730 K.C.) and 5.45 Megacycles—17.5 Megacycles.

POWER SUPPLY

110-120 Volts A.C. or 110-120 Volts D.C. It can be operated on 220 Volts A.C. or D.C. only if a special line resistance cord is used.

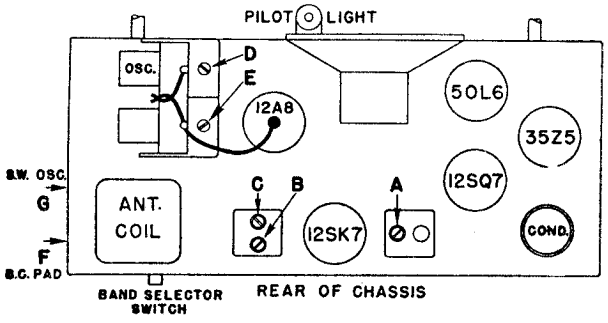
ALIGNMENT PROCEDURE

1. Be sure both set and signal generator are thoroughly warmed up before starting alignment.
2. Turn gang condenser to wide open position and make sure that dial pointer is at position marked "pointer extremes" on the dial diagram (see below).
3. Connect Output Meter across the Voice Coil.
4. Turn receiver Volume Control full on.
5. Use *lowest* output setting of signal generator that will give a satisfactory reading on the Output Meter.
6. Proceed in sequence as indicated in the chart.

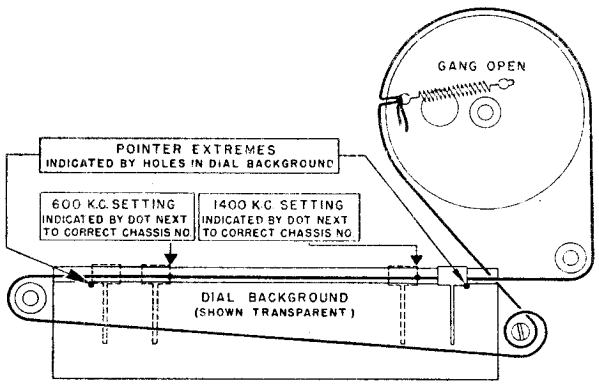
Dummy Antenna in Series with Signal Generator	Signal Generator Frequency	Connect Signal Generator to	Band Switch Position	Receiver Dial Pointer Setting	Adjust Following Trimmers	Type of Adjustment
.00025 Mica	455 K.C.	Grid Cap 12A8 Tube	B.C.	Gang-Condenser Wide open	(A) 2nd I.F. (B) 1st I.F. (C) 1st I.F.	Maximum Deflection Output Meter
.00025 Mica	1730 K.C.	End of Ant. Wire	B.C.	Set to Black dot at extreme upper end of scale.	(D) B.C. Osc.	Maximum Deflection Output Meter
.00025 Mica	1400 K.C.	End of Ant. Wire	B.C.	Tune in Generator Signal	(E) B.C. Ant.	Maximum Deflection Output Meter
.00025 Mica	600 K.C.	End of Ant. Wire	B.C.	Tune in Generator Signal	(F) B.C. Pad Rock Condenser gang while adjusting.	Maximum Deflection Output Meter
Recheck Alignment at 1400 Kc (2nd step above)						
400 ohm Carbon	15 Mc.	End of Ant. Wire	S.W.	Tune in Generator Signal	(G) S.W. Antenna	Maximum Deflection Output Meter

TUBE and TRIMMER LAYOUT

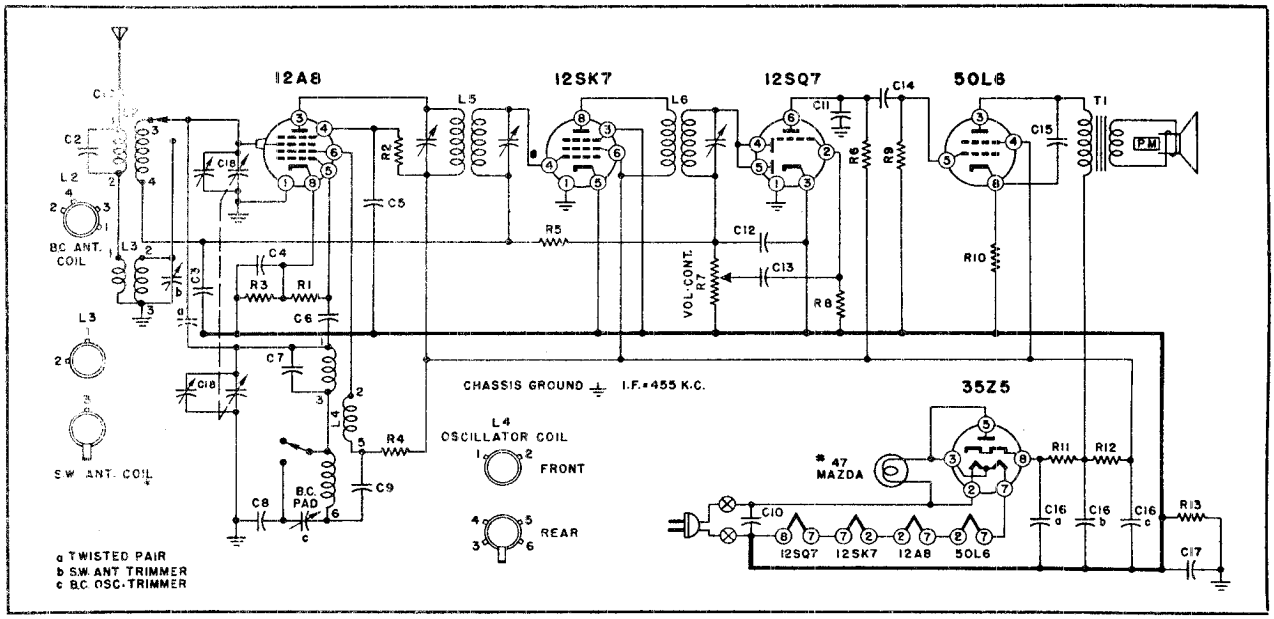
Top View



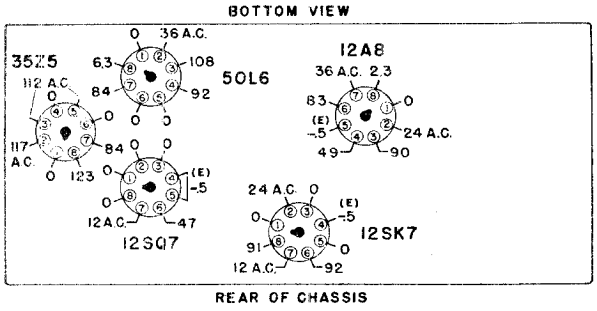
DIAL STRINGING



MODELS 6T01,
6T04X, Ch. 5A1



VOLTAGE CHART



VOLTAGE DATA

1. All readings made between Tube Socket Terminals and Terminal No. 8 on the 12SQ7 Socket.
2. Measured on a 117 Volt A.C. line.
3. Volume control full on.
4. Dial tuned to low frequency end, no signal.
5. Voltages indicated (E) obtained on Vacuum Tube volt meter.
6. All other readings shown are made with a 1000 ohm per volt meter.

REPLACEMENT PARTS

CONDENSERS

Symbol	Description	Part No.
C1	.001 Mfd., paper, 400 V.	65A2-5
C2	.00005 Mfd., mica, 500 V.	65B5-11
C3	.05 Mfd., paper, 400 V.	65A2-4
C4	.05 Mfd., paper, 400 V.	65A2-4
C5	.05 Mfd., paper, 400 V.	65A2-4
C6	.0001 Mfd., mica, 500 V.	65B5-17
C7	.00001 Mfd., mica, 500 V.	65B5-1
C8	.003 Mfd., mica, 500 V.	65B1-6
C9	.005 Mfd., paper, 400 V.	65A2-2
C10	.05 Mfd., paper, 400 V.	65A2-4
C11	.0005 Mfd., mica, 500 V.	65B5-27
C12	.00025 Mfd., mica, 500 V.	65B5-22
C13	.01 Mfd., paper, 400 V.	65A2-3
C14	.002 Mfd., paper, 400 V.	65A2-1
C15	.01 Mfd., paper, 400 V.	65A2-3
C16a	30 Mfd., electrolytic, 150 V.	67C7-41
C16b	30 Mfd., electrolytic, 150 V.	
C16c	20 Mfd., electrolytic, 150 V.	
C17	.2 Mfd., paper, 400 V.	65A2-10
b, c	Trimmer Condenser	66A1-1
C18	Tuning Condenser Gang	68A1

RESISTORS

Symbol	Description	Part No.
R1	47,000 Ohms, Carbon, ½ W.	60B8-473
R2	22,000 Ohms, Carbon, ½ W.	60B8-223
R3	470 Ohms, Carbon, ½ W.	60B8-471
R4	3,300 Ohms, Carbon, ½ W.	60B8-332
R5	2.2 Meg Ohms, Carbon, ½ W.	60B8-225
R6	220,000 Ohms, Carbon, ½ W.	60B8-224
R7	.5 Meg. Ohms, Volume Control	75B1-7
R8	4.7 Meg Ohms, Carbon ½ W.	60B8-475
R9	470,000 Ohms, Carbon, ½ W.	60B8-474
R10	220 Ohms, Carbon, ½ W.	60B8-221
R11	150 Ohms, Carbon, 1 W.	60B28-1
R12	1,000 Ohms, Carbon, 1 W.	60B28-2
R13	150,000 Ohms, Carbon, ½ W.	60B28-154

COILS & TRANSFORMERS

Symbol	Description	Part No.
L2	BC, Antenna coil	69A1
L3	SW, Antenna coil	69A2
L4	BC & SW, Oscillator coil	69A3
L5	1st I.F. Trans.	72B2
L6	2nd I.F. Trans.	72B1

MISCELLANEOUS

Description	Part No.
Band Change Switch	77B1-4
Buttons, Snap for Dial Background	13A1-3-2
Cabinet, Ivory Plastic	34D1-1
Cabinet, Mahogany Plastic	34D1-2
Collar for Line Cord Connector	32A19
Connector for Line Cord (female plug)	88A6-2
Cord, Line, 220 V	89A3
Dial Background	22B7-1
Dial Cord (42 inches)	50A1-1
Dial Pointer Strip	25A3
Dial Pointer Slide	25A2
Drive Drum Assembly	A1012
Fibre Dial Pulley	17A1-3
Knob, Ivory	33A1-1
Knob, Mahogany or Walnut	33A1-2
Pilot light, Mazda No. 47	81A1-8
Pilot light Socket & leads	82A2-2
Shaft, Tuning	28A1-1
Scale, Dial	21C1-1
Speaker & Output Transformer	78B1-1
Tension Spring, Dial cord	19A1-3

MODEL 6X12,
Ch. 6X1

CIRCUIT

Six tube AC operated Superheterodyne receiver, covering three bands. Medium: 540 KC—1730 KC. Short Wave 1: 2.75 MC—7.5 MC. Short Wave 2: 7.2 MC to 23 MC. Set has a three-speed Record Changer (RC222).

CONVERSION INSTRUCTIONS

CONVERTING THE SET FOR 220 VOLT OPERATION

To convert this set for 220 volt operation, **a conversion kit must be ordered. Be sure to read all of the information for 220 volt operation.**

CONVERTING THE RADIO To convert the radio from 110 volts to 220 volts, unsolder one end of the Jumper Wire at point "A" and solder it to point "B". See figure 1. To convert from 220 volts to 110 volts, reverse the procedure.

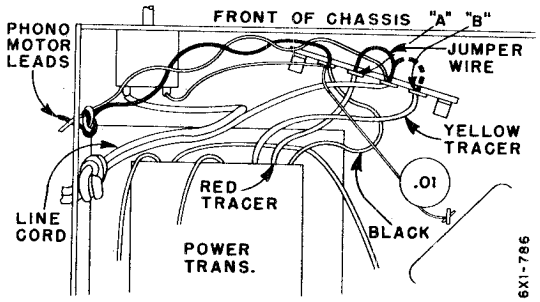


Figure 1. Bottom View of Chassis Showing Jumper Wire

CONVERTING THE PHONOGRAPH A step-down transformer (included in conversion kit, part #98A15-17) must be mounted on the inside back of the cabinet to operate this changer on 220 volts. This kit consists of a step-down transformer, a mounting plate, socket and plug, and the necessary bolts and nuts to mount the plate to the cabinet back.

Mount the transformer to the cabinet back as shown in figure 2. Disconnect the phonograph plug "C", and insert it into the socket "D" provided for it on the conversion transformer. Also, insert the conversion transformer plug "E" into the radio socket "F".

To convert the phonograph from 220 volts to 110 volts, merely unplug the transformer connections, and insert the phono plug "C' into the radio socket "F".

Conversion Transformer Kit

Transformer, Step-down (includes socket and plug)	80B20
Mounting Plate	15B544
Plug	88A8-1
Socket and Leads	89A6-3

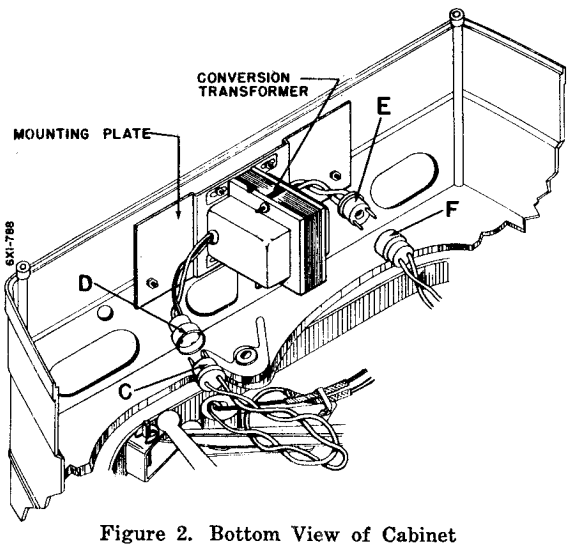


Figure 2. Bottom View of Cabinet

CONVERTING THE PHONOGRAPH MOTOR FROM 60 CYCLES TO 50 CYCLE OPERATION

To convert an Admiral (60 cycle) three-speed phonograph for 50 cycle operation, first remove the turntable retaining clip by slipping it off of the turntable hub and then remove the turntable by lifting it straight up.

NOTE: Make certain that the record changer is not in change cycle before attempting to lift the turntable. Then proceed as follows:

1. Remove the two rubber drive belts. Do not handle these belts excessively or get grease or oil on them.
2. Remove the original 78 RPM - 60 cycle coil spring from the motor drive shaft (smallest diameter shaft). Then slip the 50 cycle conversion spring (part #405A113, inside diameter 11/64") in its place.
3. Install the 33-1/3 RPM 50 cycle conversion spring (part #405A112, inside diameter 15/64") by slipping it over the 33-1/3 RPM brass drive shaft (smaller diameter of the two brass drive shafts).

IMPORTANT

The conversion springs can best be installed by turning the springs counterclockwise (to the left) while pushing down until the top of the spring is flush with the top of the shaft.

4. Remove the 45 RPM, 60 cycle drive shaft (largest diameter shaft) by lifting it straight up and off. Do not remove the oil retaining felt washer under the brass drive shaft. Then install the 45 RPM, 50 cycle conversion drive shaft (part #98A15-15) by sliding it down on the mounting stud.
5. Carefully reinstall the two rubber drive belts.
6. Reinstall the turntable. No force is needed to seat the turntable. Be sure that indented portion of the record changer drive wheel (near turntable hub) faces the turntable hub. Also, it will be necessary to push the idler wheel in toward the center of the turntable as the turntable is lowered on the hub. When the turntable is seated, replace the turntable retaining clip or ring, if used.

RECORD CHANGER: Model RC222, Pgs. RCD.CH.20-9 to RCD.Ch. 20-20.

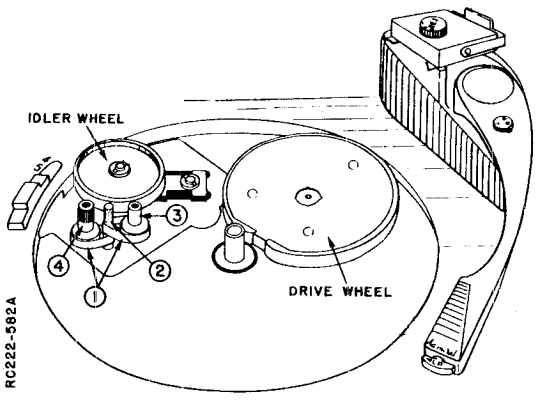


Figure 3. Top of Record Changer, Turntable Removed.

MODEL 6X12,
Ch. 6X1

ALIGNMENT PROCEDURE

- Be sure both set and signal generator are thoroughly warmed up before starting alignment.
- Turn gang condenser to wide open position and make sure that dial pointer is at position shown in illustration below.
- Connect output meter across voice coil.
- Turn receiver volume and tone controls full on.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

NOTE

To avoid splitting the slotted head of the powdered iron core tuning slugs in IF transformers, use an alignment tool having a blade 1/8" wide. Since this tool must be inserted into the underside of the IF transformers across the chassis, it must be NON-METALLIC and at least 7" long.

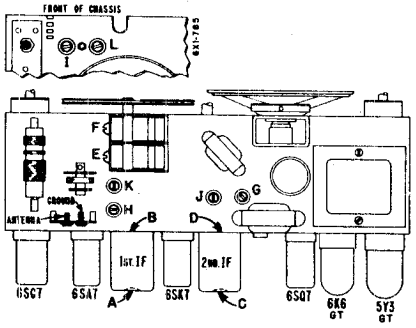
Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Band Switch Position	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	.02 mfd. condenser	†Pin No. 8 of 6SA7	"BC" Medium Band	455 KC	Gang fully open	2nd IF 1st IF	A, B* C, D*	Maximum output.
2	200 mmfd. condenser	Antenna Terminal	"BC" Medium Band	1725 KC	Gang fully open	M.B. Oscillator (on gang)	E	Maximum output.
3	200 mmfd. condenser	Antenna Terminal	"BC" Medium Band	1400 KC	Tune in generator signal	M.B. Antenna (on gang)	F	Maximum output.
4	200 mmfd. condenser	Antenna Terminal	"BC" Medium Band	600 KC	Tune in generator signal	M.B. pad	G	Maximum output. "Rock" gang while adjusting.
			Recheck alignment at 1400 KC (in step 3 above)					
5	400 ohm carbon resistor	Antenna Terminal	"SW1" Short Wave	7.5 MC	Gang fully open	SW1 Osc. Trimmer	H **	Maximum output.
6	400 ohm carbon resistor	Antenna Terminal	"SW1" Short Wave	6.2 MC	Tune in signal	SW1 Ant. Trimmer	I	Maximum output.
7	400 ohm carbon resistor	Antenna Terminal	"SW1" Short Wave	3.2 MC	Tune in signal	SW1 Osc. Pad	J	Maximum output. "Rock" gang while adjusting.
			Recheck alignment in step 5 and 6					
8	400 ohm carbon resistor	Antenna Terminal	"SW2" Short Wave	23 MC	Gang fully open	SW2 Osc. Trimmer	K **	Maximum output.
9	400 ohm carbon resistor	Antenna Terminal	"SW2" Short Wave	18 MC	Tune in signal	SW2 Ant. Trimmer	L	Maximum output. "Rock" gang while adjusting.

* Adjustments B and D are made from underside of chassis.

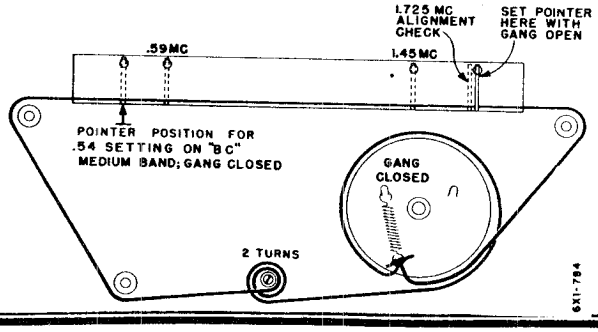
† If IF adjustments are very far off alignment, it may be necessary to feed signal through pin #4 of 6SK7, then through pin #8 of 6SA7.

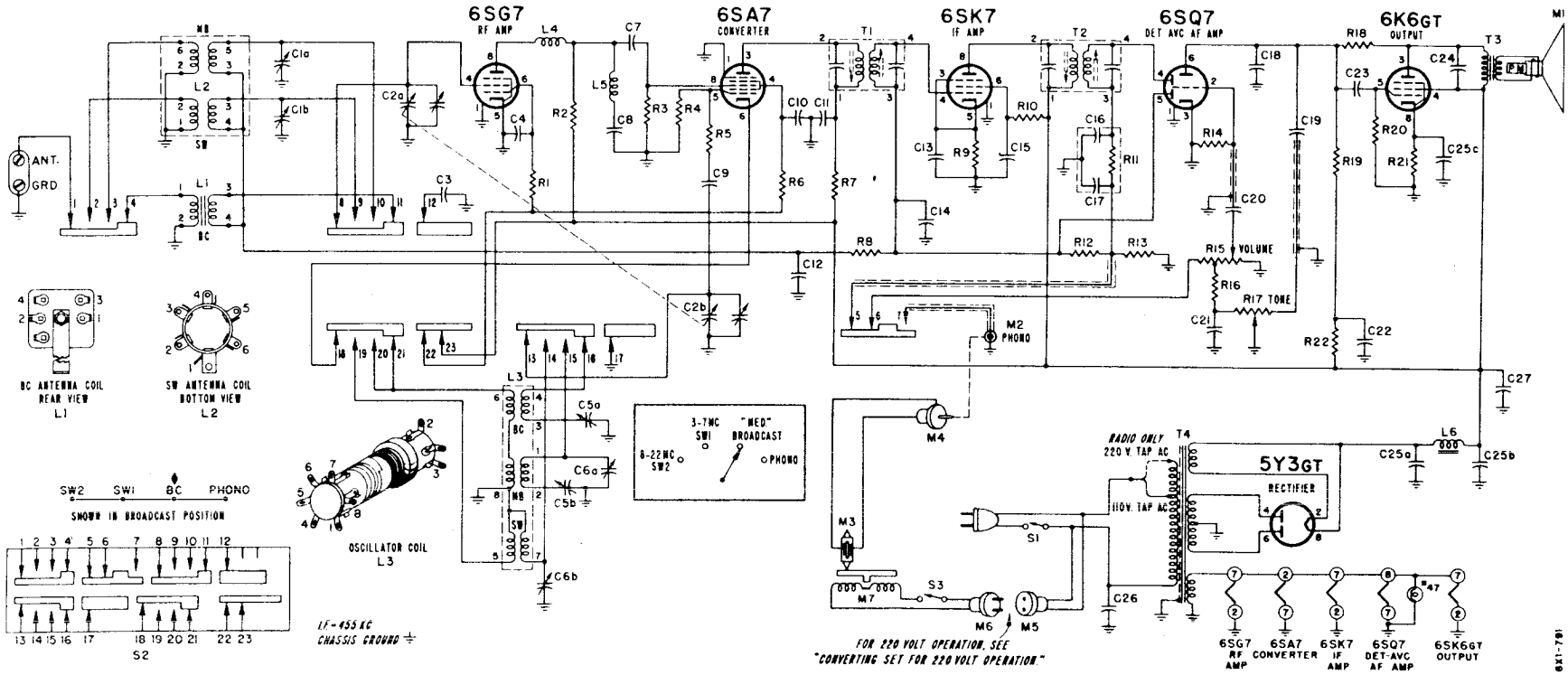
** Be sure that trimmer is aligned at correct frequency and not on image which should be approximately 910 KC lower than correct frequency, as indicated on the dial. Check to see that image appears 910 KC lower than alignment frequency.

TUBE AND TRIMMER LOCATION



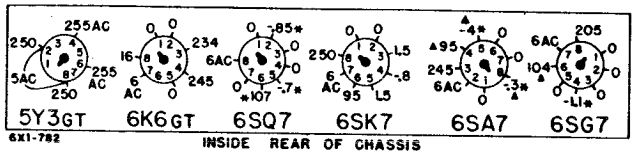
POINTER SETTING AND DIAL CORD STRINGING





VOLTAGE DATA

- Measured on 117 Volts AC line.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1,000 ohm per volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.
- All readings made between tube socket terminals and chassis ground, unless otherwise indicated.
- Dial turned to low frequency end; volume and tone controls at minimum.
- Band switch set in "BC" position.



* If taken with a 1000 ohm-per-meter, readings will be lower or practically zero.

▲ On "Phono" these voltages will be zero. All other DC readings may be slightly higher.

MODEL 6X12,
Ch. 6X1

OPERATING VOLTAGE AND FREQUENCY

These sets are wired at the factory to operate on 110 volts, AC. To operate on 220 volts, a conversion kit must be obtained (part number 98A15-17) and all instructions under "Converting The Set For 220 Volt Operation" must be followed. In some sets, the phonograph has been converted to operate on 50 cycles; in other sets the phonograph operates on 60 cycles. To convert the phonograph to operate on either 50 cycles or 60 cycles, see the conversion instructions

PARTS LIST

RESISTORS

Symbol	Dscription	Part No.
R1	47000 ohms, 1 Watt	60B 14-473
R2	2,200 ohms, ½ Watt	60B 8-222
R3	100,000 ohms, ½ Watt	60B 8-104
R4	22,000 ohms, ½ Watt	60B 8-223
R5	47 ohms, ½ Watt	60B 8-470
R6	15,000 ohms, 1 Watt	60B 14-153
R7	1,000 ohms, ½ Watt	60B 8-102
R8	270,000 ohms, ½ Watt	60B 8-274
R9	100 ohms, ½ Watt	60B 8-101
R10	47,000 ohms, ½ Watt	60B 8-473
†R11	47,000 ohms, ¼ Watt	
R12	2.2 megohms, ½ Watt	60B 8-225
R13	680,000 ohms, ½ Watt	60B 8-684
R14	4.7 megohms, ½ Watt	60B 8-475
R15	2 megohms, Volume Control	75B 2-15
R16	27,000 ohms, ½ Watt	60B 8-273
R17	2 megohm Tone Control and on-off Switch	75B 1-35
R18	1 megohm, ½ Watt	60B 8-105
R19	270,000 ohms, ½ Watt	60B 8-274
R20	470,000 ohms, ½ Watt	60B 8-474
R21	560 ohms, 1 Watt	60B 14-561
R22	33,000 ohms, ½ Watt	60B 8-333

CONDENSERS

Symbol	Dscription	Part No.
C1a	3 to 40 mmfd. ⎫ Dual	
C1b	3 to 40 mmfd. ⎭ Trimmer	66A 23-7
C2a	13 to 420 mmfd., Ant. ⎫ Gang	
C2b	13 to 420 mmfd., Osc. ⎭	68B 31
C3	.01 mfd., 450 Volts, Ceramic	65A 10-3
C4	.05 mfd., 400 Volts, Paper	64B 5-22
C5a	410 to 500 mmfd. ⎫ Dual	
C5b	1700 to 3100 mmfd. ⎭ Trimmer	66A 23-5
C6a	3 to 40 mmfd. ⎫	
C6b	3 to 30 mmfd. ⎭ Dual Trimmer	66A 23-8
C7	100 mmfd., Mica	65B 5-17
C8	60 mmfd., ± 3%, Mica	65B 1-49
C9	120 mmfd., Mica	65B 5-18
C10	.05 mfd., 400 Volts, Paper	64B 5-22
C11	.05 mfd., 400 Volts, Paper	64B 5-22
C12	.05 mfd., 400 Volts, Paper	64B 5-22
C13	.05 mfd., 400 Volts, Paper	64B 5-22
C14	.05 mfd., 400 Volts, Paper	64B 5-22
C15	.05 mfd., 400 Volts, Paper	64B 5-22
†C16	100 mmfd., Ceramic	
†C17	100 mmfd., Ceramic	
C18	250 mmfd., Ceramic	65B 6-5
C19	.005 mfd., 450 Volts, Ceramic	65A 10-5
C20	.01 mfd., 450 Volts, Ceramic	65A 10-3
C21	.01 mfd., 450 Volts, Ceramic	65A 10-3
C22	.05 mfd., 400 Volts, Paper	64B 5-22
C23	.01 mfd., 450 Volts, Ceramic	65A 10-3
C24	.005 mfd., 450 Volts, Ceramic	65A 10-5
C25a	30 mfd., 350 Volts ⎫	
C25b	30 mfd., 350 Volts ⎬ Elect.	67C 7-15
C25c	20 mfd., 25 Volts ⎭	
C26	.01 mfd., 450 Volts, Ceramic	65A 10-3
C27	.05 mfd., 400 Volts, Paper	64B 5-22

COILS, TRANSFORMERS, ETC.

Symbol	Dscription	Part No.
L1	Coil, Antenna (BC)	69A 78
L2	Coil, Antenna (SW1 and SW2)	69A 112
L3	Coil, Osc. (BC, SW1 and SW2)	69A 111
L4	Coil, Peaking (RF)	69A 80
L5	Coil, Trap (455 KC)	69A 77
L6	Choke, Filter	74A 10
T1	Transformer, 1st IF	72B 71
T2	Transformer, 2nd IF	72B 72
T3	Transformer, Speaker Output	79A 25-2
T4	Transformer, Power (117V and 220V)	80B 14-1
M1	Speaker, 5" PM	78B 39-2
M2	Jack, Phono Input	88A 1
S1	Switch, On-off	Part of R17
S2	Switch, Band (4 position)	77B 30
	Diode Filter	63A 3-1

CABINET PARTS

Description	Part No.
Bracket, Dial Scale Mtg.	15A 169
Cabinet, Plastic (Complete) Mahogany (6X12)	34D 11-2
Dial Glass	21B 54-1
Escutcheon Overlay	23C 23-4
Grille Cloth and Baffle	A1688
Hex Nut, Escutcheon Mtg. (#4-40)	2A 1-6-71
Hinge	37A 9-1
Hinge Stud	27A 17-1
Knobs, Radio	
On-Off Tone	33C 40-27
Volume	33C 40-27
Band Switch	33C 40-29
Tuning	33C 40-31
Lid, Cabinet Mahogany (6X12)	34D 11-13
Rubber Bumper (for cabinet lid)	12A 3-2
Rubber Strip, Dial Scale Mtg. (1¼" long)	12A 9-4
Screw, Escutcheon Mtg. (#4-40x¾)	1A 80-4

MISCELLANEOUS

Description	Part No.
Bracket, Pilot Light	15A 535
Cable, 3 Wire (10" long)	89A 1-3
Carton and Fillers	44B 112
Dial Background	22B 9-1
Dial Cord	50A 1-3
Grommet, Gang Mounting	12A 1-2
Line Cord	89A 1-1
Manual	
Customer Instruction (English)	41A 17-47
Customer Instruction (Spanish)	41A 17-48
Service, for 6X1 Chassis	S282
Service, for RC221, RC222 Record Changers (English)	S256
Service, for RC322	S256A
Phono Jack	88A 1
Pilot Light	81A 1-8
Pointer	25A 21
Pulley, Dial Cord	17A 1-3
Sleeve, Tuning	27A 145
Socket and Leads (Pilot light)	82A 2-2
Spring, Dial Cord Tension	19B 1-3
Washer, Tuning Shaft "E"	4B 12-24

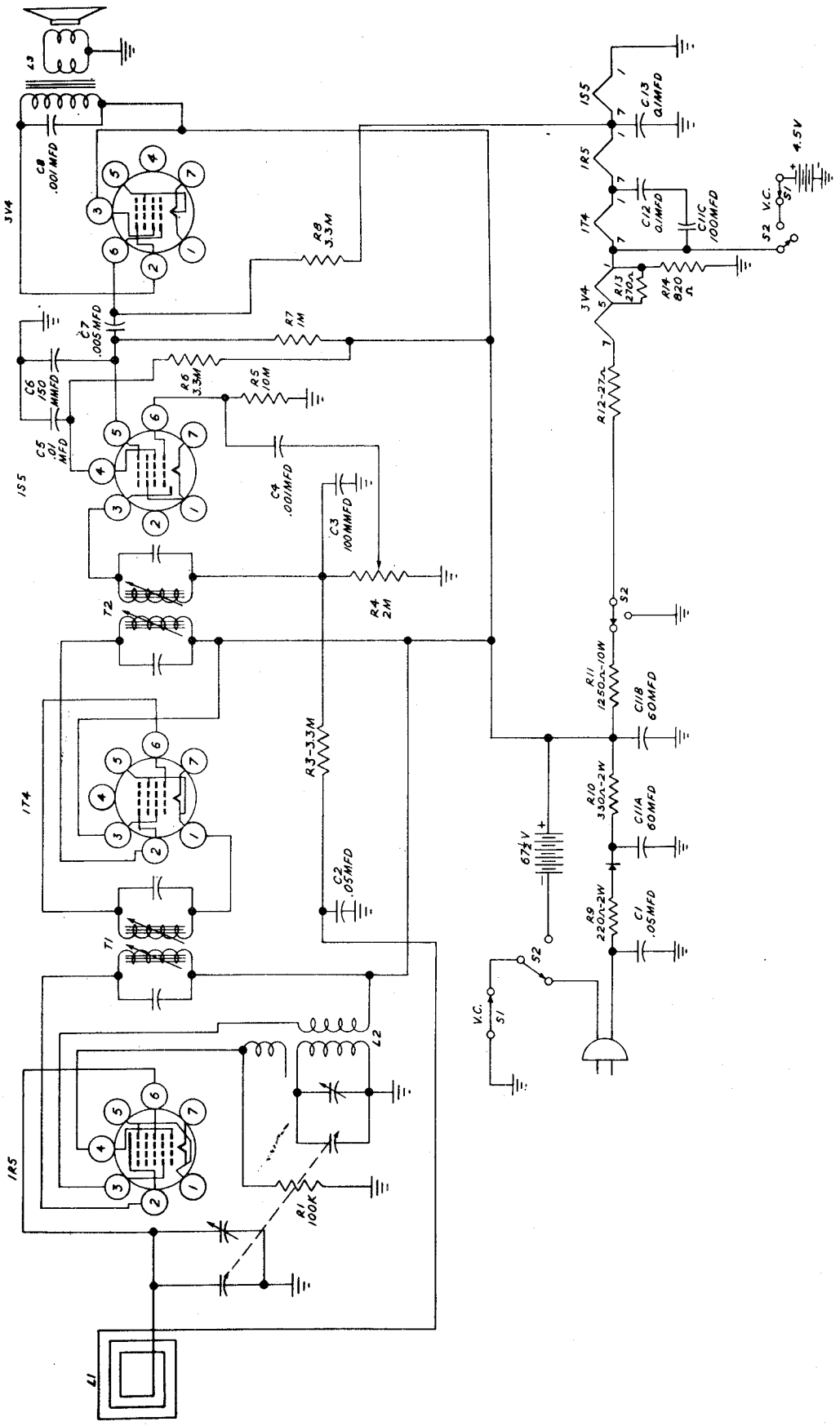
PHONOGRAPH PARTS

NOTE: See Record Changer Service Manual (form S256) and its supplement (form S256A) for complete parts list.

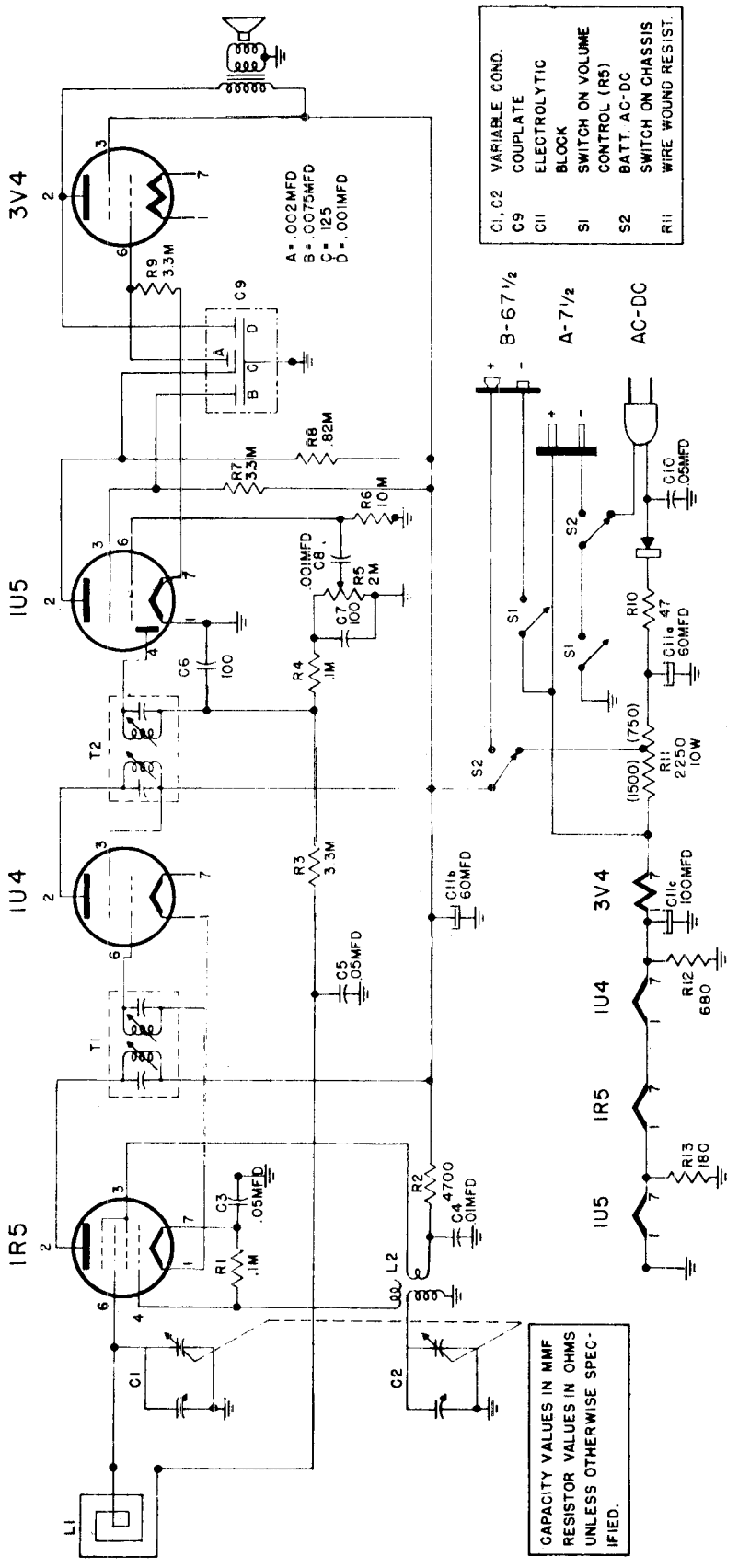
M3	Cartridge (includes needle)	409A 12
	Needle, Phonograph	
	Long Play	98A 15-6
	Standard 78 RPM	98A 15-7
M4	Plug, Pickup Shielded Cable	88A 2-3
M5	Phono Motor Socket and Leads	89A 6-3
M6	Motor Plug	88A 8-1
M7	3 Speed Motor	407B 17
S3	Switch, Phono Motor On-Off (See Caution in Changer Manual)	408A 1
	Centerpost (for 10" & 12" records)	G400B 311
	Centerpost (for 7" 33 RPM records)	G400B 310
	Centerpost for 7" 45 RPM records)	G400B 29

† Part of Diode Filter Unit 63A3-1. This unit consists of R11, C16, C17 (see schematic). If a section of the unit becomes defective, replace with exact duplicate or individual components of proper value.

MODEL A-520



MODEL A-520-A



HOW TO INSTALL THE RADIO

MODEL 5G-563

POWER SUPPLY: This receiver is designed to operate from a power source of 110 to 125 volts AC current at 60 cycles only.

Always predetermine the type of power in your location by consulting the local power company for this information.

CAUTION: Never plug this unit into a 220 Volt or a DC power source as you will seriously damage the component parts, which have been designed for 110 to 125 volts AC current at 60 cycles only.

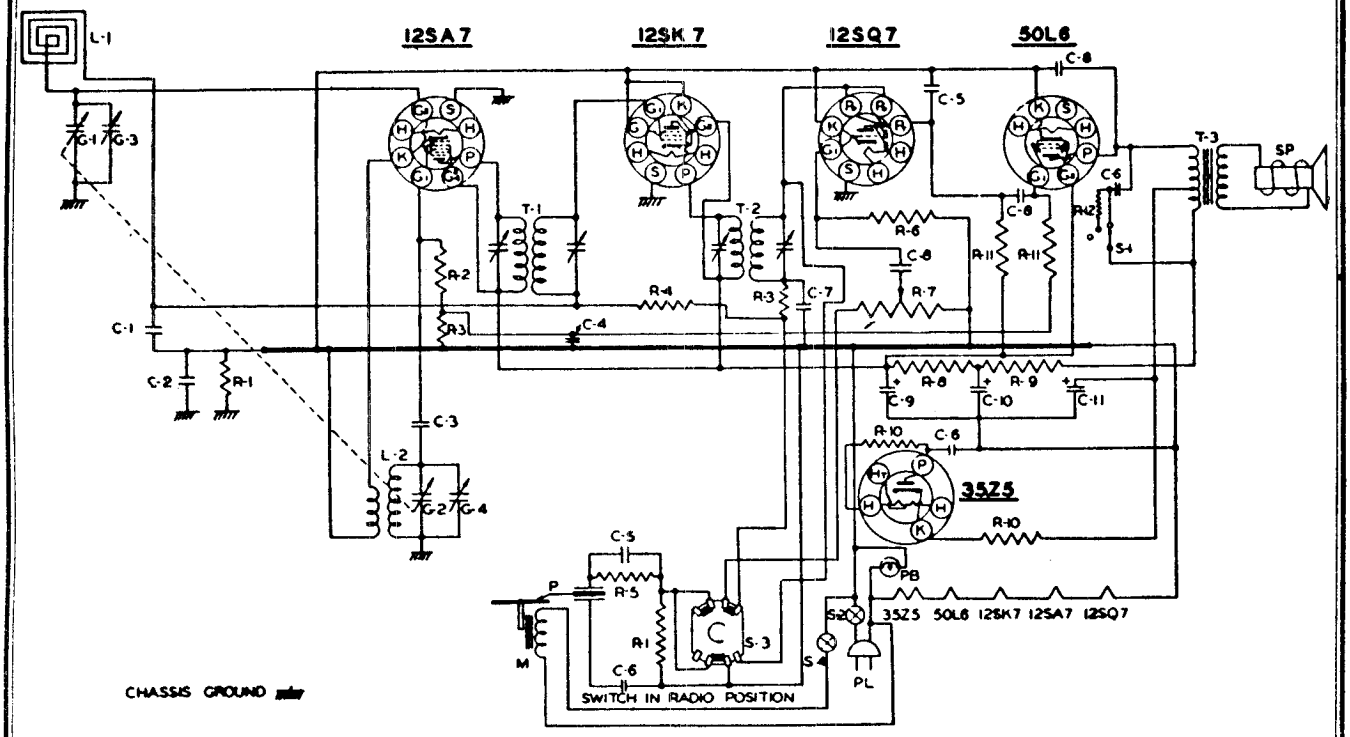
ANTENNA: This receiver is equipped with a sensitive loop antenna and will require no external antenna or ground. However, due to the directional qualities of the loop antenna, the reception of some stations may be improved by turning the receiver in different directions.

CONTROL KNOBS: This instrument is equipped with four knobs to control the operation. The extreme left knob is the "Tone" control. This control has three positions. The left hand position is "Normal" usually used for speech. The center position is "Medium" and is used for music. The right hand position is "Low" and is used to attenuate the high notes and increase the low notes. The second knob is the "Tuning" selector. This knob may be moved to the right or left to select the desired station. By mentally adding a zero to the numbers on the dial, the result will be read directly in kilocycles, i. e. 60 + 0 = 600 KC or 170 + 0 = 1700 KC.

The first knob to the right of the speaker opening is the "Volume" control and also the "OFF-ON" switch. In the extreme left hand position the switch is in "OFF" position. Turn this knob to the right and a click will be heard. This indicates that the power has been turned on. Allow about 30 seconds for the tubes to heat up and the instrument will be ready for operation. To increase volume, turn this knob to the right.

The extreme right hand knob is the "Radio-Phono" switch. The right hand position is for "Radio" operation and the left hand position is for "Phono" operation.

SD-77 U



MODEL 5G-563

ALIGNMENT DATA

Remove the chassis from the cabinet. A Signal Generator with the following frequencies is required: 455 KC, 1400 KC and 1720 KC.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the A.V.C. from working and giving false readings. Turn the tone control to complete left hand position. Keep the generator output as low as possible to prevent overloading.

Connect an output meter across the voice coil of the speaker.

Connect a 20,000 ohm resistor across the loop connector terminals to reflect proper loop impedance.

FIRST STEP: Connect the hot lead from the generator to the "ANT." section of the gang condenser through a .1 MFD. condenser. The ground lead must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455 KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

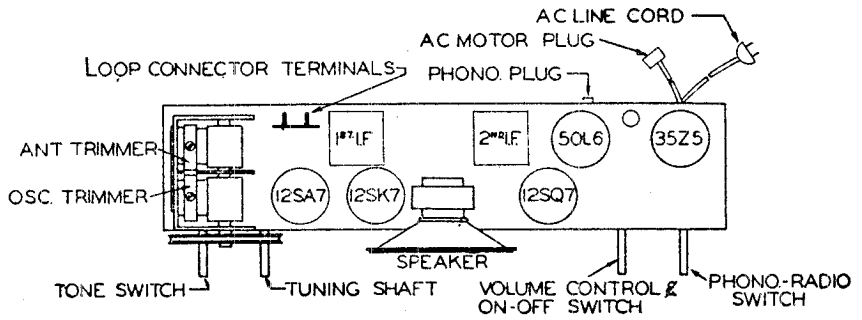
SECOND STEP: With the leads from the generator connected in the same manner as in I.F. alignment, adjust the signal generator to 1720 KC. The "O.S.C." trimmer is located on the front section of the gang condenser. Adjust this trimmer until the signal is tuned in. The gang condenser should be at complete minimum capacity for this setting.

THIRD STEP: Remove the generator leads from the chassis. Remove the 20,000 ohm resistor from the loop connector terminals. Reinstall the chassis in the cabinet, connect the loop leads, motor plug and phono pickup leads.

Connect the generator leads to a transmitting loop, made of a few turns of wire, and loosely couple to the receiver loop antenna which is located on the back end of the cabinet. Adjust the generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The "ANT." trimmer is located on the rear section of the gang condenser. Adjust this trimmer until a maximum signal is noted on the output meter.

No further adjustment should be necessary, unless the receiver has been damaged, as the coils and tuning condenser have been specially handled at the factory to insure proper alignment at the lower frequencies.

TUBE AND TRIMMER LOCATION

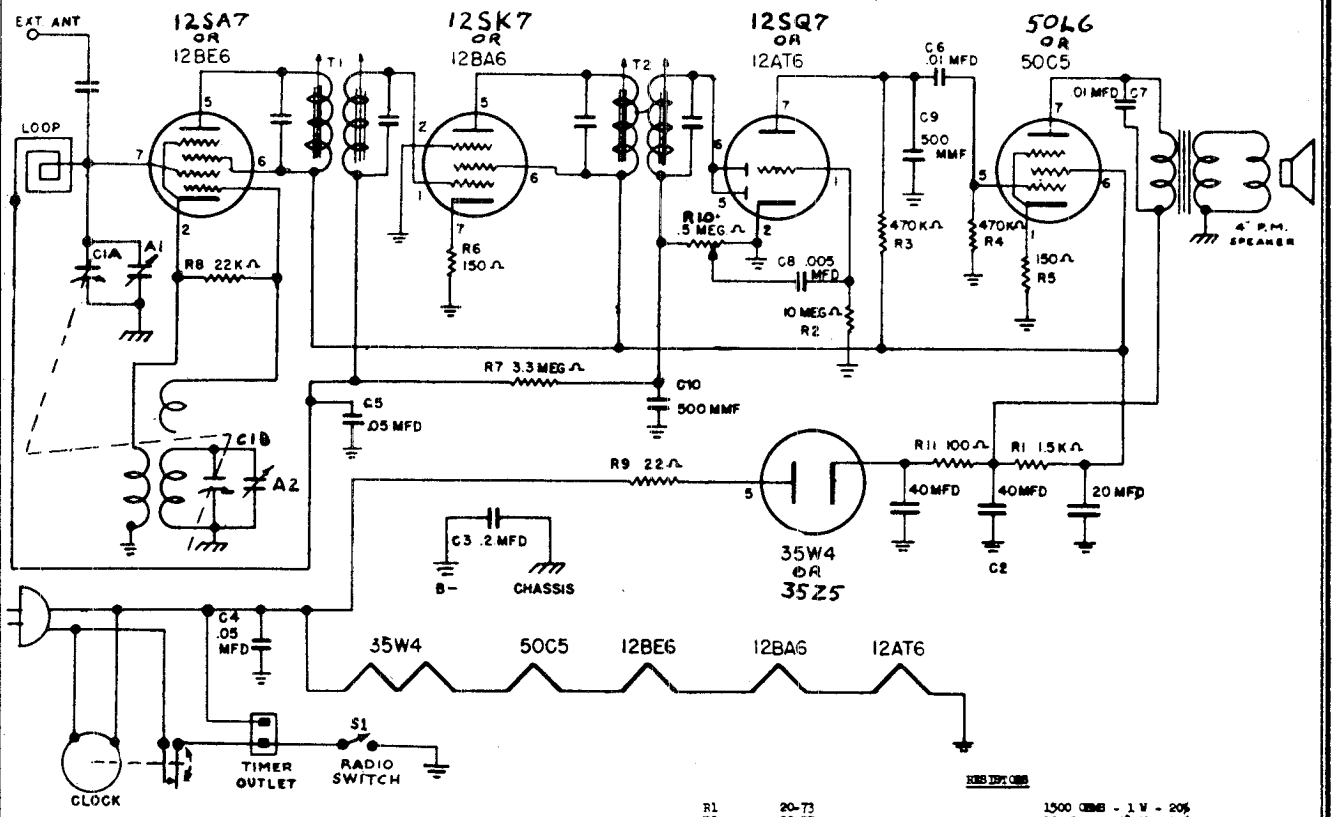


TL-77-U

FIGURE-1

PART NO.		DESCRIPTION	PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
PC-2	C-1	.05MFD. CONDENSER 200 V.	IR-1	R-8	470Ω RESISTOR 1/2W 20 %	SW-2	S-1	TONE SWITCH
PC-8	C-2	.1 MFD. CONDENSER 400 V.	IR-42	R-9	1000Ω RESISTOR 1 W. 10 %		S-2	SWITCH ON VOLUME CONTROL
MC-4	C-3	.0005 MFD. MICA	IR-17	R-10	33 Ω RESISTOR 1/2 W. 20 %	SW-1	S-3	PHONO-RADIO SWITCH
PC-4	C-4	.25 MFD. CONDENSER 200 V.	IR-11	R-11	470M Ω RESISTOR 1/2 W. 20 %		S-4	SWITCH ON RECORD CHANGER
MC-5	C-5	.0005 MFD. MICA	IR-15	R-12	2200 Ω RESISTOR 1/2 W. 20%	AC-M-7	M	RECORD CHANGER MOTOR
PC-5	C-6	.05 MFD. CONDENSER 400 V.	GC-5	G-1	GANG CONDENSER	AC-PU-7	P	CRYSTAL PICKUP ARM CARTRIDGE S-1
MC-2	C-7	.001 MFD. MICA		G-2		PB-2	PB	110 V. 7½ W. PILOT BULB
PC-7	C-8	.01 MFD. CONDENSER 400 V.		G-3	ANT. TRIMMER	CO-2	PL	LINE CORD
EC-14	C-9	.20 MFD.		G-4	OSC. TRIMMER.			
	C-10	40 MFD. 150 W.V. ELECTROLYTIC						
	C-11	40 MFD.						
			LI-6	T-1	INPUT I.F. TRANSFORMER			
IR-20	R-1	220M Ω RESISTOR 1/2 W. 20 %	LI-7	T-2	OUTPUT I.F. TRANSFORMER			
IR-9	R-2	22 M Ω RESISTOR 1/2 W. 20%		T-3	OUTPUT TRANSFORMER			
IR-10	R-3	47 M Ω RESISTOR 1/2 W. 20%						
IR-23	R-4	3.3 MEG Ω RESISTOR 1/2 W. 20%	LL-17	L-1	LOOP ANT.			
IR-12	R-5	1 MEG Ω RESISTOR 1/2 W. 20%	LO-14	L-2	OSC. COIL			
IR-13	R-6	2.2 MEG Ω RESISTOR 1/2 W. 20%						
VC-4	R-7	1 MEG. VOLUME CONTROL	SPK-12	SP	5" P.M. SPEAKER			

MODELS 5H-678, 5H-679



REPLACEMENT PARTS LIST

SYMBOL NO.	PART NO.
C1	30-26
C2	31-30A
C3	32-13
C4	32-55
C5	32-4
C6,7	32-1
C8	32-20
C9,10	35-13

CONDENSERS

DESCRIPTION
VARIABLE CONDENSER, 2 GANG, 420 & 162 MMF.
ELECTROLYTIC CONDENSER, 40MFD-40-20 MFD/150 V
TUBULAR PAPER CONDENSER, .2 MFD/400 V
" " " , PHENOLIC, .05 MFD/400V
" " " , .05 MFD/200 V
" " " , .01 MFD/400 V
" " " , .005 MFD/600 V
MICA CONDENSER, 500 MMFD/500 V

R1	20-73	1500 OHMS - 1 W - 20%
R2	20-57	10 MEG. - 1/4 W - 20%
R3,4	20-98	470 K - 1/4 W - 20%
R5	20-81	150 OHMS - 1/2 W - 20%
R6	20-89	150 OHMS - 1/4 W - 20%
R7	20-56	3.3 MEG. - 1/4 W - 20%
R8	20-82	22 K - 1/4 W - 20%
R9	20-93	22 OHMS - 1/2 W - 20%
R10	50-27	VOLUME CONTROL, 0.5 MEG.
R11	20-40	100 OHMS - 1/2 W - 20%
T1,2	60-18	OSCILLATOR COIL
	61-11	IF TRANSFORMER
	125-34-B	BACK ASSEMBLY, INCL. LOOP
S1	65-11	RADIO SWITCH
	80-25A	4" P.M. SPEAKER WITH OUTPUT TRANSFORMER
	120-54	CABINET (WITHOUT CLOCK INSERT)
	120-48	CENTER CLOCK INSERT
	122-21	KNOB (2)
	140-7	CLOCK

ALIGNMENT PROCEDURE

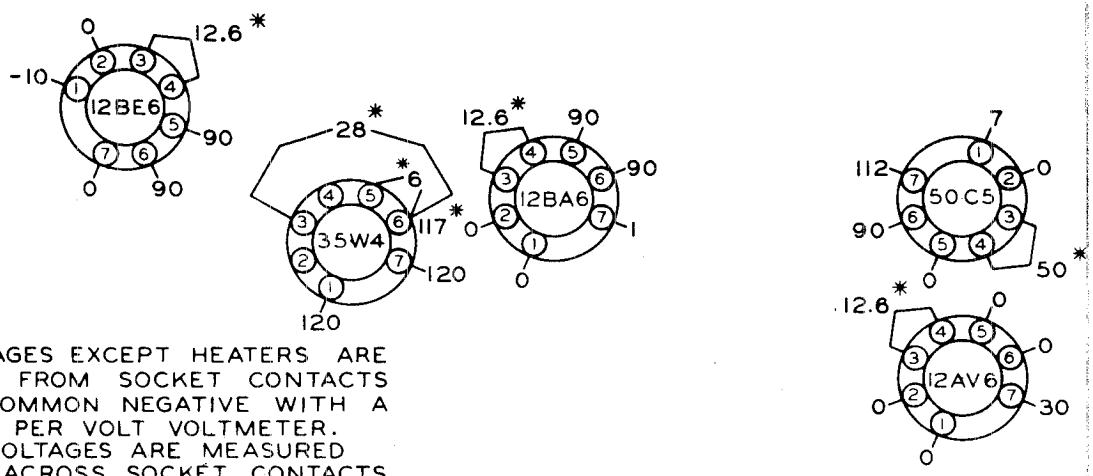
- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full mesh (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

*Nine markings on the dial represent respectively 540KC, 600KC, 700KC, 800KC, 900KC, 1100KC, 1300KC, 1500KC, and 1650KC reading from left to right. These points are to be used for the alignment of the receiver.

MODELS 5H-570,
5H-571, Ch. YHU

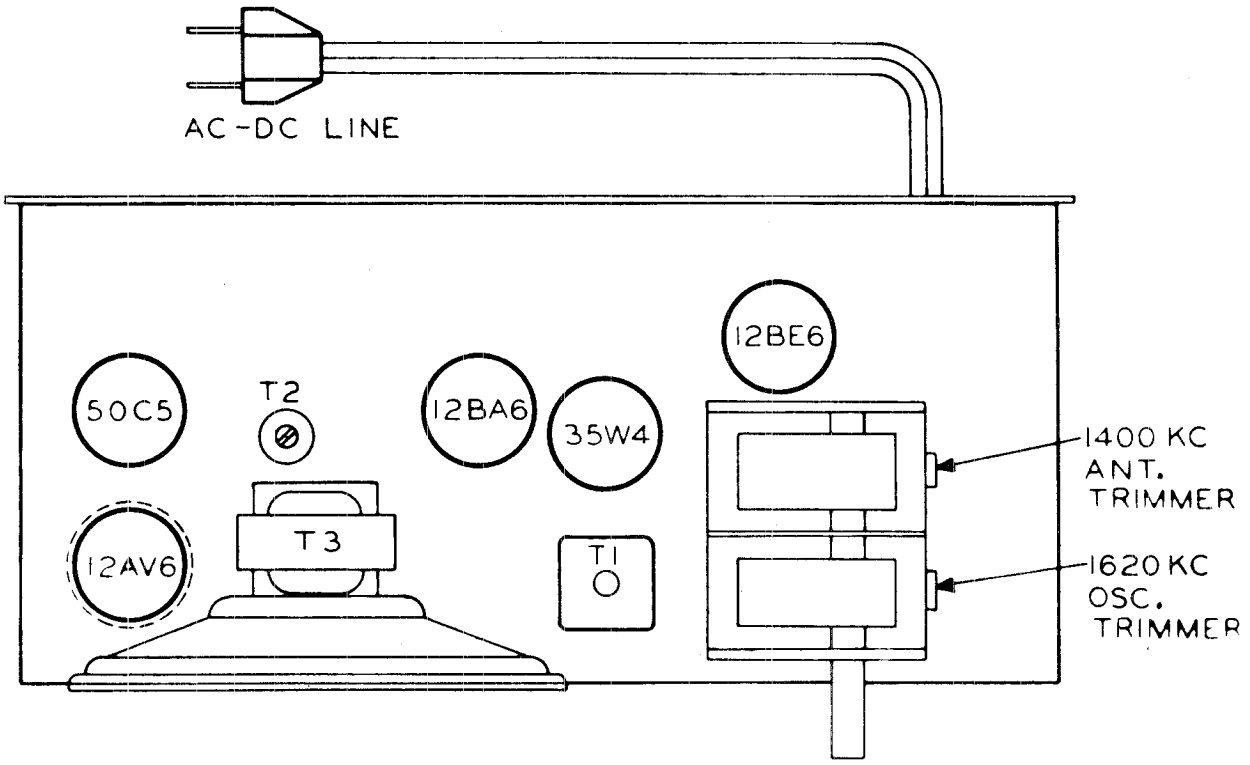
REAR OF CHASSIS



ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO THE COMMON NEGATIVE WITH A 1000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.
* A.C. EXCEPT WHEN SET IS USED ON D.C.

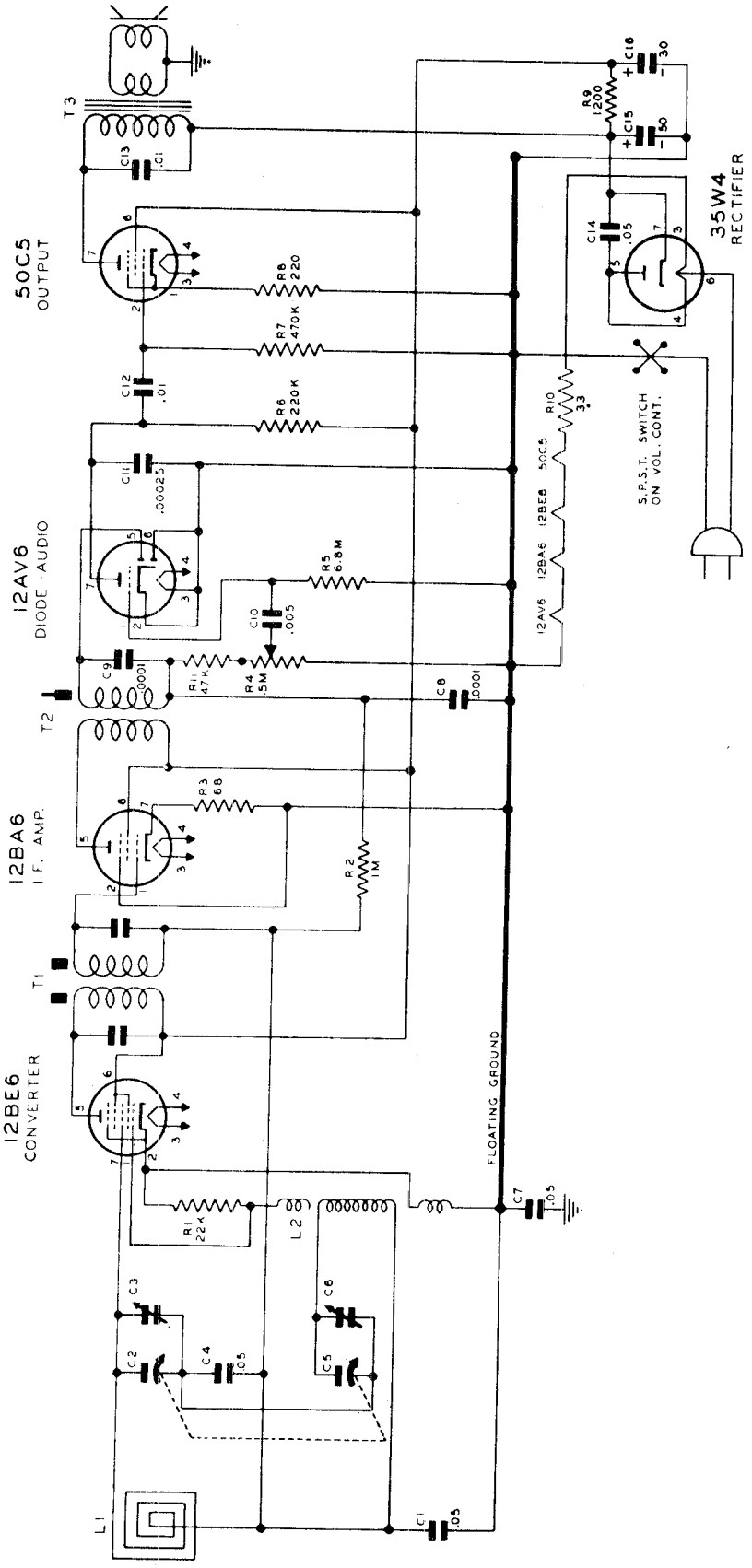
VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PART NO. 4-A-90



PART NO. 4-A-90

MODELS 5H-570,
5H-571, Ch. YHU



ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

BEFORE STARTING ALIGNMENT:

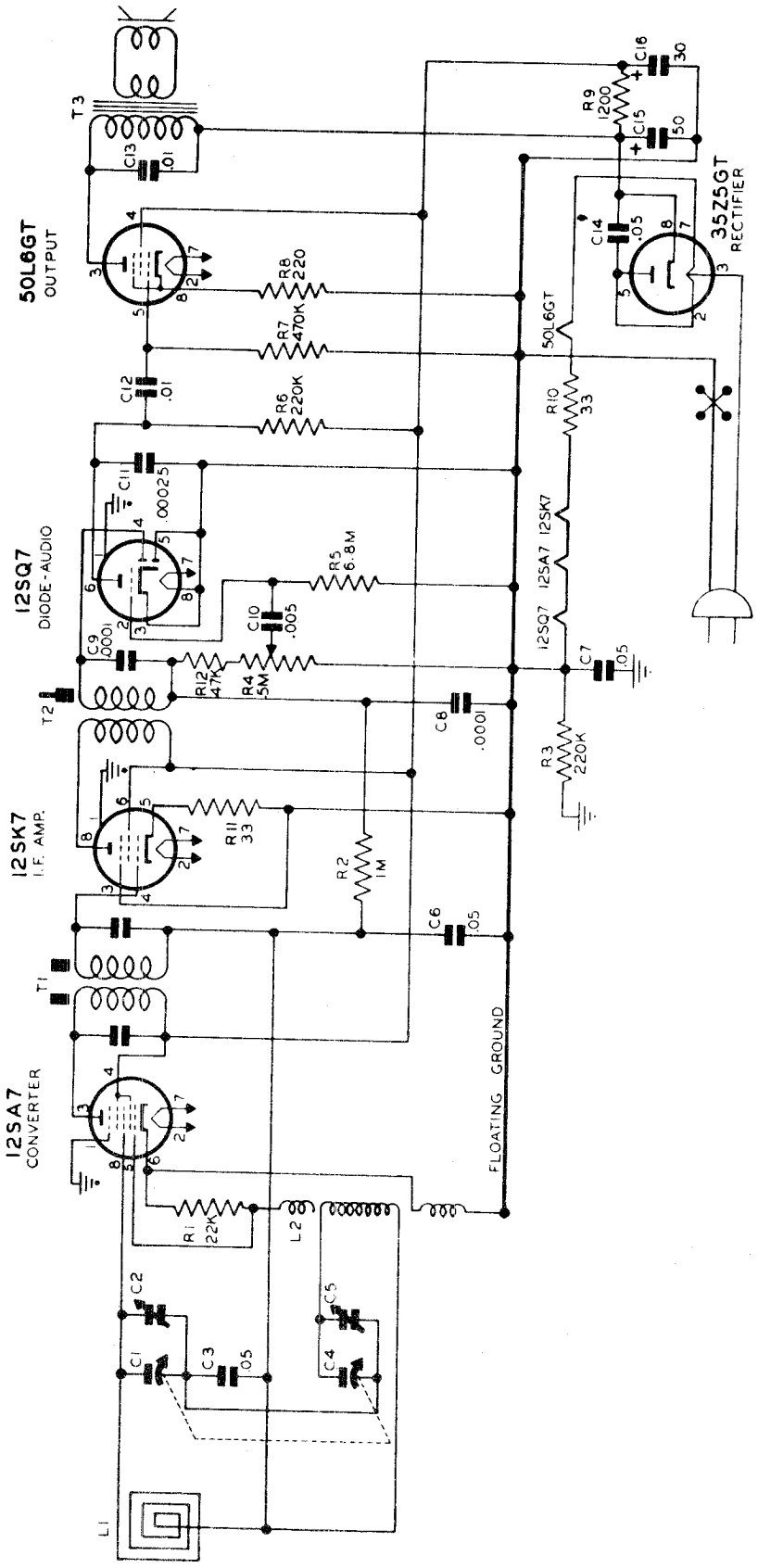
(A) Remove the chassis and loop antenna from the cabinet at the same time by removing the two screws on the rear apron of the chassis which fasten the chassis to cabinet.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

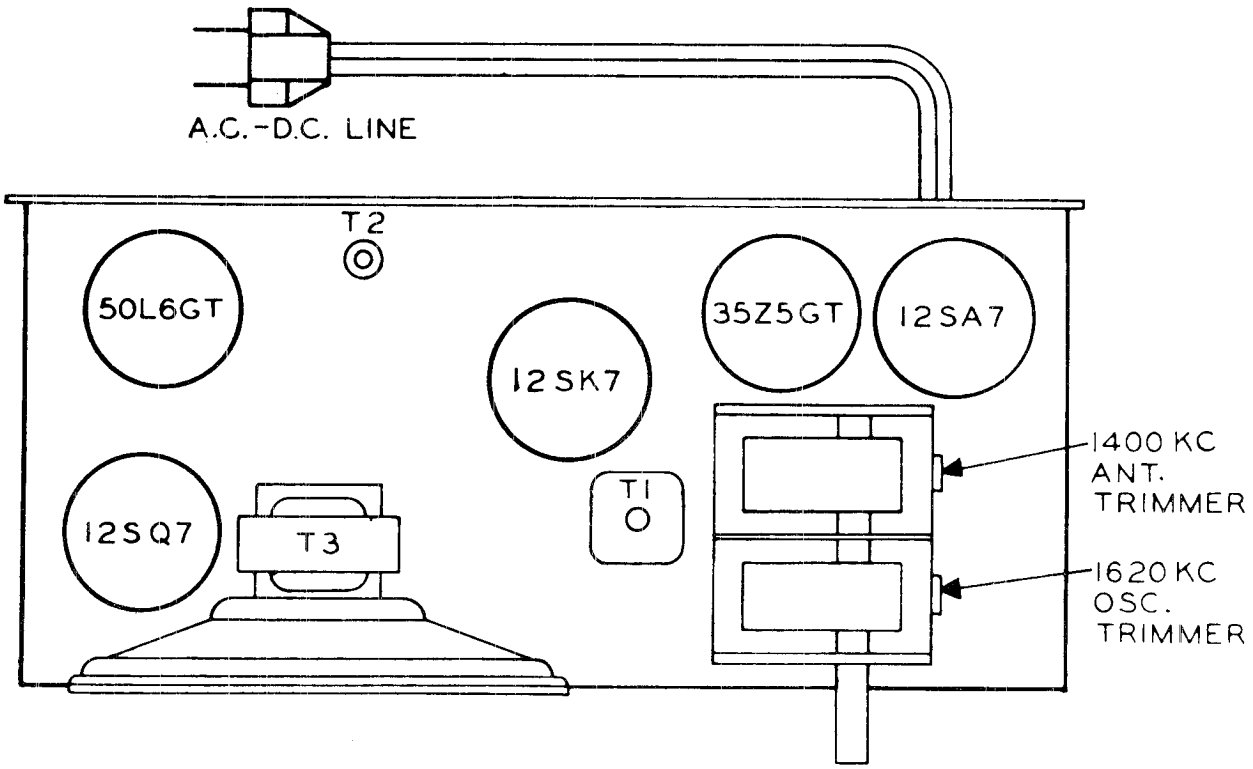
STEPS	Set Receiver dial to:	TEST OSCILLATOR		Dummy Antenna	Refer to parts designations in schematic drawing for trimmers mentioned below:
		Adjust test Oscillator Frequency to:	Attach Output of test oscillator to:		
1	Any point where no interfering signal is received.	EXACTLY 455 KC	High side to grid of Converter tube (*). Low side to common negative	.1 MFD CONDENSER	Adjust 2nd. I. F. (T2) and then each of the slugs of the 1st. I.F. (T1) for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	Dummy Antenna	2 Turns of Hookup Wire 6" in Dia. (Place Approx. a Foot from and in Same Plane as Loop)	Adjust 1620 KC oscillator trimmer for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	Dummy Antenna		Adjust 1400 KC antenna trimmer for maximum output.

* Insert 12AU6 for No. YHU. Insert 12SA7 for No. YHAU

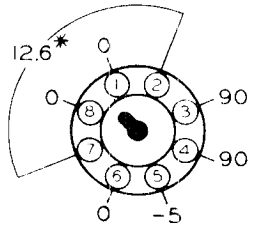
MODELS 5H-570,
5H-571, Ch. YHAU



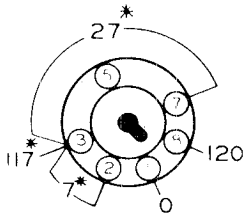
MODELS 5H-570,
5H-571, Ch. YHAU



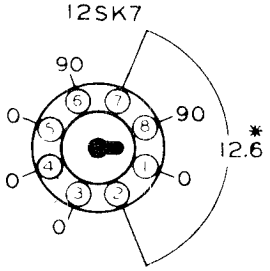
REAR OF CHASSIS

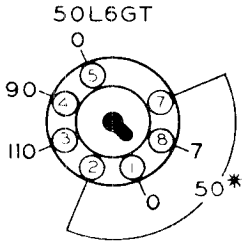


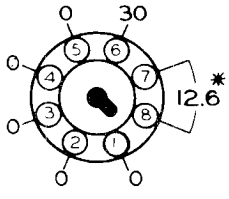
12SA7



35Z5GT







12SQ7

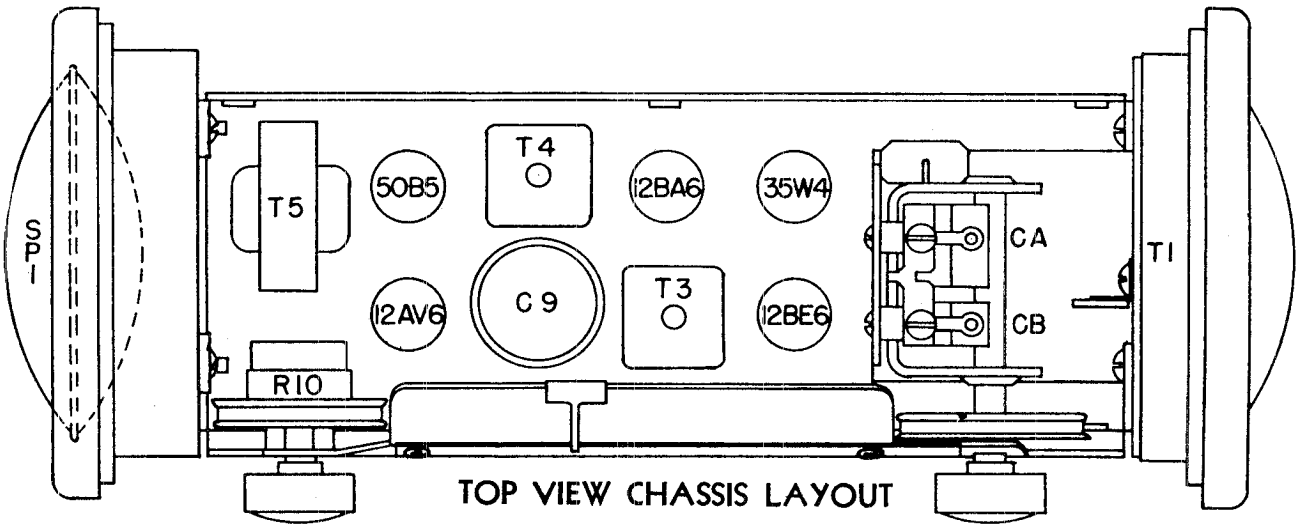
ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO THE COMMON NEGATIVE WITH A 1000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.

*A.C. EXCEPT WHEN SET IS USED ON D.C.

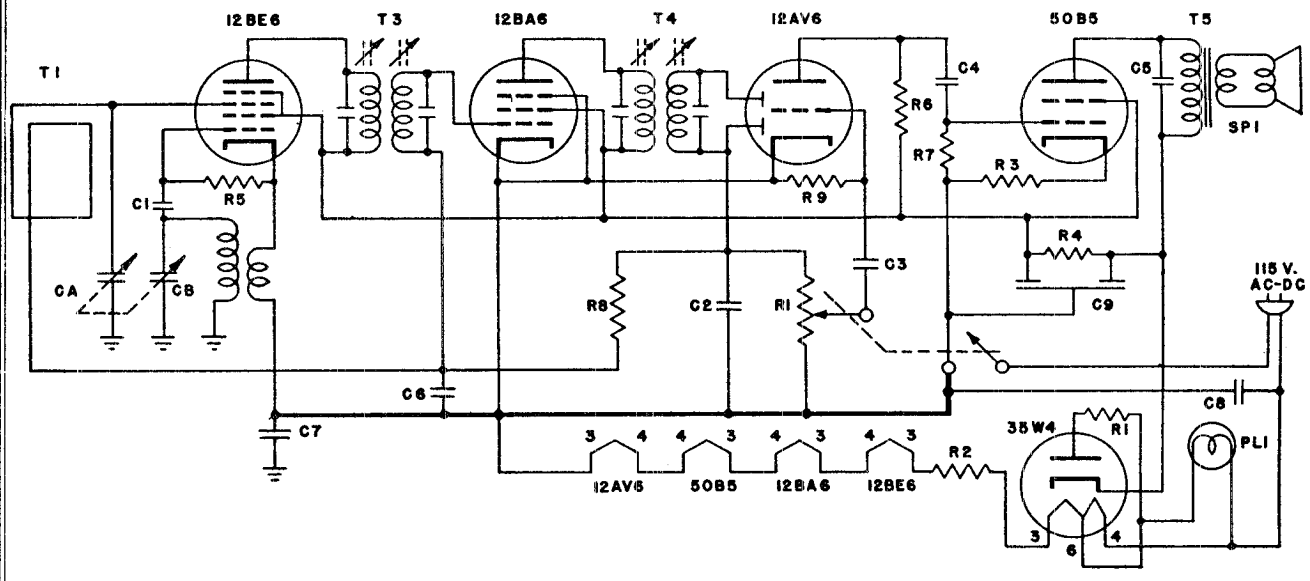
VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

MODELS 5H-607, 5H-608

- Band Coverage: 1750 KC to 535 KC.
- Operates on 115 Volts—A. C. or D. C.
- Four tubes plus rectifier { 1-12BE6 Det. Osc., 1-12BA6 I. F. Amp., 1-12AV6 2nd Det. 1st Audio, 1-50B5 Output, 1-35W4 Rect.



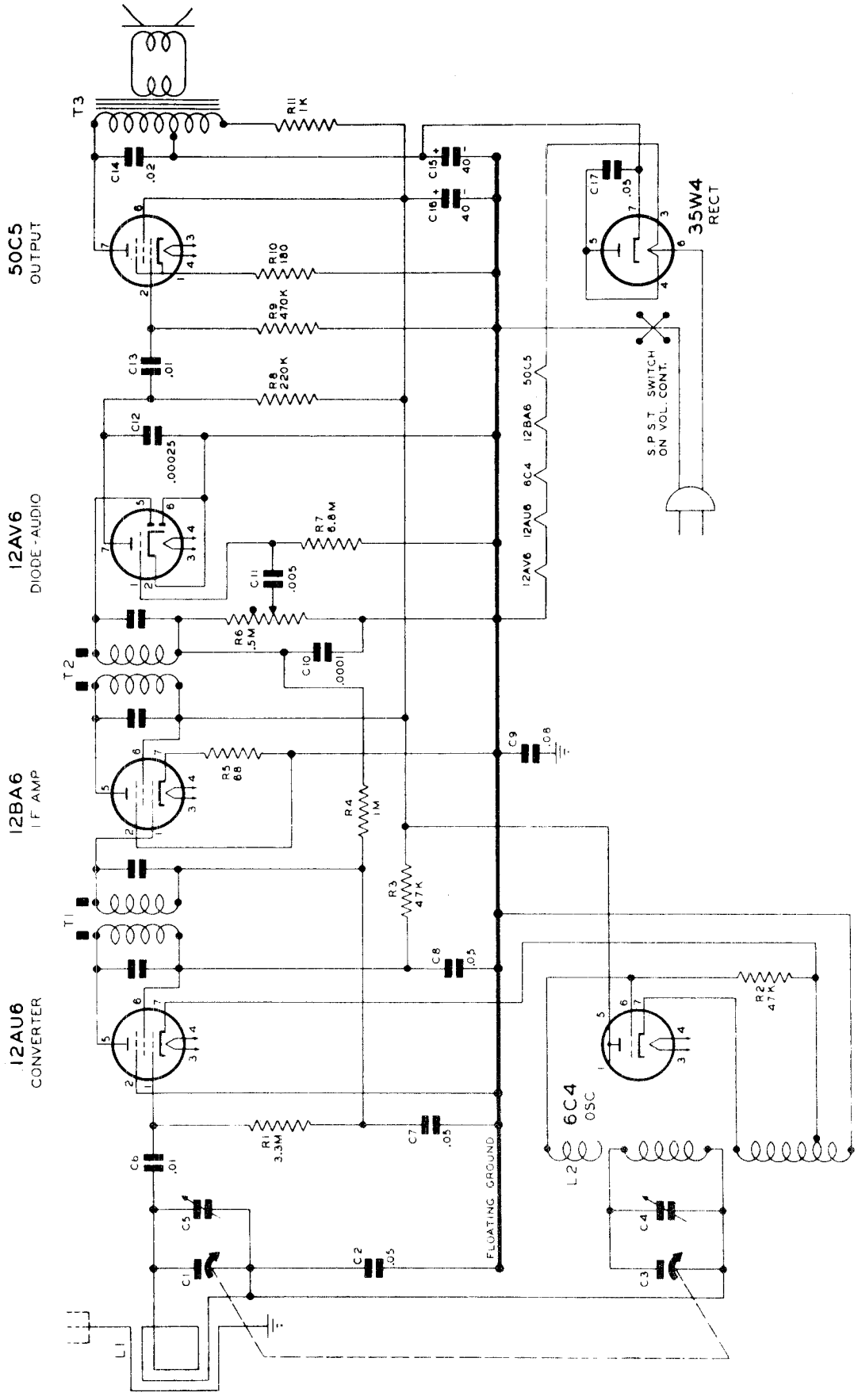
TOP VIEW CHASSIS LAYOUT



R1 - 25 OHM	1/2	WATT	RESISTOR	C1 - .0001 MFD.	400V. CONDENSER
R2 - 100 "	5	"	"	C2 - .0001 "	" "
R3 - 180 "	1/2	"	"	C3 - .01 "	" "
R4 - 1500 "	"	"	"	C4 - .01 "	" "
R5 - 25M "	"	"	"	C5 - .01 "	" "
R6 - 500M "	"	"	"	C6 - .05 "	200V. "
R7 - 500M "	"	"	"	C7 - .1 "	400V. "
R8 - 5MEG. "	"	"	"	C8 - .1 "	" "
R9 - 5MEG. "	"	"	"	C9 - 50+50 "	150V. "
R10 - 500M "	POT. WITH SWITCH			CA-B - GANG CONDENSER	

T1 - LOOP ANTENNA
T2 - OSC. COIL
T3 - 455 KC. I.F.
T4 - 455 KC. I.F.
T5 - O. P. TRANSFORMER
PLI - NO. 44 PILOT LAMP
SPI - PILLOW SPEAKER

MODELS 6H-580,
6H-581



ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

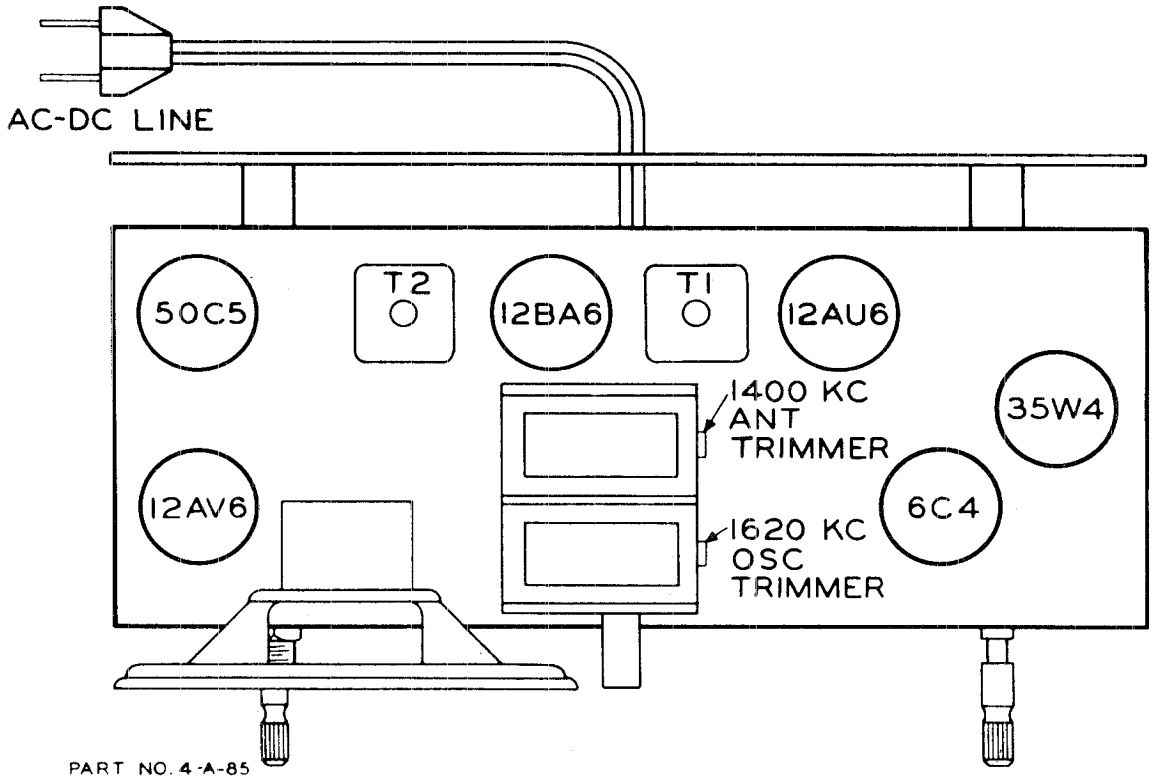
Before starting alignment:

(A) Remove the chassis and loop antenna from the cabinet at the same time. To accomplish this, remove the two fasteners holding the top of the back to the cabinet and remove the two screws on the rear apron of the chassis which fasten the chassis to the cabinet.

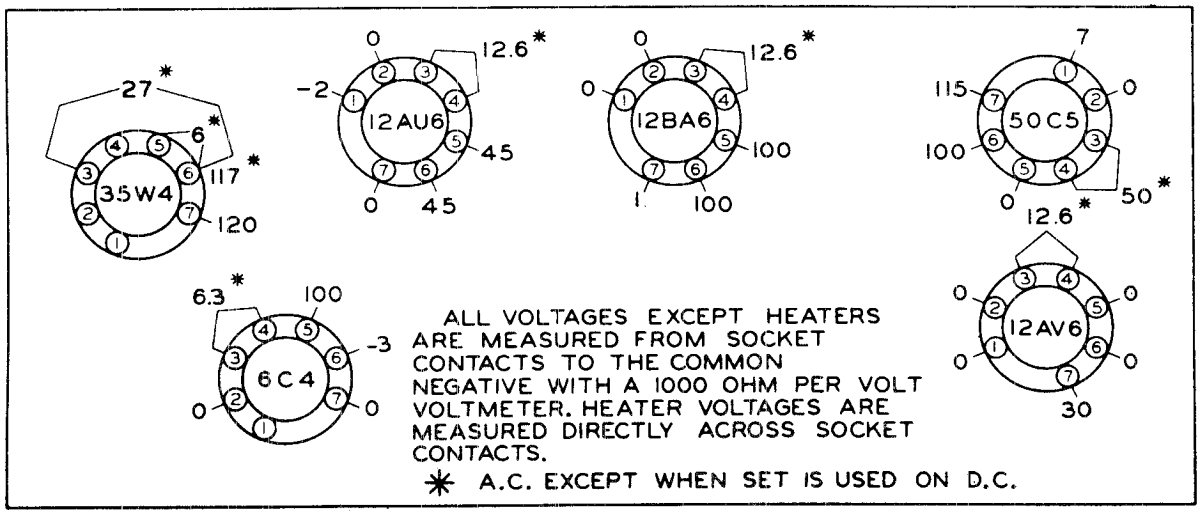
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

STEPS	Set Receiver dial to:	TEST OSCILLATOR		DUMMY ANTENNA	ADJUSTMENT
		Adjust test oscillator Frequency to:	Attach output of test oscillator to:		
1	Any point where no interfering signal is received.	Exactly 455 KC.	High side to gric of 12AU6 Tube. Low side to common negative.	.05 MFD Conden-ser.	Adjust slugs at top and bottom of 2nd. I.F. (T2) and then each of the slugs of the 1st. I.F. (T1) for maximum output.
2	Exactly 1620 KC.	Exactly 1620 KC.	External Antenna. Blue lead on loop.	100 MMFD Conden-ser	Adjust 1620 KC Oscillator trimmer for maximum output.
3	Approx. 1400 KC.	Approx. 1400 KC.	External Antenna. Blue lead on loop.	100 MMFD Conden-ser	Adjust 1400 KC Antenna trimmer for maximum output.

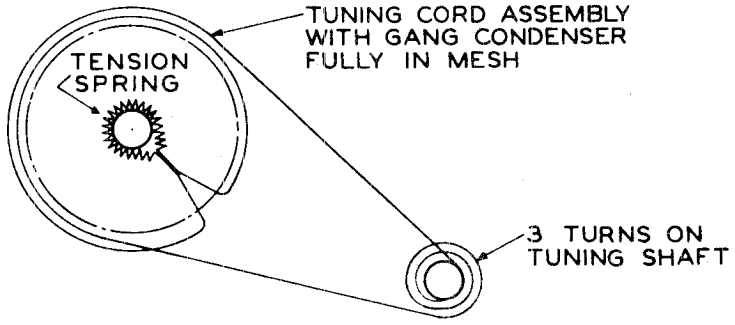
MODELS 6H-580,
6H-581



REAR OF CHASSIS



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)



MODEL C-351,
1951 Chevrolet

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. Any standard two or three section whip or "fish pole" antenna will provide good reception of distant or weak stations. The unit is simple to install and requires no electrical adjustment after installation.

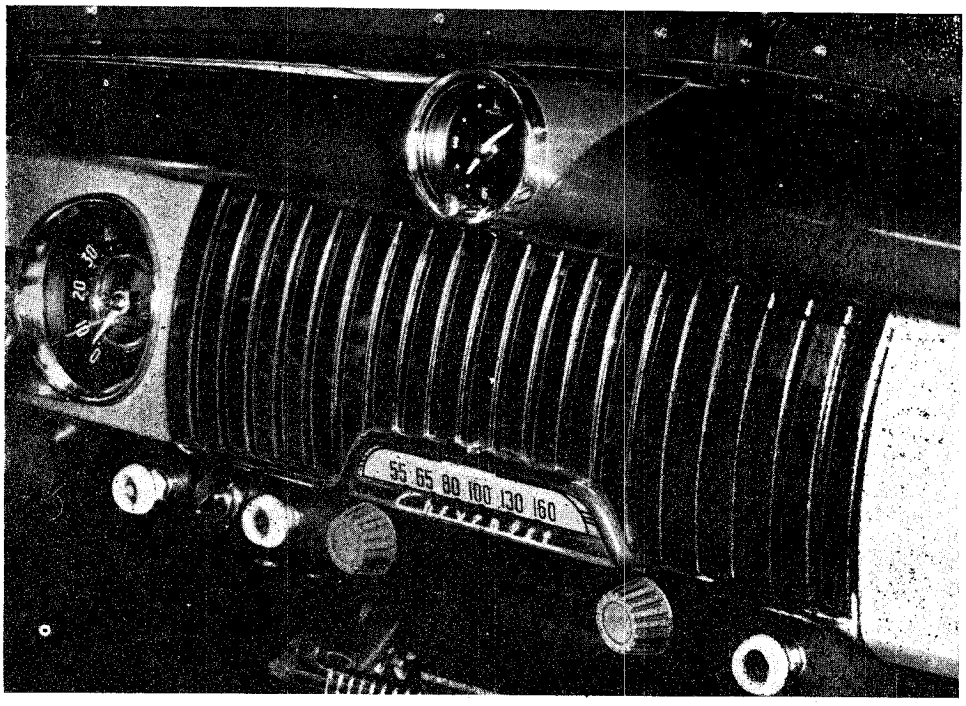


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove two speed nuts securing dummy control cover plate. Discard dummy plate and speed nuts.
2. Remove 12-24 hex nuts securing dummy radio opening cover plate. Save hex nuts but discard dummy plate.
3. Referring to Fig. 2 (rear view), place mounting brackets over 12-24 stud bolts and attach with #12 lockwashers, contained in kit of mounting hardware, and 12-24 hex nuts previously removed.
4. Remove knobs, cup washers, hex nuts, washers and control cover plate from control shafts and mounting bushings.
5. Referring to Fig. 2 (front view), position the receiver behind the instrument panel so that the shafts and mounting bushings protrude through the instrument panel and the stud bolts on the sides of the receiver slide into the slotted ends of the mounting brackets.
6. Secure the mounting brackets to receiver with 1/4" lockwashers and 1/4-20 hex nuts.

MODEL C-351,
1951 Chevrolet

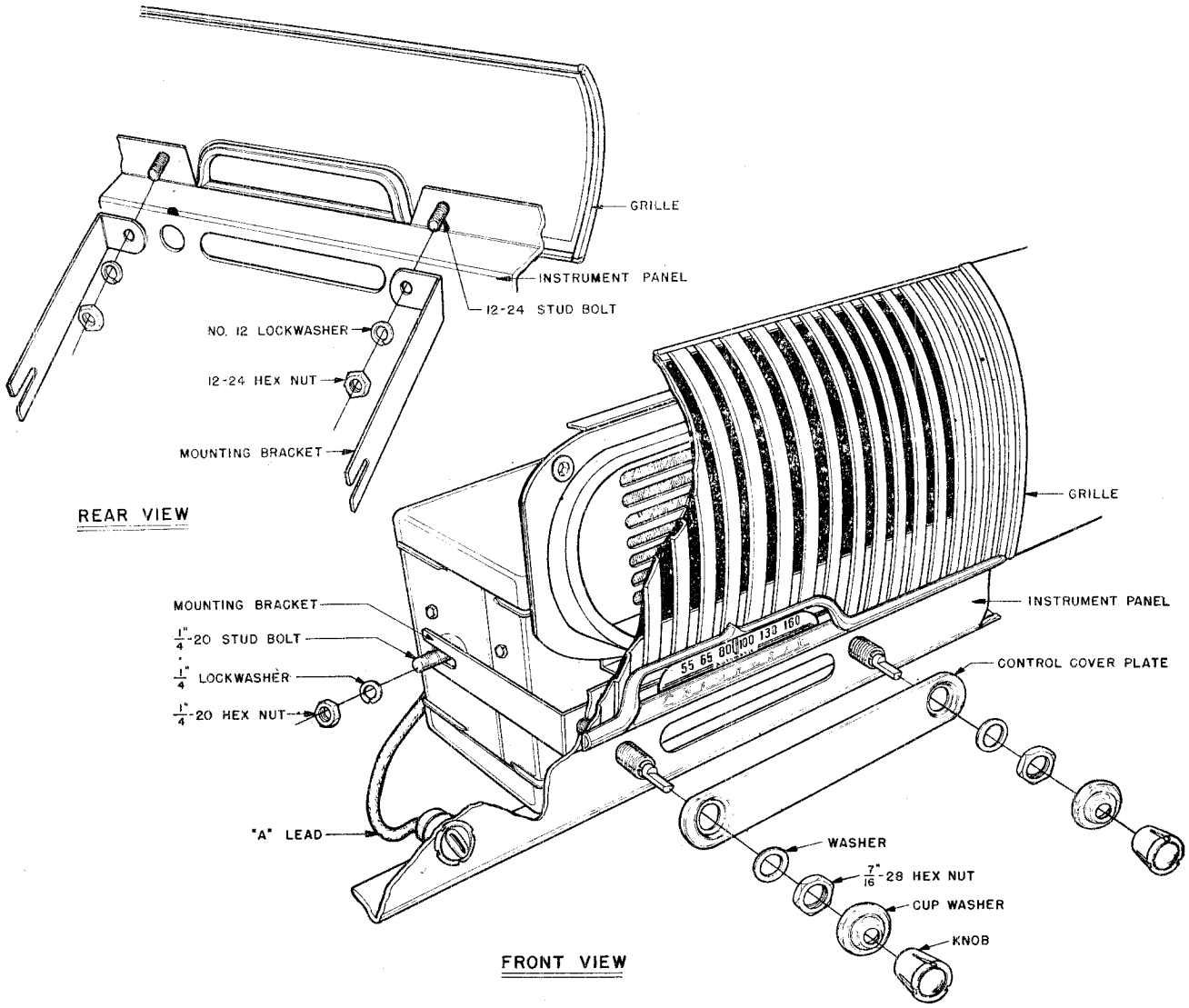


Fig. 2 DETAIL ASSEMBLY

INSTALLATION (Continued)

7. Place control cover plate over mounting bushings.
8. Replace washers and hex nuts on mounting bushings.
9. Replace cup washers and knobs on control shafts.
10. Connect the "A" lead to ignition switch.
11. Plug antenna cable into receptacle located on the back of the receiver.

ACCESSORIES FURNISHED FOR INSTALLATION

The following mounting hardware parts are shipped attached to the receiver. (See Detail Assembly drawing Fig. 2.)

- 2 Knobs
- 2 Cup washers
- 2 7/16-28 Hex nuts
- 2 Washers
- 1 Control Cover Plate
- 2 1/4" Lockwashers
- 2 1/4-20 Hex Nuts

An envelope containing additional mounting hardware is supplied with this receiver. In contains the following parts:

- 2 No. 12 Lockwashers
- 2 Mounting Brackets

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:
1 Generator Condenser.
1 Distributor Suppressor.

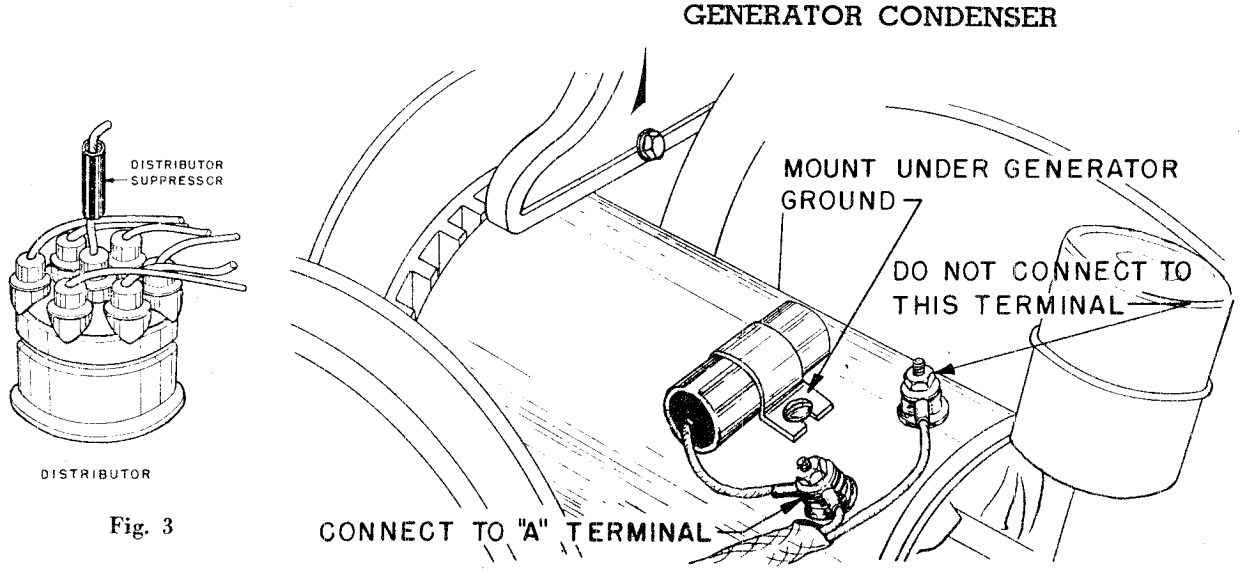


Fig. 3

DISTRIBUTOR SUPPRESSOR

Disconnect the center lead in the distributor head of the motor. Cut lead approximately 2 inches back from metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead, with attached suppressor, back into distributor head.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

MODEL C-351,
1951 Chevrolet

HOW TO ORDER PARTS

Always give the part No. (No. printed on the part if different from that shown on this list) and the name of the part. When No. is not available, give complete description of part and the Model No. of this receiver.

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models.)

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 4).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure". After realignment has been completed repeat the procedure as final check.

INSTRUCTIONS FOR SERVICING RECEIVER COMPONENTS

The novel design of this receiver permits servicing all components without removing the chassis from the case. The top cover can be removed by removing the four (4) screws securing it to the case. This exposes all tube sockets, connections, resistors and condensers for observation and service.
Removing the bottom cover makes it possible to service tubes, vibrator, and volume control.

PARTS LIST

CONDENSERS

Schematic Reference	Diagram Part No	Description
C2, C3, C4	C207	.05 MFD 200 volt condenser
C5	CC200	100 MMFD ceramic condenser
C6, C13, C14	CC201	200 MMFD ceramic condenser
C7	C203	.002 MFD 400 volt condenser
C8, C9	C206	.01 MFD 600 volt condenser
C10, C11	C209	.5 MFD 100 volt condenser
C12	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV-200	CV-200	3 section variable tuning condenser

RESISTORS

R1	R309	1 megohm ½ watt 20% resistor
R2	R306	20K ohm ½ watt 20% resistor
R3	R314	1.5K ohm ½ watt 20% resistor
R4	R310	2 megohm ½ watt 20% resistor
R5	R311	10 megohm ½ watt 20% resistor
R6	R307	250K ohm ½ watt 20% resistor
R7	R308	500K ohm ½ watt 20% resistor
R8, R13	R303	330 ohm ½ watt 20% resistor
R9	R313	20K ohm 2 watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
RV-200	RV-200	Volume control ¾ megohm with switch

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	57FB-3	Antenna Coil
L3	57FB-4	RF coil
L4	L201	RF Oscillator coil
L5	L202	Choke, vibrator hash
L6	L203	Choke, "A" line
T1	1655-16	1st IF transformer
T2	1655-16	2nd IF transformer
T3		Output transformer (Part of speaker not furnished separately)
T4	TV-100 or TV-86A	Vibrator transformer

MISCELLANEOUS

A351	"A" lead assembly
H352	Bracket, mounting
H353	Case, (less covers)
H207	Clip, anti-rattle
H208	Clip, coil mounting
H209	Cover, bottom case
H354	Control Cover Plate
H355	Cover, top case
H311	Cup washers, shaft
A201	Fuse, 15 amp
H211	Grommet, rubber, gang mounting
H310	Knob
H212	Receptacle, antenna cable
PM-250	Speaker, 5¼" PM includes output transformer
V-83 or V-94	Vibrator
H113	7/16-28 Hex nut
C100	.5 MFD Generator condenser
R100	Distributor suppressor

DIAL PARTS

D351	Dial Scale
PS351	Dial Pointer
DS200	Drive shaft assembly
H201	Grommet, rubber drive
T51	Pilot light
H202	Pilot light socket
H203	Pulley, idler
H204	Spring, Dial Drive String Tension
H205	String, Dial Drive

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

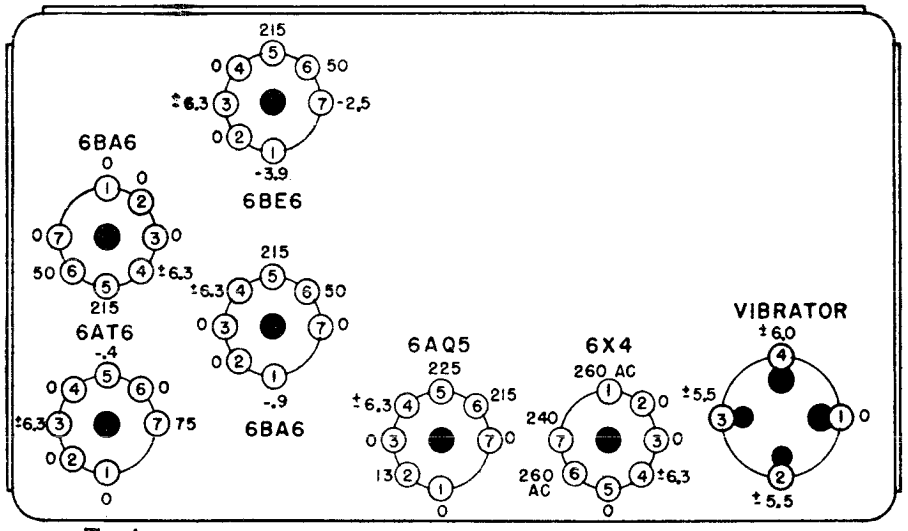
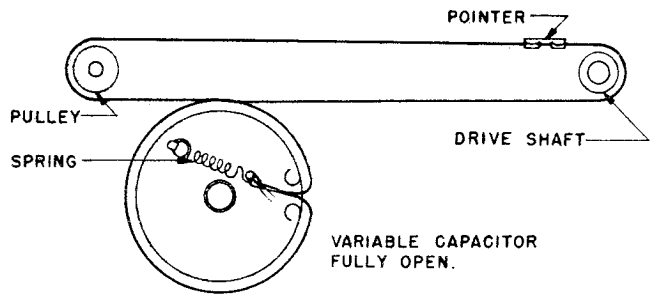


Fig. 4



DIAL CORD DRIVE

Fig. 5

MODEL C-351,
1951 Chevrolet

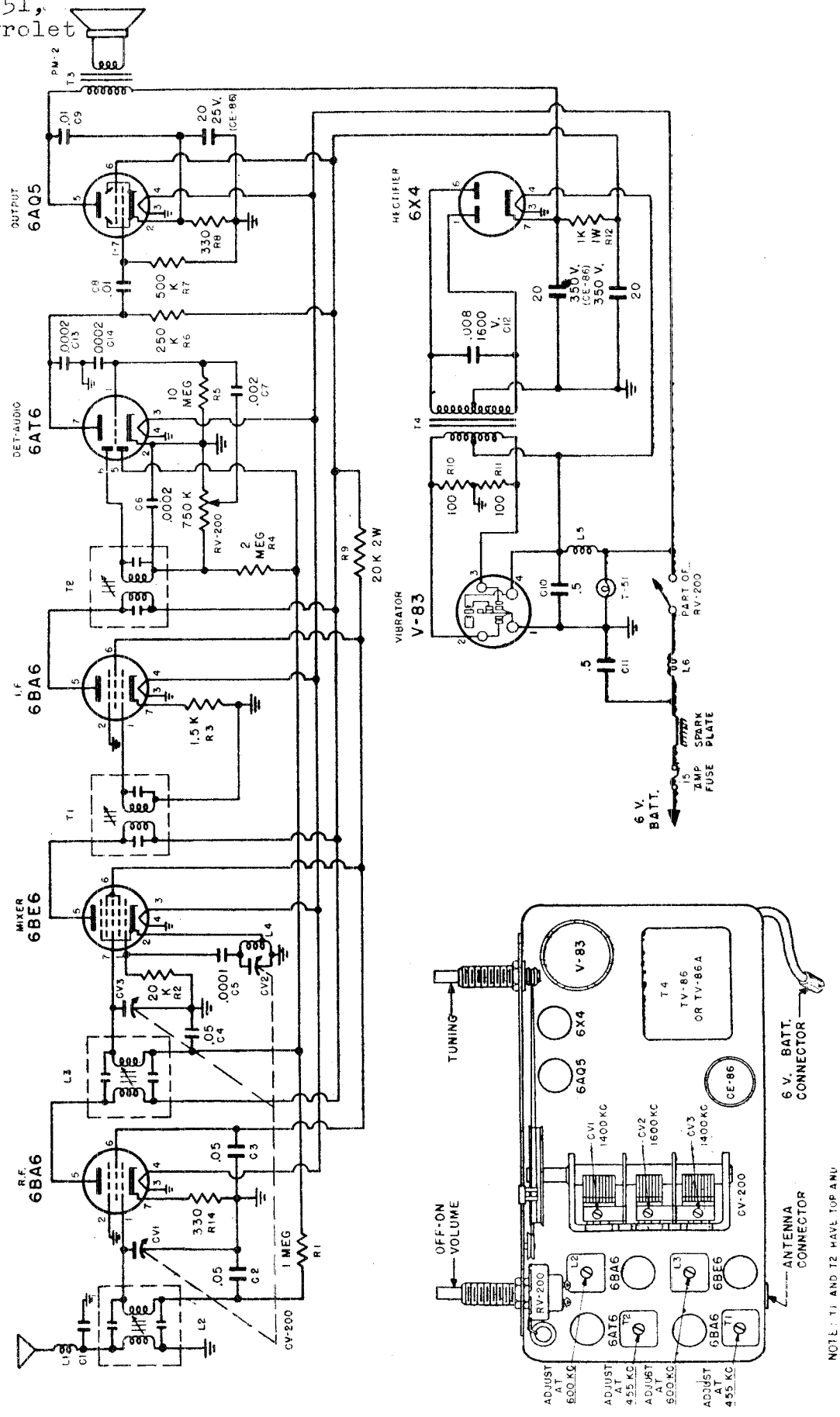


Fig. 6 Note: 6AV6 used in place of 6AT6 on some models.

MODEL F-151,
1951 Ford

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. Any standard two or three section whip or "fish pole" antenna will provide good reception of distant or weak stations. The unit is simple to install and requires no electrical adjustment after installation.

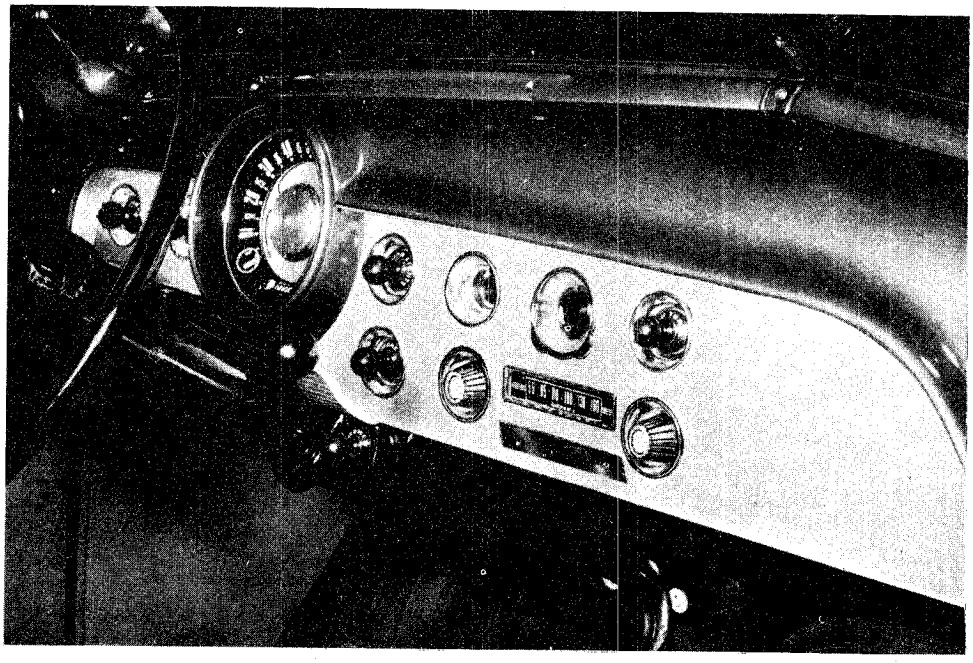


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove the radio opening cover plate by removing the speed nuts at the rear of the instrument panel.
2. Remove and discard radio bezel cups on car by removing hex nuts securing bezel cups to instrument panel.
3. Remove knobs, hex nuts, and bezel cups from tuning unit.
4. Carefully position tuning unit behind instrument panel so the mounting bushings and shafts protrude through the front panel.
5. Place bezel cups over mounting bushings.
6. Attach tuning unit and bezel cups to instrument panel with a hex nut on each mounting bushing.
7. Replace knobs.
8. Position mounting bracket over mounting stud located behind instrument panel and secure with a ¼" lockwasher and a ¼ - 20 nut.
9. Secure mounting bracket to side of tuning unit with hex head No. 8 self tapping screw, as shown in Fig. 2
10. Place speaker and power pack unit over three threaded stud bolts behind the instrument panel. (Position power pack unit so that power cable is located near the tuning unit.) See Fig. 2.
11. Secure power pack into position with the wing nuts supplied in the kit of mounting hardware.

MODEL F-151,
1951 Ford

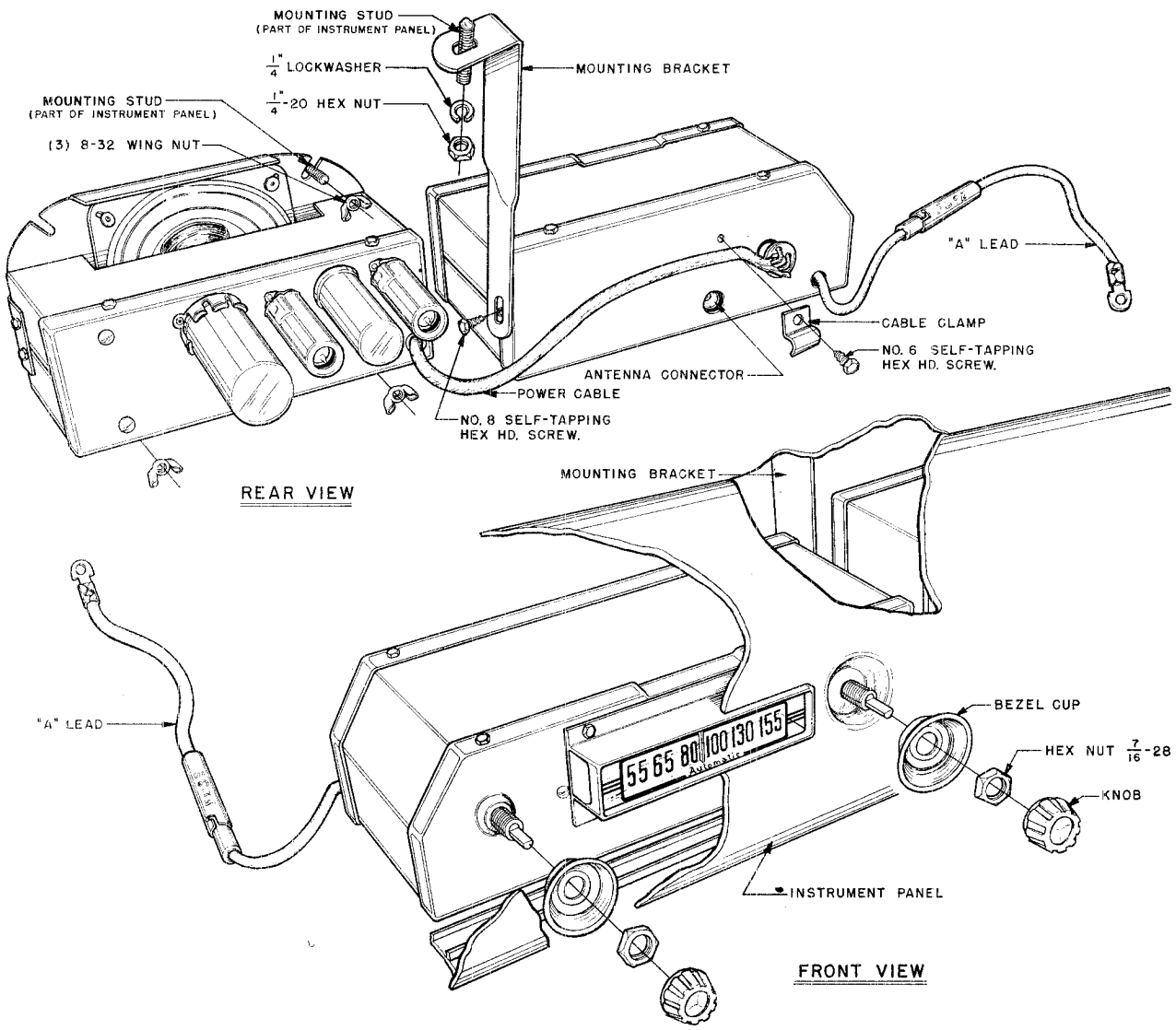


Fig. 2 DETAIL ASSEMBLY

INSTALLATION (Continued)

12. Insert power cable plug into socket on rear of tuning unit.
13. Secure power cable under cable clamp and tighten clamp screw.
14. Plug antenna cable into tuning unit.
15. Connect "A" lead to terminal on ignition switch.

ACCESSORIES FURNISHED FOR INSTALLATION

Mounting Parts Kit

The following mounting hardware parts are shipped attached to the receiver.

(See detail assembly drawing FIG. 2)

- 2 Bezel cups
- 2 7/16 — 28 hex nuts
- 2 Knobs
- 1 Cable clamp

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

- 1 Supporting bracket
- 1 No. 8 self-tapping screw
- 1 1/4" lockwasher
- 1 1/4 — 20 nut
- 3 No. 8 — 32 wing nuts

MODEL F-151,
1951 Ford

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:
1 Generator Condenser
1 Distributor suppressor

DISTRIBUTOR SUPPRESSOR

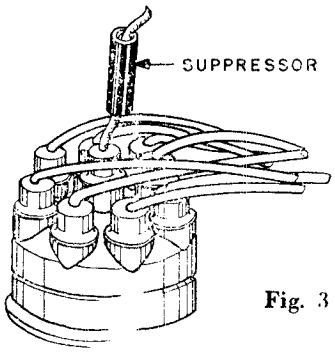


Fig. 3

DISTRIBUTOR 8 CYLINDER

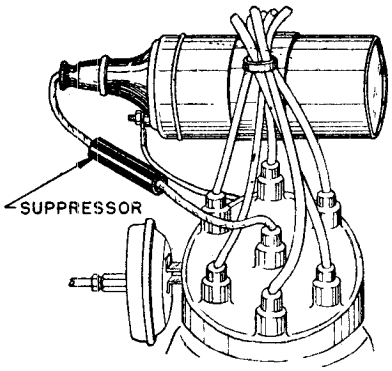


Fig. 4

DISTRIBUTOR-6 CYLINDER

Disconnect high tension wire that runs from the ignition coil to the center hole of the distributor head. Cut lead one and one-half inches back from metal tip end for 8 cylinder Ford or two and one-half inches back for 6 cylinder Ford. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor, back into distributor head.

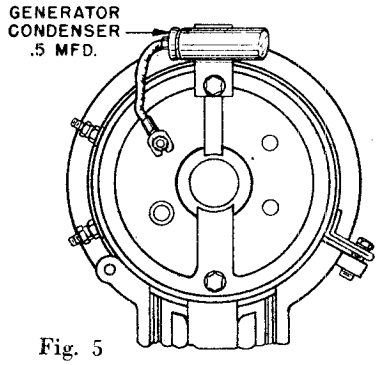


Fig. 5

GENERATOR CONDENSER

Loosen the top assembly bolt from the rear end plate of the generator. DO NOT REMOVE. Mount .5 MFD generator condenser under this bolt. Tighten bolt and connect condenser lead to the armature terminal of the generator.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

HOW TO ORDER PARTS

Always give the part No. (No. printed on the part if different from that shown on this list) and the name of the part. When No. is not available, give complete description of part and the Model No. of this receiver.

MODEL F-151,
1951 Ford

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted 3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models)

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 7 and 7A)

All voltages should be measured with an input voltage of 6.3 volts DC.

To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

DIAL CORD DRIVE

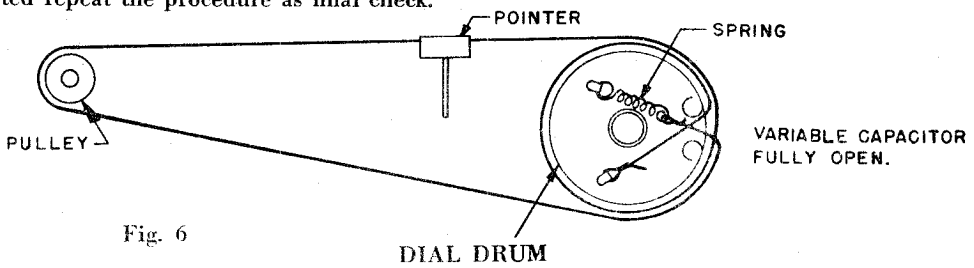


Fig. 6

REPLACEMENT PARTS LIST

SCHEMATIC DIAGRAM REF. NO.	PART NO.	DESCRIPTION
		CONDENSERS
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-100A	3 section variable
		RESISTORS
R1	R309	1 megohm ½ watt 20% resistor
R2, R14	R303	330 ohm ½ watt 20% resistor
R3	R306	20K ohm ½ watt 20% resistor
R4	R314	1.5K ohm ½ watt 20% resistor
R5	RV-100	Volume control ¾ megohm with switch
R6	R310	2 megohm ½ watt 20% resistor
R7	R311	10 megohm ½ watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm ½ watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
R13	R308	500K ohm ½ watt 20% resistor
		COILS AND TRANSFORMERS
L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash
T2	14977 or 1655-16	2nd IF transformer
T1	14977 or 1655-16	1st IF transformer

PART NO.	DESCRIPTION
T3	TV-100 or 318V-2 Vibrator transformer
T4	Output transformer (Part of speaker not furnished separately)

DIAL PARTS

D151	Dial Scale
H151	Dial Scale Holder
PS151	Dial Pointer
T47	Pilot Light
H114	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H115	String, dial drive

MISCELLANEOUS

A300	"A" lead assembly
H152	Bezel Cup
H153	Case, less covers for Power Supply Unit
H154	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H102	Cover, power supply unit mounting (with speaker louvres)
A201	Fuse 15 Amp.
H155	Knob
H156	Mounting Bracket
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptacle, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5¼" PM (includes output transformer)
V-83	Vibrator
H311	Cup washer
H113	7/16—28 Hex nut
C100	.5 MFD generator condenser
R100	Distributor suppressor

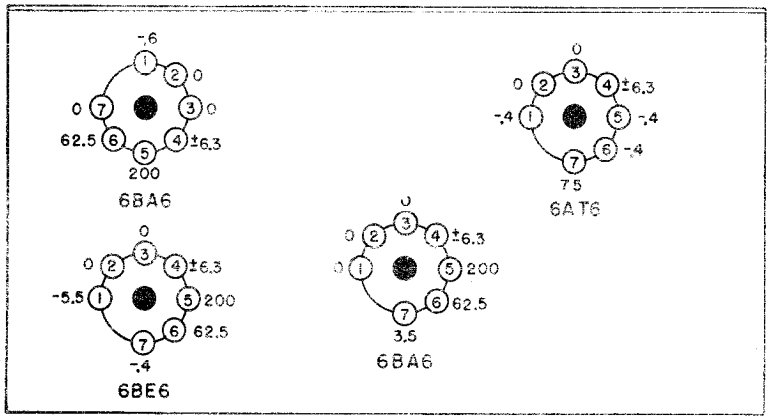
ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

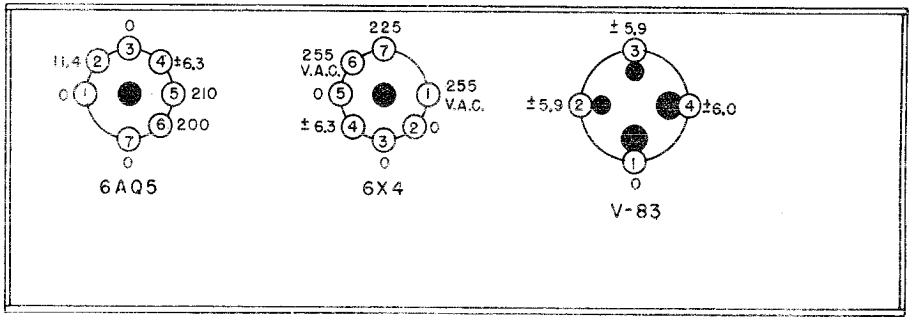
BOTTOM VIEW OF CHASSIS



FRONT OF CHASSIS

Fig. 7

BOTTOM VIEW OF POWER PACK



SOCKET VOLTAGES

Fig. 7A

MODEL
F-151,
1951
Ford

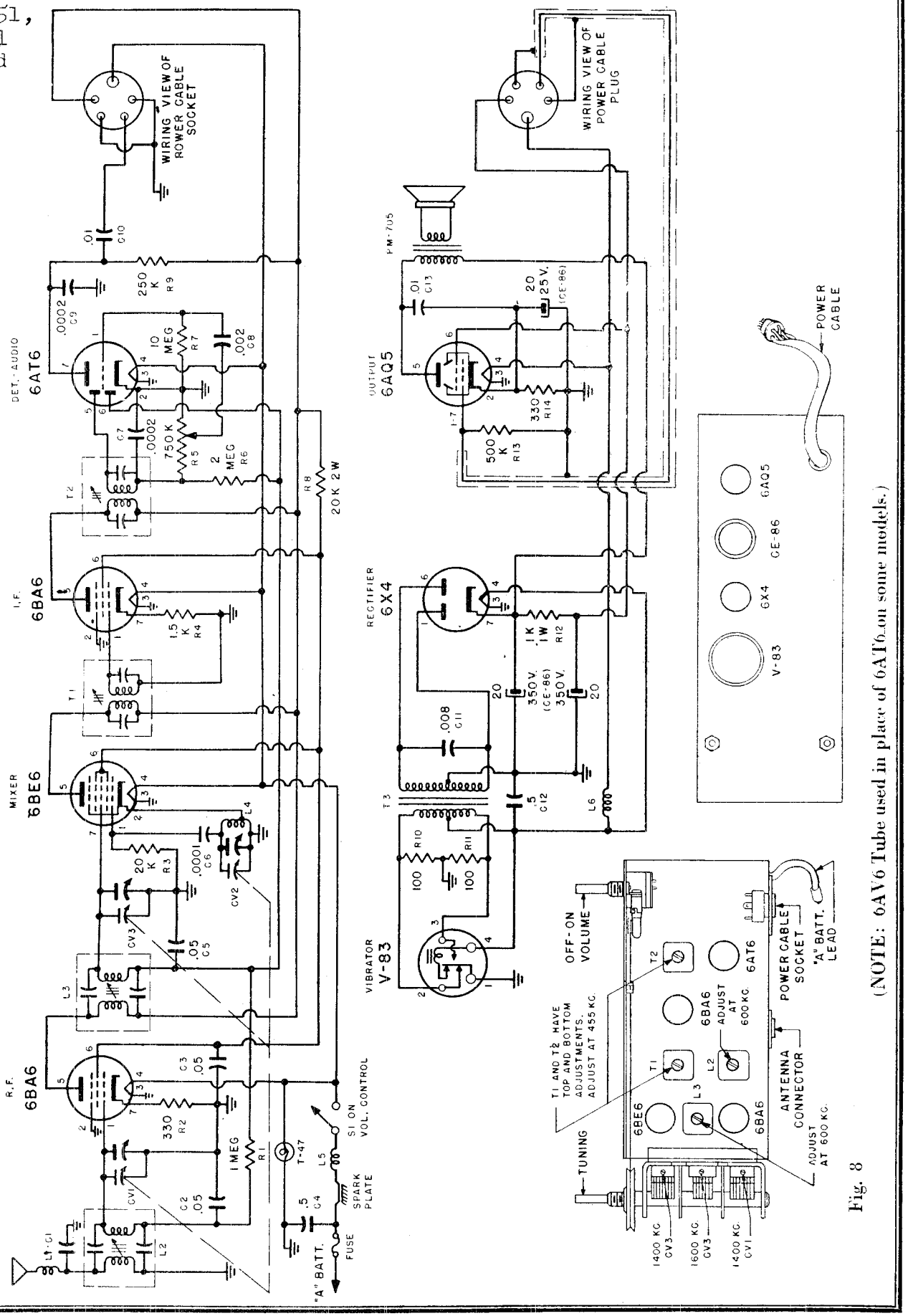


Fig. 8

(NOTE: 6AV6 Tube used in place of 6AT6 on some models.)

MODEL K700,
Henry J

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. Any standard two or three section whip or "fish pole" antenna will provide good reception of distant or weak stations. The unit is simple to install and requires no electrical adjustment after installation.

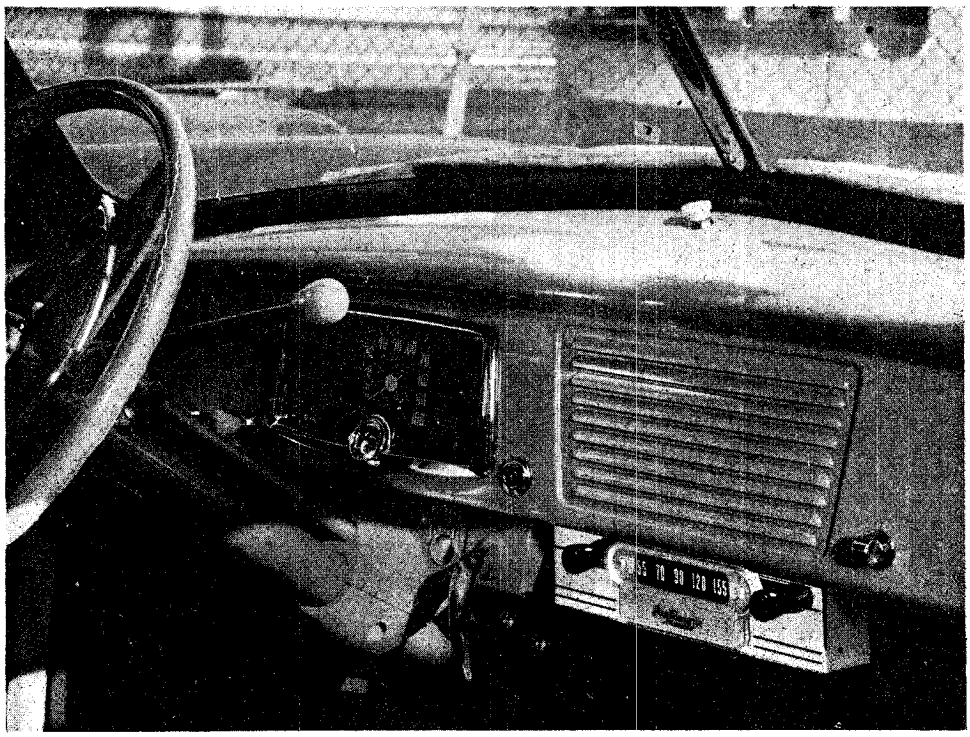


Fig. 1

OPERATION

VOLUME CONTROL KNOB

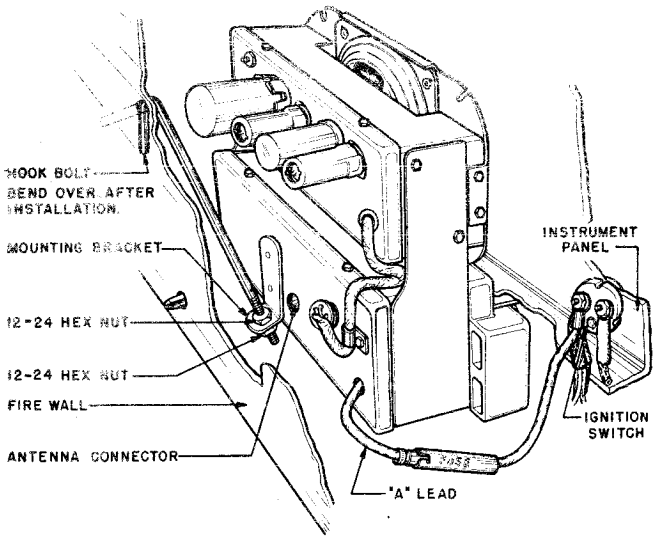
This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

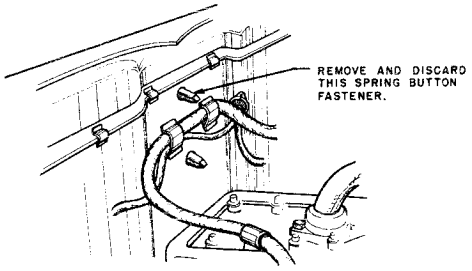
STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION (See Fig. 2)

1. Remove ash tray and holder and discard.
2. Lift hood of car and push out upper spring button fastener by compressing with a pair of pliers and pushing forward. This fastener is located on the firewall directly behind the speaker grill and is used to secure the wall mat to the firewall.
3. Insert hook bolt through the spring button fastener hole from the engine side.
4. Place a 12-24 hex nut approximately one inch up on threaded end of hook bolt.
5. Remove mounting plate from radio by removing the two flat head 10-32 screws under the tuning head.
6. Attach mounting plate to instrument panel with two 10-32 flat head screws, lockwashers, and nuts.
7. Position radio behind instrument panel so that bushings on mounting bracket protrude into holes on die-cast tuning head. Insert threaded end of hook bolt through hole on bracket attached to back of radio.
8. Screw 12-24 hex nut on hook bolt.





FIREWALL VIEW UNDER HOOD

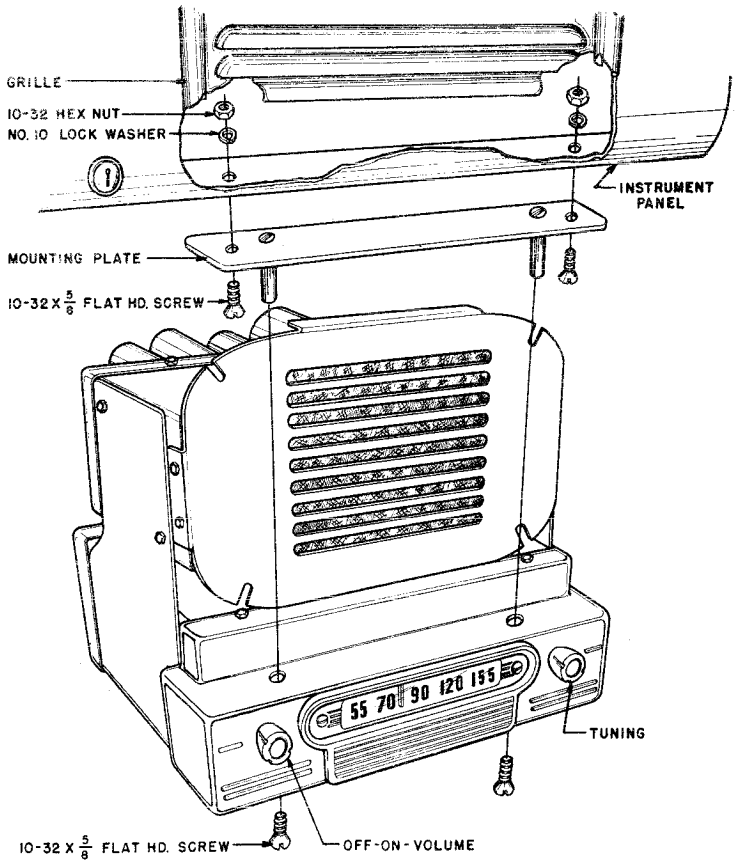


Fig. 2

DETAIL MOUNTING ASSEMBLY

ACCESSORIES FURNISHED FOR INSTALLATION

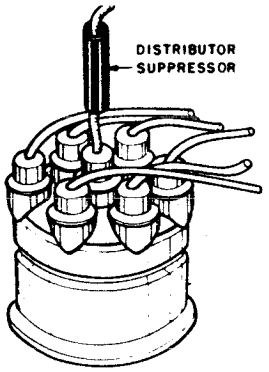
1 Mounting plate
2 12-24 hex nuts
4 10-32 x 5/8" flat head screws
2 No. 10 lockwashers
2 10-32 hex nuts
1 Hook bolt

INSTALLATION (Continued)

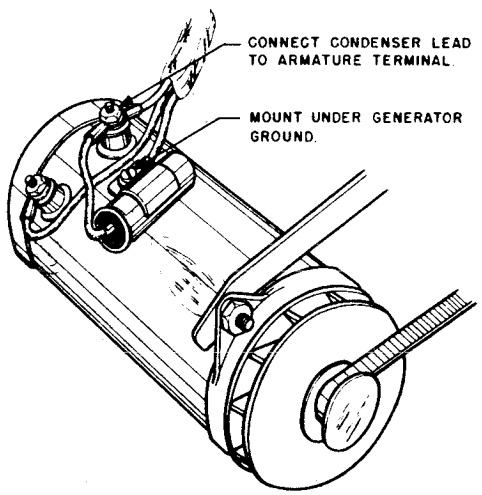
9. Insert two 10-32 flat head screws through bottom edge of radio and screw into bushings attached to mounting bracket.
10. Adjust position of the two 12-24 hex nuts on hook bolt so that radio is mounted parallel to the instrument panel. Tighten bottom hex nut. Bend over end of hook bolt on engine side.
11. Connect "A" lead to terminal on ignition switch.
12. Plug antenna cable into receiver.

GENERATOR CONDENSER

Loosen screw on top surface of generator near terminals. Insert slotted generator condenser bracket under screw head and tighten screw. Connect generator condenser lead to armature terminal. *Do not connect to field terminal.*



DISTRIBUTOR
Fig. 3



GENERATOR CONDENSER
Fig. 4

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser.
1 Distributor suppressor.

DISTRIBUTOR SUPPRESSOR

Disconnect the high tension wire that runs from the ignition coil to the center hole of the distributor cap. Cut lead one inch back from the metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor back into distributor cap.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise in most cases. If the motor noise persists the following steps should be taken. Check operation of radio as each step is made.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

AMMETER CONDENSER

A .5 MFD by-pass condenser should be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 6 and 6A).

All voltages should be measured with an input voltage of 6.3 volts DC.

To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

DIAL CORD DRIVE

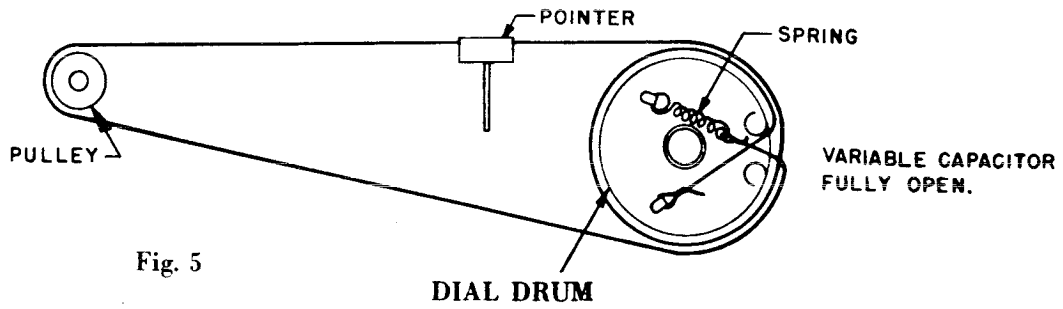


Fig. 5

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

BOTTOM VIEW OF CHASSIS

SOCKET VOLTAGES

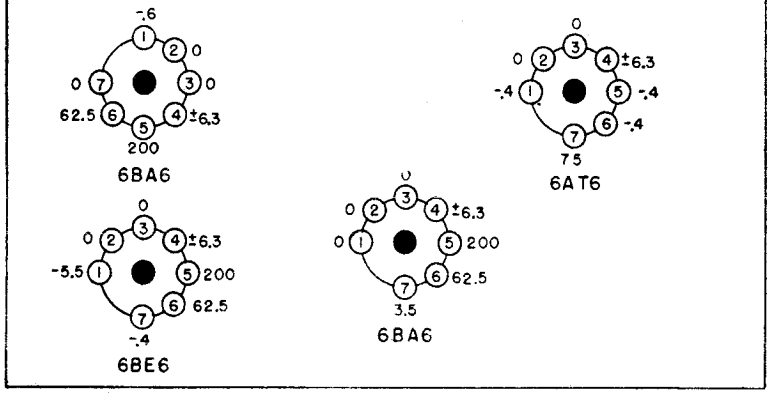


Fig. 6

BOTTOM VIEW OF POWER PACK

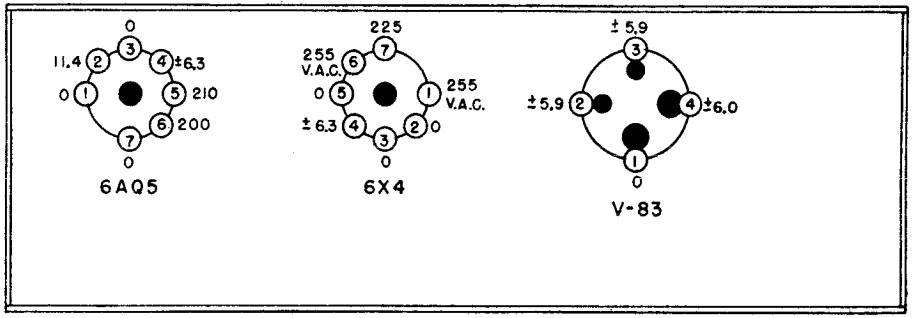


Fig. 6A

MODEL
K700,
Henry J

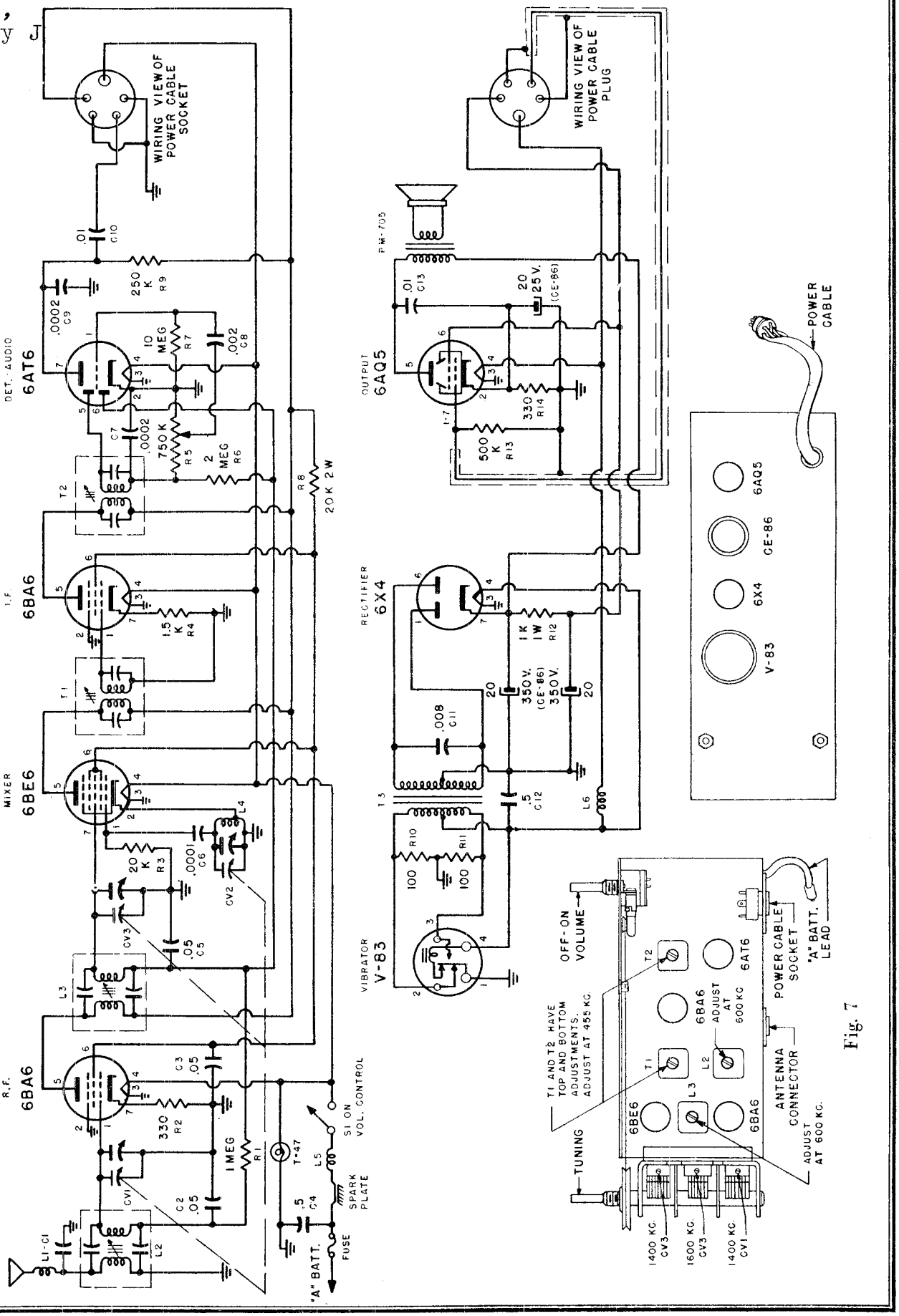


Fig. 7

MODEL K700,
Henry J

PARTS LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-400	3 section variable

RESISTORS

R1	R309	1 megohm ½ watt 20% resistor
R2, R14	R303	330 ohm ½ watt 20% resistor
R3	R306	20K ohm ½ watt 20% resistor
R4	R314	1.5 K ohm ½ watt 20% resistor
R5	RV-570	Volume control ¾ megohm with switch
R6	R310	2 megohm ½ watt 20% resistor
R7	R311	10 megohm ½ watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm ½ watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
R13	R308	500K ohm ½ watt 20% resistor

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash
T2	14977 or 1655-16	2nd IF transformer
T1	14977 or 1655-16	1st IF transformer
T3	TV-100 or 318V-2	Vibrator transformer
T4		Output transformer (Part of speaker not furnished separately)

MISCELLANEOUS

A300	"A" lead assembly
H521	Case, less covers for Power Supply Unit
H520	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H102	Cover, power supply unit mounting (with speaker louvres)
K700	Cover, RF tuning unit, front (complete with plastic escutcheon)
A201	Fuse 15 Amp.
K701	Hook bolt
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptable, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5¼" PM (includes output transformer)
V-83	Vibrator
H310	Knob
H311	Cup washer
C100	.5 MFD generator condenser
R100	Distributor suppressor
K702	Mounting Bracket

DIAL PARTS

H523	Dial Scale Escutcheon. Plastic
PS100	Dial Pointer
T47	Pilot Light
H114	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H115	String, dial drive

Operating Instructions

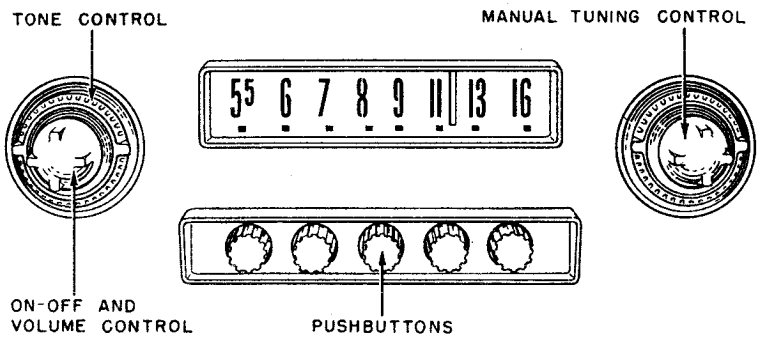


Figure 1—Operating Controls

Dial Illumination

The radio dial lamp is independent of radio operation, and is turned on and off with the car lights. Its brilliance is adjusted by means of the Instrument Panel Lighting intensity control.

Receiver Installation

1. Install the antenna in accordance with the instructions packed in the antenna kit.

2. Remove and discard the radio opening coverplates from the instrument panel by removing the speed nuts at the rear of the panel.

3. CAREFULLY, from the underside of the instrument panel, position the speaker baffle and speaker on the three threaded stud bolts so that the speaker lead is on the left when viewed from the front, and tighten securely with the three #8-32 wing nuts provided in the installation kit (see figures 2 and 3).

4. Using the ¼-inch lock washers and nuts supplied in the installation kit, attach the tops of the right-hand and left-hand rear mounting brackets loosely to the studs on the underside of the instrument panel, near the windshield, as shown in figures 2 and 3.

5. Place the receiver in position behind the instrument panel, with the radio head centered in the panel openings (see figure 3). Secure the control shafts with two hex nuts supplied in the installation kit. Attach the lower ends of the mounting brackets loosely to the studs on the sides of the case, using the serrated washers, lock washers, and hex nuts provided in the installation kit (see figures 2 and 3). Tighten the upper ends of the brackets securely. Adjust the serrated washers at the lower ends of the bracket to make fine adjustments on the position of the unit, then tighten the hex nuts securely.

6. Place the bezel cups over the Tuning and Volume control shafts, and secure with the ½-inch hex nuts supplied (see figure 3). Slip the disc and knob on the Volume control shaft, and the knob on the Tuning control shaft.

7. Connect the speaker by inserting its plug into the receptacle on the rear of the receiver. Connect the antenna by inserting its cable plug into the receptacle on the right side of the case (see figure 2).

8. Plug the "A" lead bullet-connector (see figure 3) into the female receptacle that terminates the Blue-White tracer of the double connector at the end of the main wiring harness, behind the circuit breaker.

9. Plug the dial light bullet-connector (see figure 3) into the female receptacle that terminates the Blue-Red tracer of the double connector at the end of the main wiring harness, behind the circuit breaker

10. VERY IMPORTANT: Turn the receiver on and allow it to operate for approximately 15 minutes in order for each part to reach its normal operating temperature. Tune in a weak station at the high end of the broadcast band (near 1300 kilocycles) and, with fingers, rotate the antenna trimmer (see figure 2) for maximum volume.

Setting Pushbuttons

Manually tune in a local station of your choice, so that, with volume turned down, its signal is heard without distortion. With finger pressure, loosen a pushbutton by rotating it in a counterclockwise direction. (IMPORTANT: DO NOT ROTATE PUSHBUTTON MORE THAN ONE FULL TURN TO THE LEFT.) Press in the loosened pushbutton, and release. Tighten the button with fingers by turning to the right. The pushbutton is now set up for the station which was tuned in manually. Use the same procedure for setting up the remaining pushbuttons, manually tuning in the desired station for each button. (Preferably set up pushbuttons during daytime, due to high sensitivity of the set.)

MODEL M-2, Ford Part
No. 1A-18805-A1

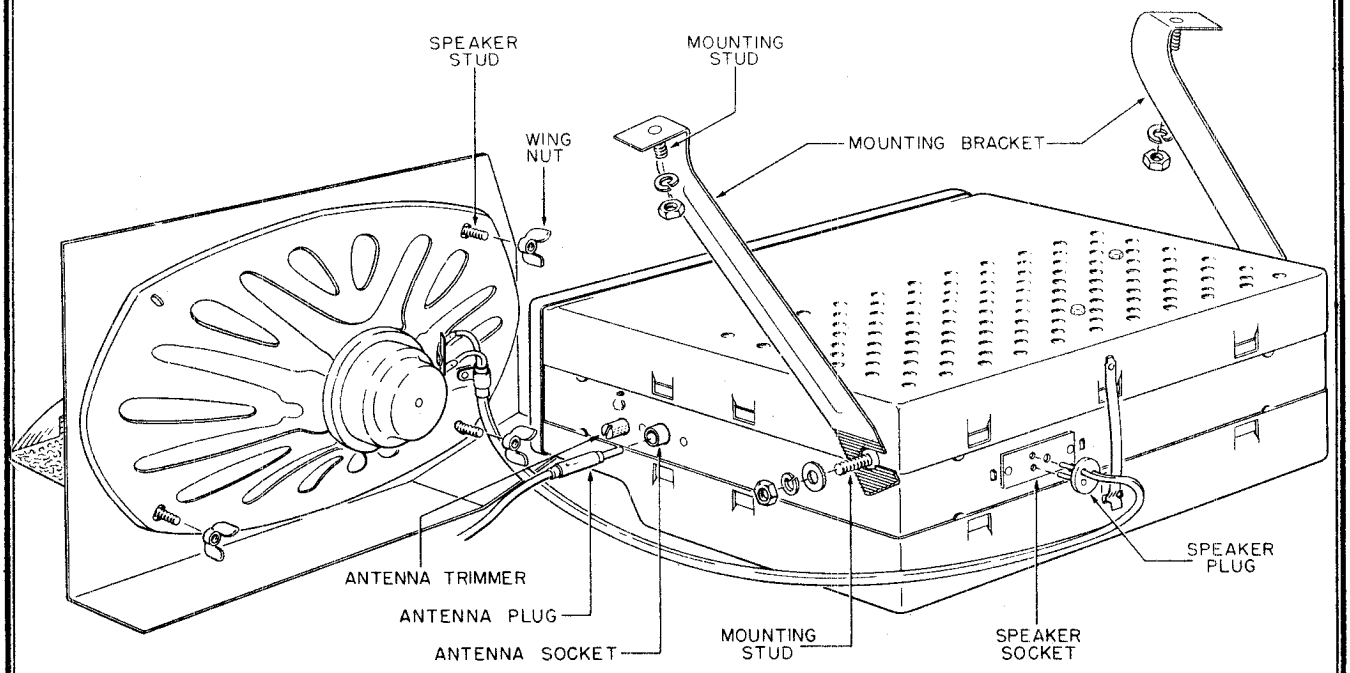


Figure 2—Installation Procedure, Rear View of Receiver

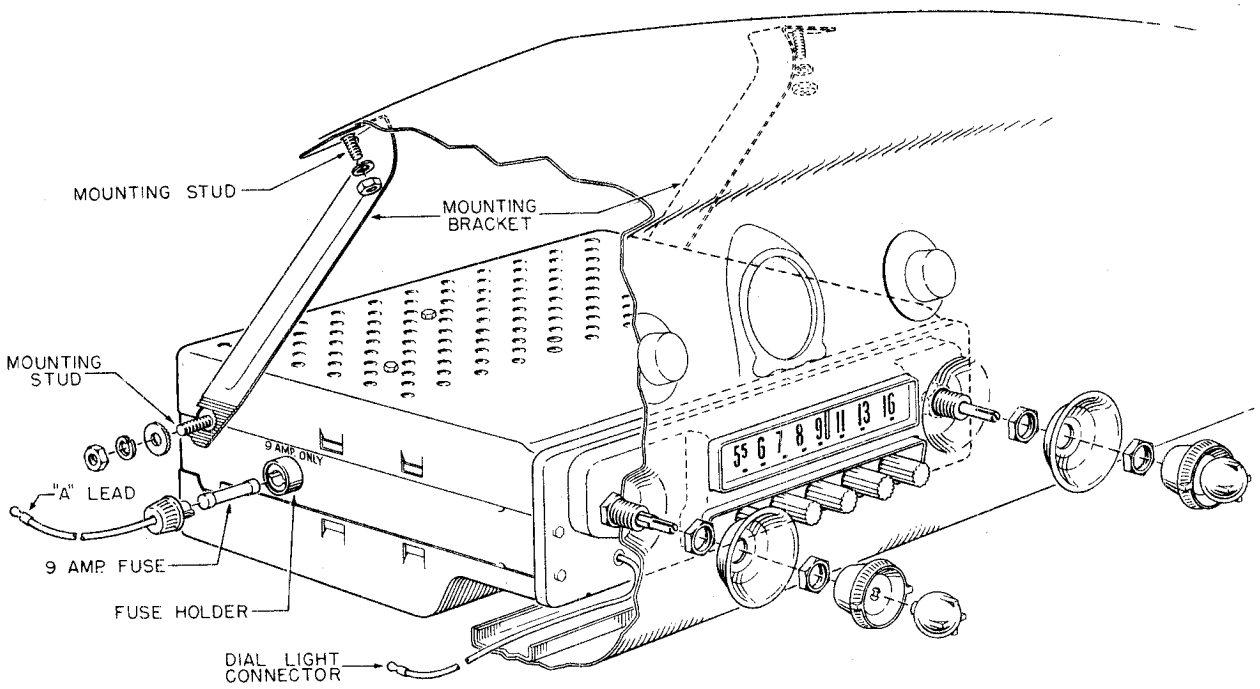


Figure 3—Installation Procedure, Front View of Receiver

Interference Elimination

Extraneous radio-frequency noises from ignition systems and other sources that might interfere with reception on your Ford Radio Receiver can be eliminated by installing the suppression parts, packed in the installation kit, in accordance with the directions given herein.

IMPORTANT: Use the utmost care in cleaning away paint and dirt where parts are to be installed to insure good electrical contacts. Tighten all nuts and bolts securely.

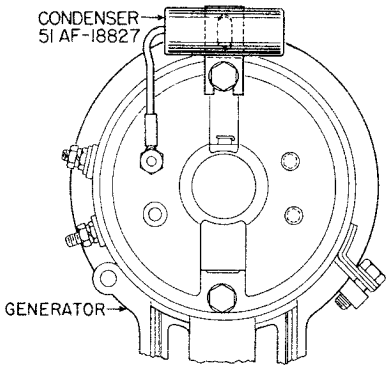


Figure 1

1. Loosen (do not remove) the top assembly bolt on the rear end plate of the Generator. Slide the bracket of Condenser 51AF-18827 under the bolt and tighten (see figure 1). Connect the lug end of the Condenser lead to the Armature terminal of the Generator.

2. Cut the high tension wire that runs from the Ignition Coil to the center hole of the Distributor Cap (make the cut 2½-inches from the coil on six cylinder cars, and 1½-inches on eight cylinder cars). See figure 2. Remove the wire from the Coil and screw the cut end of the wire into Suppressor 1GA-18811-A. Screw the other end of the Suppressor on the cut end of the Distributor wire, and replace the wire in the Ignition Coil.

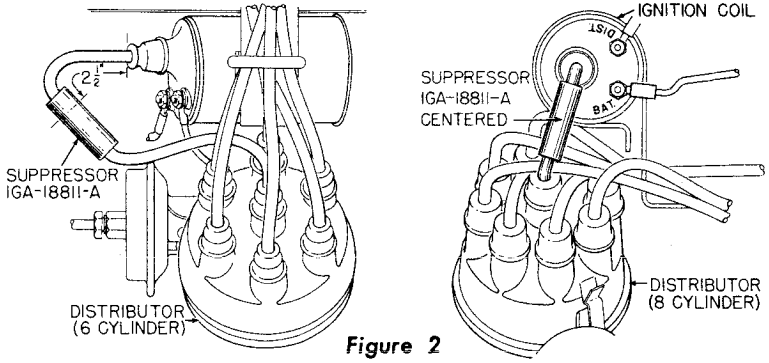


Figure 2

Condenser Installation

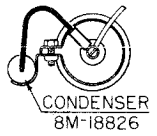


Figure 3

3. Condenser 8M-18826 is furnished with a bracket which fits around the Oil Pressure Gauge Unit. Mount and connect the Condenser as shown in figure 3.

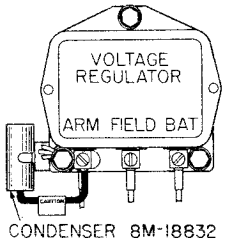


Figure 4

4. Mount Condenser 8M-18832 on the Voltage Regulator as shown in figure 4. Connect its lead to the "ARM" terminal on the Regulator. Be careful that Condenser bracket does not short on the terminal.

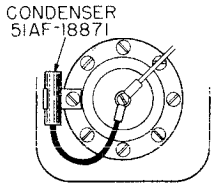


Figure 5

5. Remove the Fuel Tank Gauge cover plate located in the luggage compartment floor. Mount and connect Condenser 51AF-18871 as shown in figure 5. Fasten cover plate and apply sealing compound to insure a good seal for the cover.

Wheel Static

6. Remove inner and outer hub caps from each front wheel. Clean inner cups and spindles. Snap Static Collector Springs (Part No. 8A-18938) in inner hub caps (see figure 6). IMPORTANT: BEND COTTER KEY AWAY FROM SPINDLE CENTER HOLE SO THAT IT WILL NOT INTERFERE WITH STATIC COLLECTOR. Replace inner and outer hub caps.

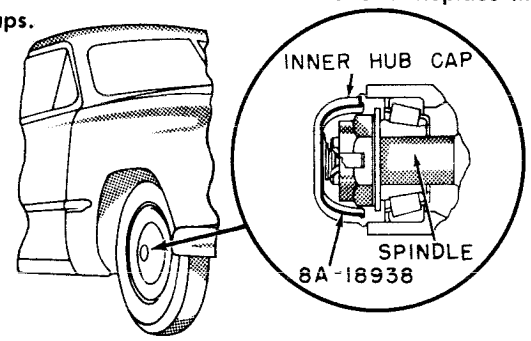


Figure 6

MODEL M-2, Ford Part No. 1A-18805-A1

GENERAL

The Bendix Model M-2, Ford Model 1A-18805-A1 Auto Radio is a six-tube superheterodyne receiver with vibrator power supply and full wave rectifier. The antenna, radio, frequency, and oscillator circuits are inductively tuned, by means of push buttons and or the manual tuning control, over a frequency range of 540 to 1606 kilocycles, by means of iron cores.

The On-Off, Volume and Tone Controls are on concentric shafts at the left of the receiver. The Manual Tuning Control is at the right. The Speaker is a separate unit.

TUBE COMPLEMENT

6SK7/GT	R.F. Amplifier	6SQ7/GT	Det., AVC and AF ampl
6SA7/GT	Converter	6V6/GT	AF Amplifier
6SK7/GT	I.F. Amplifier	6X5/GT	Rectifier

POWER SUPPLY

The Power Supply uses a 6X5/GT full wave rectifier tube in conjunction with a four prong full wave non-synchronous type vibrator.

ALIGNMENT

Recommended Test Equipment

Signal Generator - 260 to 1700 KC range. Output from 1, to 100,000 microvolts. Modulation 30% at 400 cycles.

Output meter - 2 watt capability with 4.0 ohm termination or, P. M. Speaker, for alignment by ear as an alternate.

Dummy Antenna - Constructional circuit included in the rear section of this manual.

General:

Make all alignment adjustments to the receiver with "A" lead connected to a 7.2 volt negative source, and ground the chassis to the positive side of this source. Rotate the volume and tone controls to their maximum clockwise position. Connect the output meter across the speaker voice coil. Use an insulated screw driver for making all adjustments. Use shielded cables for connections between signal generator, dummy antenna and receiver. For each adjustment, the signal level should be set as low as possible while still obtaining a reasonable output indication. The signal level should be controlled at the signal generator, and not with the receiver controls.

1. I.F. Alignment

(a) Set the signal generator frequency to 265.0 KC. Connect the signal lead thru the standard test dummy antenna to the receiver antenna connection.

(b) Turn the receiver manual tuning control for the high frequency end of the dial

(c) Adjust the I F iron cores L-6A, L-6B, L7A and L7B for maximum output. Repeat this operation to assure accurate alignment.

MODEL M-2, Ford Part No. 1A-18805-A1

2. R.F. Alignment

Note: Before commencing RF alignment, turn the manual tuning control until the dial pointer travels as far towards the low frequency end of the dial as possible. This should be about one quarter of an inch to left of the 5.5 marker. Reset the dial pointer if necessary.

(a) Set the signal generator to 1606 KC, and connect the signal lead thru the dummy antenna to the receiver antenna socket.

(b) Turn the receiver tuning control until the receiver is set to the highest frequency as indicated by the pointer.

(c) Adjust the trimmers C1, C7 and C9 for maximum output. Repeat this to assure accurate alignment.

3. Sensitivity Control Adjustment

(a) Using the dummy antenna, the signal generator should be connected to the receiver as in the R. F. alignment procedure. Make sure the receiver volume control is fully clockwise.

(b) Apply a signal, 30 percent modulated at 400 cycles, of sufficient strength to produce one watt output, when tuned in on the receiver.

(c) Remove modulation and adjust the sensitivity control R14 for 100 milliwatts of noise, maximum, at the worst point in the band. This will usually be found at the high frequency end of the dial.

4. Alignment with Car Antenna

With the antenna fully extended, tune in a weak station near 1600 KC and adjust the antenna trimmer C1 for maximum volume.

5. Tuner Iron Core Alignment

Note: The following procedure is only required when a coil or iron tuning core is replaced.

(a) Be sure the I.F. coils are properly aligned as outlined in Section 1.

(b) Set the tuner core carriage at the position which tunes the receiver to the highest frequency. Adjust the position of the iron tuning cores so that they do not extend inside the coil, but remain well within the coil form.

(c) Introduce a 1606 KC signal into the set through the dummy antenna and adjust trimmers C1, C7 and C9 for maximum output.

(d) Use the manual control to tune the receiver until the position is centered on the 1300 KC dial frequency marker. Tune the signal generator to 1300 KC. Adjust the iron tuning cores separately for maximum output.

(e) Set the tuner again to the highest frequency position and introduce 1606 KC. Tune trimmers C1, C7 and C9 for maximum output. Note: Make no further adjustment of the iron tuning cores at 1606 KC.

(f) Repeat sections (d) and (e).

(g) Use glyptol or equivalent cement to cement the iron core screws securely to the tuner core carriage.

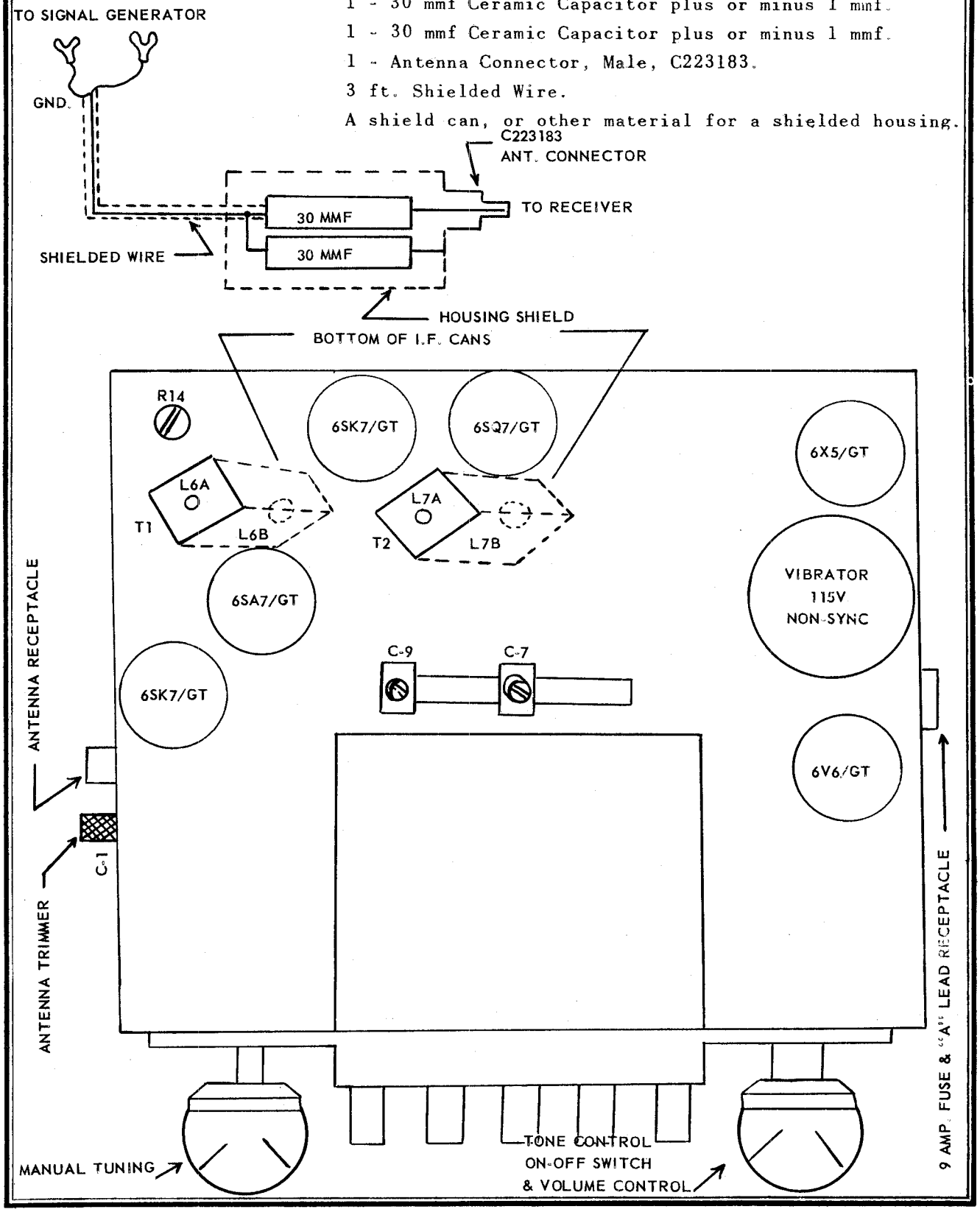
MODEL M-2, Ford Part No. 1A-18805-A1

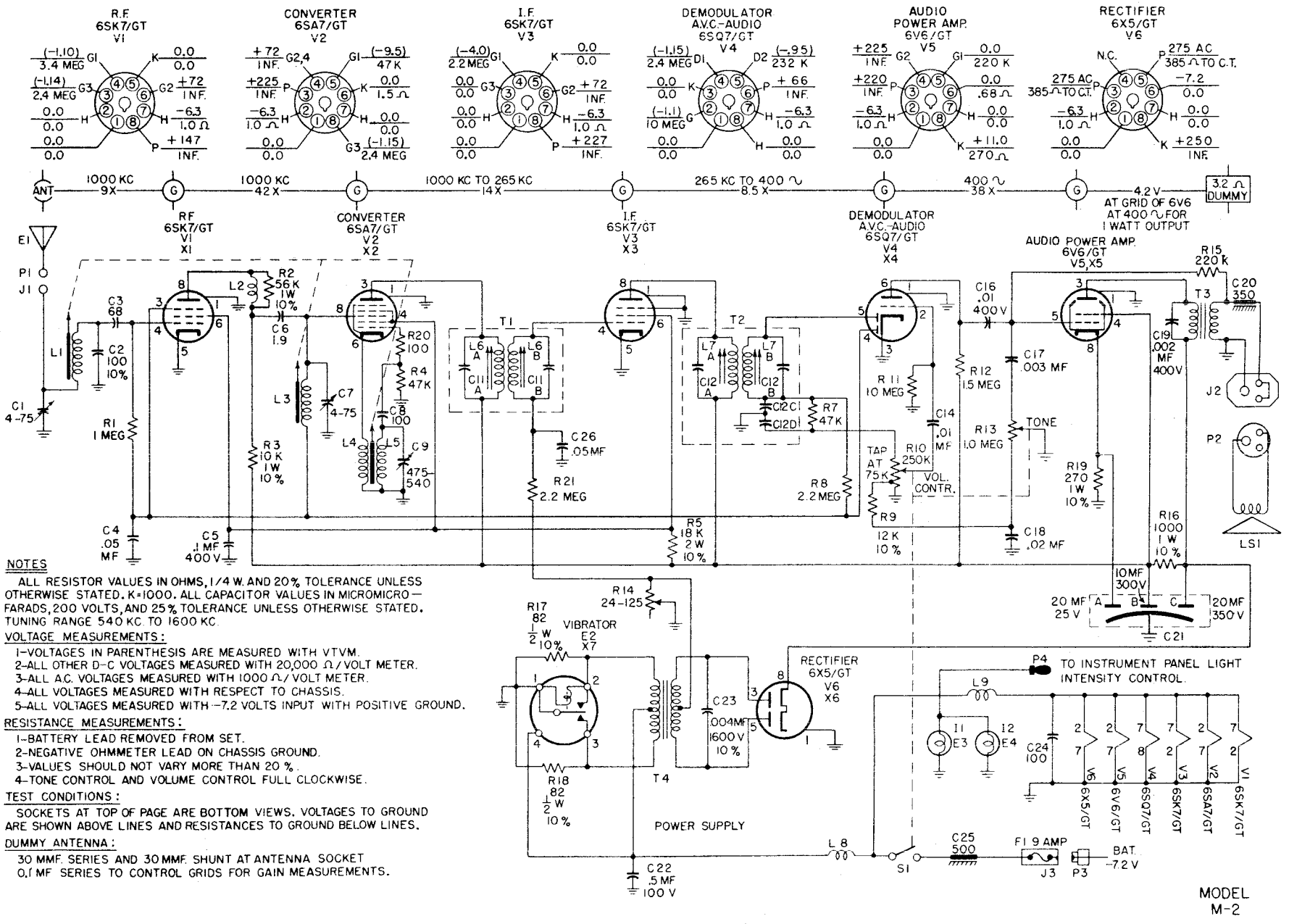
DETAILS FOR CONSTRUCTING DUMMY ANTENNA

The purpose of the dummy antenna is to properly match the output of the signal generator to the receiver input.

Material Required

1 - 30 mmf Ceramic Capacitor plus or minus 1 mmf.
1 - 30 mmf Ceramic Capacitor plus or minus 1 mmf.
1 - Antenna Connector, Male, C223183.
3 ft. Shielded Wire.
A shield can, or other material for a shielded housing.





NOTES

ALL RESISTOR VALUES IN OHMS, 1/4 W. AND 20% TOLERANCE UNLESS OTHERWISE STATED. K=1000. ALL CAPACITOR VALUES IN MICROMICRO—FARADS, 200 VOLTS, AND 25% TOLERANCE UNLESS OTHERWISE STATED. TUNING RANGE 540 KC. TO 1600 KC.

VOLTAGE MEASUREMENTS:

1—VOLTAGES IN PARENTHESIS ARE MEASURED WITH VTVM.
2—ALL OTHER D-C VOLTAGES MEASURED WITH 20,000 Ω/VOLT METER.
3—ALL A.C. VOLTAGES MEASURED WITH 1000 Ω/VOLT METER.
4—ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS.
5—ALL VOLTAGES MEASURED WITH −7.2 VOLTS INPUT WITH POSITIVE GROUND.

RESISTANCE MEASUREMENTS:

1—BATTERY LEAD REMOVED FROM SET.
2—NEGATIVE OHMMETER LEAD ON CHASSIS GROUND.
3—VALUES SHOULD NOT VARY MORE THAN 20%.
4—TONE CONTROL AND VOLUME CONTROL FULL CLOCKWISE.

TEST CONDITIONS:

SOCKETS AT TOP OF PAGE ARE BOTTOM VIEWS. VOLTAGES TO GROUND ARE SHOWN ABOVE LINES AND RESISTANCES TO GROUND BELOW LINES.

DUMMY ANTENNA:

30 MMF. SERIES AND 30 MMF. SHUNT AT ANTENNA SOCKET
0.1 MF SERIES TO CONTROL GRIDS FOR GAIN MEASUREMENTS.

MODEL M-2

MODEL M-2, Ford Part No. 1A-18805-A1

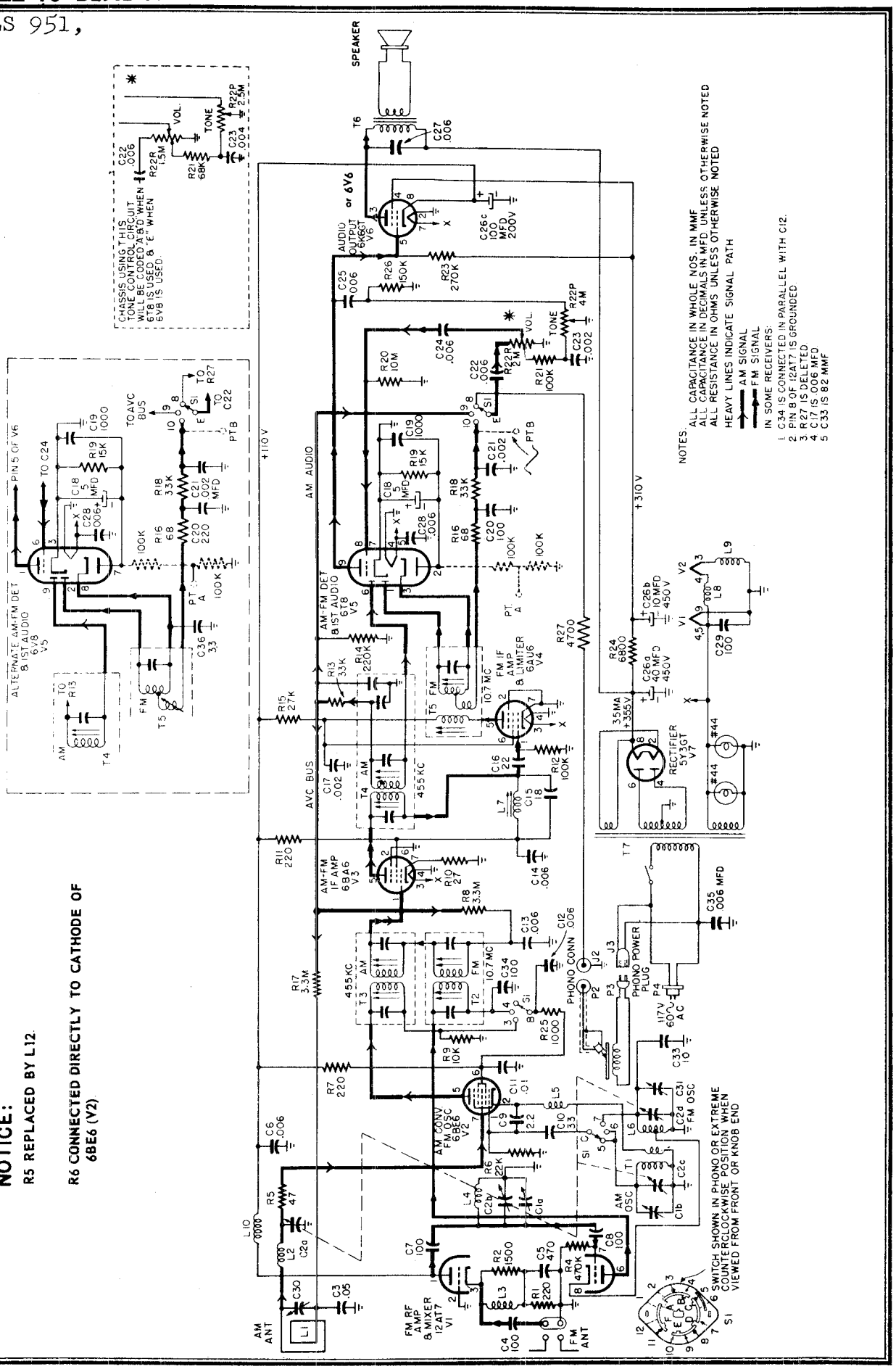
MODEL M-2, Ford Part No. 1A-18805-A1

Bendix Radio Part Number	Description
HSC-775-S-23	Nut, 1/2 x 28
HN-799-G16-E	Lock Washer, 1/4"
HC-897-S-08-6	Self Tapping Screw #6 - 1/4"
HC-897-S-08-8	Self Tapping Screw #8 - 1/4"
HC-897-S-24-8	Self Tapping Screw #8 - 3/4"
A-17028-13	Grommet for "A" Lead
L-201564-1	Escutcheon Assy. Complete
C-203458	Clutch and Gear Assy. (Tuner)
L-203683-1	Speaker Baffle Assembly
R-203684-1	Push Button Tuner & Coil Plate Assy.
R-203684-2	Pinion Shaft & Drive Assy. (Tuner)
R-203684-3	Manual Drive Shaft Assy. (Tuner)
C-204412-1	Knob - Volume and ON-OFF
C-204419-1	Knob - Tuning Control
C-204858-1	Wheel Static Collector Assy.
L-206690-1	Top Cover Assembly
L-206691-1	Bottom Cover Assembly
C-207001-1	Capacitor - Volt Regulator- Cond. Assy.
L-207070-1	Installation Kit of Parts (Includes complete set of knobs, wheel static collector assy., generator condenser, fuel g auge condenser, oil gauge condenser, ten (10)ignition suppressors, two (2) bezel plates, volt regulator cond., three (3) wing nuts and miscellaneous hardware
L-207097-1,2-3-4	Speaker Assembly
C-207746	Manual Drive Shaft (Tuner Assembly)
A-207747	Push Button Reset Screw Assembly (Tuner Assy.)
C-215521-2	Coil - Hash Choke
A-215705	Iron Core Slug (Tuner)
C 215734	R.F. Coil with Iron Core Slug
C-215739-2	Filament Choke Assembly
C-215785	Oscillator Coil with Iron Core Slug
C-215787	Antenna Coil with Iron Core Slug
C-215818-1	Image Trap Assembly (alternate C-215818-2)
C-217453-1	Transformer - Power
C-217465	Transformer - Audio Output
C-219046-2	Antenna Trimmer
C-219057	Special Trimmer Capacitor - 430-500 mmf.
C-219555-5	Sensitivity Control - 200 ohm
C-219586-2	Dual Potentiometer, Volume Tone On-Off Sw
C-220098-1	Capacitor - Paper - .003 mfd. - 600 V
C-220098-3	Capacitor - Paper - .01 mfd. - 200 V
C-220098-4	Capacitor - Paper - .02 mfd. - 200 V
C-220098-5	Capacitor - Paper - .05 mfd. - 200 V
C-220098-6	Capacitor - Paper - .1 mfd. - 400 V
C-220098-10	Capacitor - Paper - .5 mfd. - 100 V
C-220098-11	Capacitor - Paper - .002 mfd. - 600 V
C-220098-12	Capacitor - Paper - .01 mfd. - 400 V
C-220098-17	Capacitor - Paper - .004 mfd. - 1600 V
C-220099-3	Capacitor - Mica - 100 mmfd. - 20% - 500 V
C-220099-11	Capacitor - Mica - 100 mmf. - 10% - 500 V
C-220106	Capacitor - Generator - 1.0 mfd. - 200 V
C-220108-1	Capacitor - Dry Electrol - Triple - 20 mfd. 350V 20 mfd. - 25V - 10 mfd. - 300 V
C-220173	Capacitor - Special Temp. Coef - 43 mmf.
C-220183-1	Capacitor - Fuel Gauge Cond.Assy. - .0 mfd.-200V
C-220184	Capacitor - Voltage Regulator Condenser (part of C-207001-1)

MODEL M-2, Ford Part No. 1A-18805-A1

Bendix Radio Part Number	Description
C-220185	Capacitor - Oil Gauge Cond.Assy.-.5 mfd. 200 V
C-220186-3	Capacitor - Mica - 68 mmf. - 20% - 500 V
C-220551A-101M	Resistor - 100 ohm - 1/4 W - 10%
C-220551A-105M	Resistor - 1.0 megohm - 1/4 W - 20%
C-220551A-106M	Resistor - 10 megohm - 1/4 W - 20%
C-220551A-123K	Resistor - 12,000 ohm - 1/4 W - 10%
C-220551A-155M	Resistor - 1.5 meg. - 1/4 W - 20%
C-220551A-224M	Resistor - 220,000 ohm - 1/4 W - 20%
C-220551A-225M	Resistor - 2.2 megohm - 1/4 W - 20%
C-220551A-473M	Resistor - 47,000 ohm - 1/4 W - 20%
C-220551B-820M	Resistor - 82 ohm - 1/2 W - 10%
C-220551C-102K	Resistor - 1000 ohm - 1 W - 10%
C-220551C-103K	Resistor - 10,000 ohm - 1 W - 10%
C-220551C-271K	Resistor - 270 ohm - 1 W - 10%
C-220551D-183K	Resistor - 18,000 ohm - 2 W - 10%
C-220554	Suppressor Resistor - 10,000 ohm
C-221319-2	Pilot Lamp - 6 V - Mazda - Type #55
C-221613-9	Fuse - 9 amp. - SFE Fast Blow
C-222118-1-3	"A" Lead Assembly
C-222810-1	Vibrator - 115 cycles
A-223012-3	Octal Socket, Lugs 1 & 7 Gnded.
A-223012-4	Octal Socket, Lugs 1 & 4 Gnded.
A-223012-5	Octal Socket, Lugs 1, 2, 3 & 5 Gnded.
A-223012-7	Octal Socket, Lugs 1, 3 & 8 Gnded.
C-223182-2	Vibrator Socket - 4 prong
C-223183	Antenna Socket
C-223184-1	Speaker Socket
N-230182	Tuner Coil Assy. (Includes osc. & ant. coils, RF Coils, Iron Core Slugs, Capacitors, etc.)
L-230840	R.H. Support Bracket
L-230841	L.H. Support Bracket
A-233499-1-2-4	Fuse Holder Assembly (Alternate C-233775-1-2-4)
A-234668	Clip (I.F. Mtg.)
C-235233	Bezel - (Trim)
L-235234	Knob - Tone
A-238531	Spring - Tension (Manual Shaft)
C-238533	Spring - Backlash (Pointer)
A-239702	Knob Retaining Spring
A-240354	Bushing (Manual Drive)
C-241709-6	Nut 1/4 - 20
A-241710-1	Tinnerman Nut Lock (for fuse holder)
A-241736	Wing Nut
C-243223	Hash Shield
A-243398-1	Capacitor - Spark Plate
A-243398-2	Capacitor - Spark Plate
A-243399-1	Capacitor - Spark Plate Insulator
A-243399-2	Capacitor - Spark Plate Insulator
A-245602	Neoprene Torque Washer (for tuner)
A-245631	"C" Washer (for manual shaft assy.)
A-245692	Stop Washer (for manual shaft assy.)
A-245770	"C" Washer (for securing pointer)
A-245886	Serrated Washer (installation kit)
L-246968	Calibrated Dial Glass
L-246980	Sub-Dial (Black Plate)
C-249615	Pointer Arm
CH-263010-1	Iron Core (I.F. Can)
C-287055	Lamp Holder
L-291701	Transformer - L.F. - Input
L-291702-1	Transformer - I.F. - Output
C-293168-1	R.F. Coupling - 1.9 mmf. (Capacitor)

MODELS 951,
951W



MODELS 951, 951W

REPLACEMENT PARTS LIST
Models 951 & 951W

Stock No.	Symbol No.	Description
		ELECTRICAL COMPONENTS
CV0F00	C1a,b,2a,b,c,d	CAPACITOR–Variable
CP2T40	C3	CAPACITOR–Paper .05 mfd 200V
CM22A101M	C4,29	CAPACITOR–Mica 100 mmf 500V
CC9M42	C5	CAPACITOR–Ceramic 470 mmf Min 500V
CP6T20	C6,12,13,14,22,24,25,27,28	CAPACITOR–Paper .006 mfd 600V
CC9A34	C7,8	CAPACITOR–Ceramic 100 mmf 500V
CC9A14	C9	CAPACITOR–Ceramic 2.2 mmf 500V
CC8B28	C10	CAPACITOR–Ceramic 33 mmf 500V
CC9R80	C11	CAPACITOR–Ceramic .01 mfd Min 500V
CM6S16	C15	CAPACITOR–Mica 18 mmf 500V
CM22A220M	C16	CAPACITOR–Mica 22 mmf 500V
CE1T06	C18	CAPACITOR–Electrolytic 5 mfd 50V
CC9M50	C19	CAPACITOR–Ceramic 1000 mmf Min 500V
CP6T12	C17,21,23	CAPACITOR–Paper .002 mfd 600V
CM22A101M	C20	CAPACITOR–Mica 100 mmf 500V (Use only with 6T8-V5-tube)
CM22A221K	C20	CAPACITOR–Mica 220 mmf 500V (Use only with 6V8-V5-tube)
CE3A06	C26a,b,c	CAPACITOR–Electrolytic 40-450, 10-450, 100-200
CT1B06	C31	CAPACITOR–Trimmer FM
CC6B22	C33	CAPACITOR–Ceramic 10 mmf 500V N330
CC9A34	C34	CAPACITOR–Ceramic 100 mmf 500V
CP9T21	C35	CAPACITOR–Paper .0068 mfd 600V
CC9A16	C36	CAPACITOR–Ceramic 3.3 mmf 500V (Use only with 6V8-V5-tube)
RC22A221M	R1,7,11	RESISTOR–Comp 220 ohms ¼W
RC22A474M	R4	RESISTOR–Comp 470K ¼W
RC22A470M	R5	RESISTOR–Comp 47 ohms ¼W
RC22A223M	R6	RESISTOR–Comp 22K ¼W
RC22A335M	R8,17	RESISTOR–Comp 3.3 meg ¼W
RC25A103M	R9	RESISTOR–Comp 10K 2W
RC22A270K	R10	RESISTOR–Comp 27 ohms ¼W ±10%
RC22A104M	R12,21	RESISTOR–Comp 100K ¼W
RC22A333M	R13,18	RESISTOR–Comp 33K ¼W
RC22A224M	R14	RESISTOR–Comp 220K ¼W
RC23A273K	R15	RESISTOR–Comp 27K ½W +10%
RC22A680M	R16	RESISTOR–Comp 68 ohms ¼W
RC22A153M	R19	RESISTOR–Comp 15K ¼W
RC22A106M	R20	RESISTOR–Comp 10 meg ¼W
*RV4D00	R22p,r	POTENTIOMETER–Tandem 4 meg Min ¼W Tone; 2 meg ¼W Vol. with switch
RC23A274K	R23	RESISTOR–Comp 270K ½W ±10%
RC24A682M	R24	RESISTOR–Comp 6800 ohms 1W
RC22A102M	R25	RESISTOR–Comp 1000 ohms ¼W
RC22A154M	R26	RESISTOR–Comp 150K ¼W
RC22A472M	R27	RESISTOR–Comp 4700 ohms ¼W
SR3D00	S1	SWITCH–Rotary 4 Pole 3 Pos
TO0B00	T1	TRANSFORMER–Osc BC
TI0C15	T2	TRANSFORMER–1st IF Input FM
TI0C14	T3	TRANSFORMER–IF Input AM

Stock No.	Symbol No.	Description
		ELECTRICAL COMPONENTS (Continued)
TI0D27	T4	TRANSFORMER–IF Output AM
TR0R00	T5	TRANSFORMER–Ratio Detector
TA0O25	T6	TRANSFORMER–Output
TP0H03	T7	TRANSFORMER–Power
LF0A11	L2	COIL–RF Choke
LA0F02	L3,R2	COIL–Antenna FM Input
LI0F02	L4	COIL–RF FM
LF0A13	L5	COIL–RF Filament Choke 2.2 mh
LO7F01	L6	COIL–Osc FM
LI0F03	L7	COIL–2nd IF FM
LF0A00	L8,9	COIL–RF Choke Filament
LF0A12	L10	COIL–RF Choke
#44		LAMP–Bayonet Base
		MECHANICAL COMPONENTS
BT3S06		BOARD–Terminal 3 Lug 1 Mtg
BT4S05		BOARD–Terminal 4 Lug 1 Mtg
BT5S03		BOARD–Terminal 5 Lug 1 Mtg
CD0N04		CABLE–Dial 37-3/16"
CL2A08		CORD–AC Line
HC0S00		CLIP–Spring Tuning Shaft
HC0S60		CLIP–Spring Retainer Transformer Mtg
HP0D05		PLATE–Dial Back
HR0S14		RIVET–Shoulder .375 x .118
HS0C75		SPRING–Coil Dial Cord
HS6F00		SLEEVE–Spacer Flared Tuning Cap.
ID0M29		INDICATOR–Dial Metal
JR2O16	J3	JACK–Receptacle 2 Contact Phono Power
JR1S00	J2	JACK–Receptacle 1 Contact Phono Audio
MP0I00		PULLEY–Idler Fibre
SO0D05		SOCKET–Dial Lamp
SO7M16		SOCKET–Tube 7 Prong Min
SO7M17		SOCKET–Tube 7 Prong Min
SO9M01		SOCKET–Tube 9 Prong Min
SO8S07		SOCKET–Tube Octal

CABINET COMPONENTS

Stock No.	Description
AL0Z23	ANTENNA–Loop AM
BT2T01	BOARD–Terminal 2 Lug with Bracket
BZ0B39	BACK–Cabinet Cover
DS0C18	DIAL–Scale 540-1620 KC, 88-108 MC
HC0D02	CLAMP–Dial Retainer
HZ0C12	CATCH–Bullet
HZ0G01	GLIDE–Metal
HZ0H23	HINGE–Door R.H.
HZ0H24	HINGE–Door L.H.
HZ0H25	HANDLE–Door
KC0B31	KNOB–Control, Tone
KC0B32	KNOB–Control, Volume
KC0B33	KNOB–Control, Tuning
KC0B34	KNOB–Control, Bandswitch
SP1R03	SPEAKER–12" PM Round
ZW7G12	CABINET–Console Combination

*Receivers coded "D" and "E" use a 1.5 meg pot. for Volume in conjunction with a 68K resistor (R21) and a .004 mfd capacitor (C23). This 1.5 meg pot. is not a replaceable item. Please reorder by stock no. KR0T00, which includes a 2 meg pot. (R22r), a 100K resistor (R21) and a .002 mfd capacitor (C23).

Chassis Description

The C-300 chassis used in the Model T-30 is a five tube radio chassis designed for reception of AM (Broadcast band) signals. The chassis contains a single ended 50L6 Power Output amplifier in conjunction with a 5" speaker for sound reproduction. It can be operated on either AC or DC.

Parts List C-300 (T-30)

Ref. No.	Part Description	Part No.
	-Transformers-	
L101	Loop Antenna (T-30)	750219A-1
T101	Oscillator Coil	452242A-1
T102	IF Transformer	452243A-1
T103	IF Transformer	452243A-1
T104	Output Transformer part of	750220A-1
	-Resistors-	
R102	22K ½w 10%	3229A-223
R103	1 meg ½w 10%	3229A-105
R104	3.3 meg ½w 10%	3229A-335
R105	Control (Volume & Switch)	452312A-1
R106	220K ½w 10%	3229A-224
R107, R109	150 ohms ½w 10%	3229A-151
R108	1500 ohms 1w 10%	3232A-152
	Printed Circuit	452244A-1
	-Condensers-	
C101, C110	(2) 470 mmf ± 20% Ceramic	2239A-103
C102	56 mmf ± 10% Ceramic	2241A-554
C103, ABCD	Tuning Gang	650349A-1
C104	.047 mfd 200V MOPT	2246A-4730
C105	150 mmf ± 20% Ceramic	2240A-021
C106, AB	Electrolytic (a) 50 mfd 150V (b) 50 mfd 150V	650326A-1
C107	.01 mfd 600V MOPT	2248A-1030
C108	.022 mfd 600V MOPT	2244A-2230
C112	.1 mfd 600V MOPT	2244A-1040

-Miscellaneous-	
Cabinet	950090A-1
Knobs (2)	452321A-1
Back Cover	850135A-1
Speaker, PM 5"	750220A-1
Line Cord	650171A-4
Mounting Clips for IF Transformers	58514

MODEL T-30,
Ch. C-300

Alignment Instructions

Equipment required:

1. Calibrated RF Signal Generator (Signal from 455 KC to 1620KC).
2. Low Range Output Meter.

Alignment:

a. Turn set on, adjust volume to maximum.
b. See that dial pointer coincides with calibration marks at extremes of dial scale.
c. Connect output meter across the speaker voice coil.
d. Make a loop of the RF Generator leads (connect the leads together through a .01 mfd capacitor) and loosely couple to the Loop Antenna.

Step	Set RF Generator at	Set Condenser gang at	Adjust	To Obtain
1	455KC	Fully Open at some quiet point	IF Slugs T103 T102	Maximum Output
2	1620KC	1620KC	Osc. Trimmer C103D	Same
3	1500	1500	Ant. Trimmer C103B (on Loop)	Same
4	537KC	537KC	T101 Osc. Slug	Same

SPECIFICATIONS

Tube Complement:

Type	
12BE6	Oscillator-Converter
12BA6	IF Amplifier
12SQ7	Detector, AVC & 1st Aud. Amp.
50L6	Power Output
35Z5	Rectifier

Frequency Range:
AM Broadcast Band 540KC to 1620KC

Power Source:
Rating 105-125 volts, AC-DC
Power Consumption 35 watts

Loudspeaker:
Size & Type 5 inch PM
Voice Coil Impedance 3.2 ohms

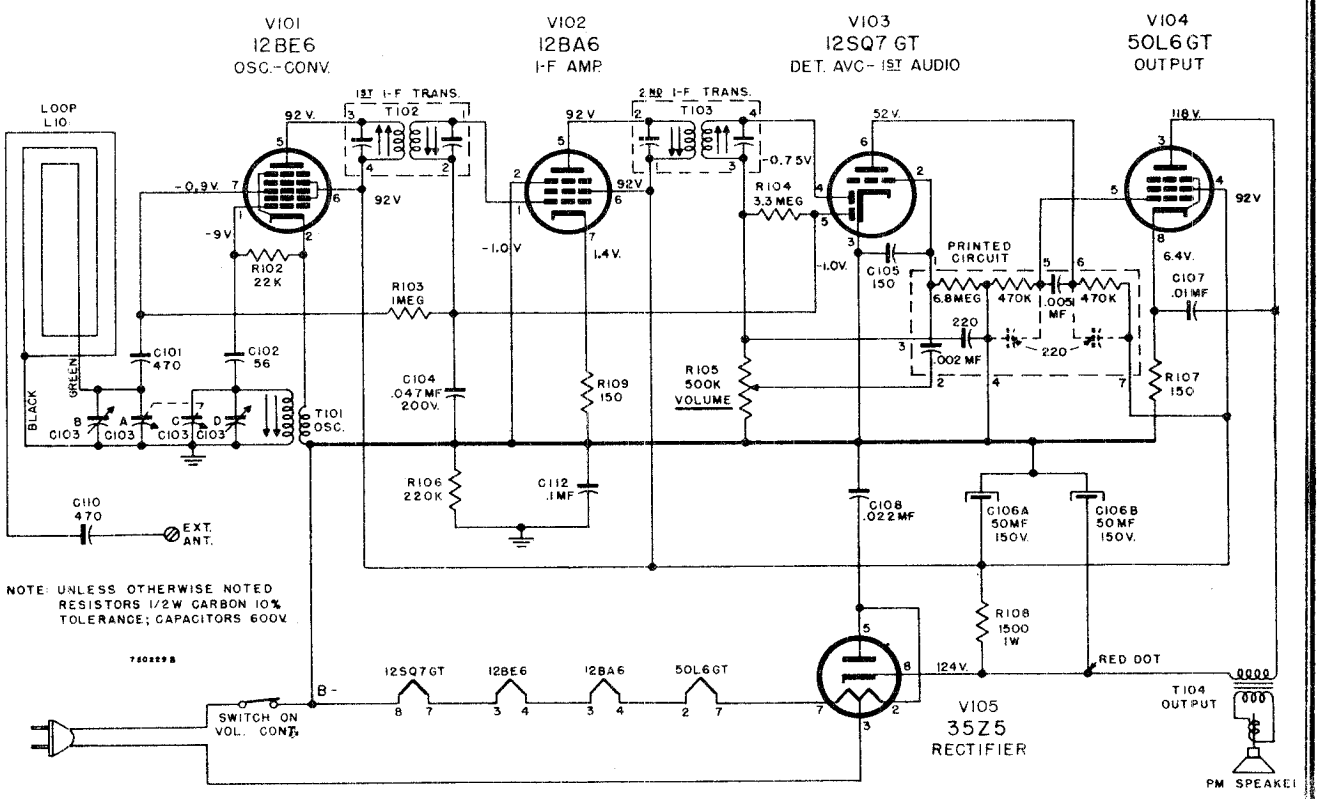
Power Output: 1.75 watts

Antenna:
Built-in Loop in rear of cabinet (Terminal on rear of cabinet for connection of outdoor aerial.)

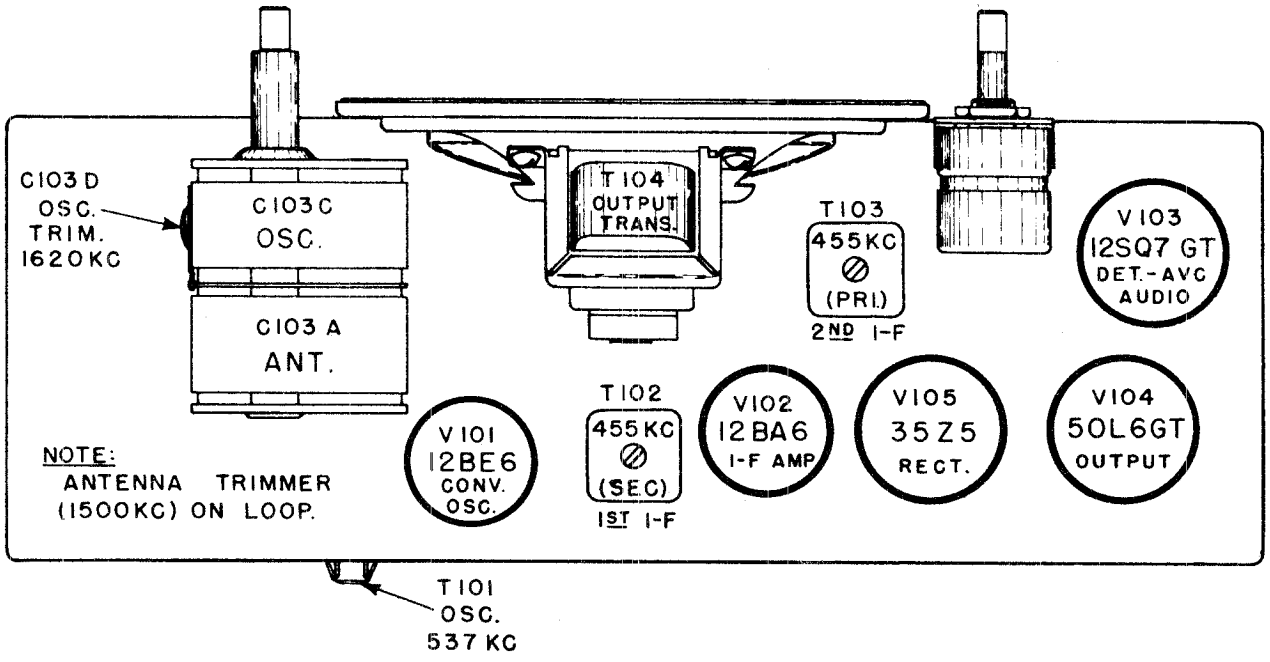
Cabinet Dimensions:
Height 6 5/8", Width 12 1/2", Depth 5 7/16".

MODEL T-30,
Ch. C-300

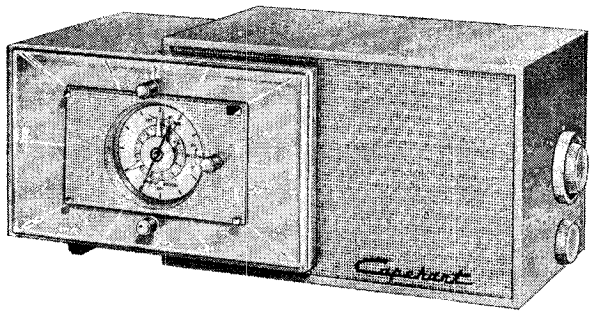
SCHEMATIC DIAGRAM



CHASSIS LAYOUT



MODEL TC-20,
Ch. C-297



MODEL TC-20

CHASSIS DESCRIPTION

The C-297 is a 5 tube radio chassis, designed for reception of AM (Broadcast Band) signals only. Since the chassis is operated in conjunction with an electric clock mechanism, it is to be operated only from an alternating current (AC) source.

The power source for the chassis is turned "on" and "off" by the Control Knob on the clock. When the Control Knob is in the **Manual** position, the radio chassis power source is on and it cannot be turned on or off automatically by the clock. When the Control Knob is in the **Off** position, the power source to the chassis is off and it cannot be turned on by the clock. However, with the Control in the Off position the power source can be turned on by adjusting the Sleep Knob for a time period up to 60 minutes and at the expiration of this time period, the power source will be turned off. (The Sleep control is a mechanical timing device which mechanically actuates the "on-off" switch which is also manually actuated by the Control Knob). When the Control Knob is in the **Wake-Up** position, the power source is off, however, it will be turned on automatically by the clock mechanism at the time to which the clock alarm is set. The function of the Sleep Knob is the same in this Control Knob position as it is in the **Off** position.

NOTE: The clock motor will be energized at all times when the line cord is connected to the power source.

SPECIFICATIONS

Tube Compliment:

Type	Purpose
12BE6	Oscillator-Converter
12BA6	I-F Amplifier
12AV6	Detector, AVC & 1st Audio Amplifier
50C5	Power Output
35W4	Rectifier

Frequency Range:

AM Broadcast Band ..... 540KC to 1620KC

Power Source:

Rating ..... 105-125 volts, 60 cycle **AC only**
Power Consumption ..... 35 watts

Appliance Outlet:

Maximum Rating ..... 1100 watts

Loudspeaker:

Size and type ..... 4 inch PM
Voice Coil Impedance ..... 3.2 ohms

Power Output:

..... 1.5 watts

Antenna:

Built-in loop in rear of cabinet
(terminal on rear of cabinet for connection of outdoor aerial.)

Cabinet Dimensions:

Height 5 7/16 inches, Width 12 3/8 inches, Depth 5 1/2 inches.

MODEL TC-20,
Ch. C-297

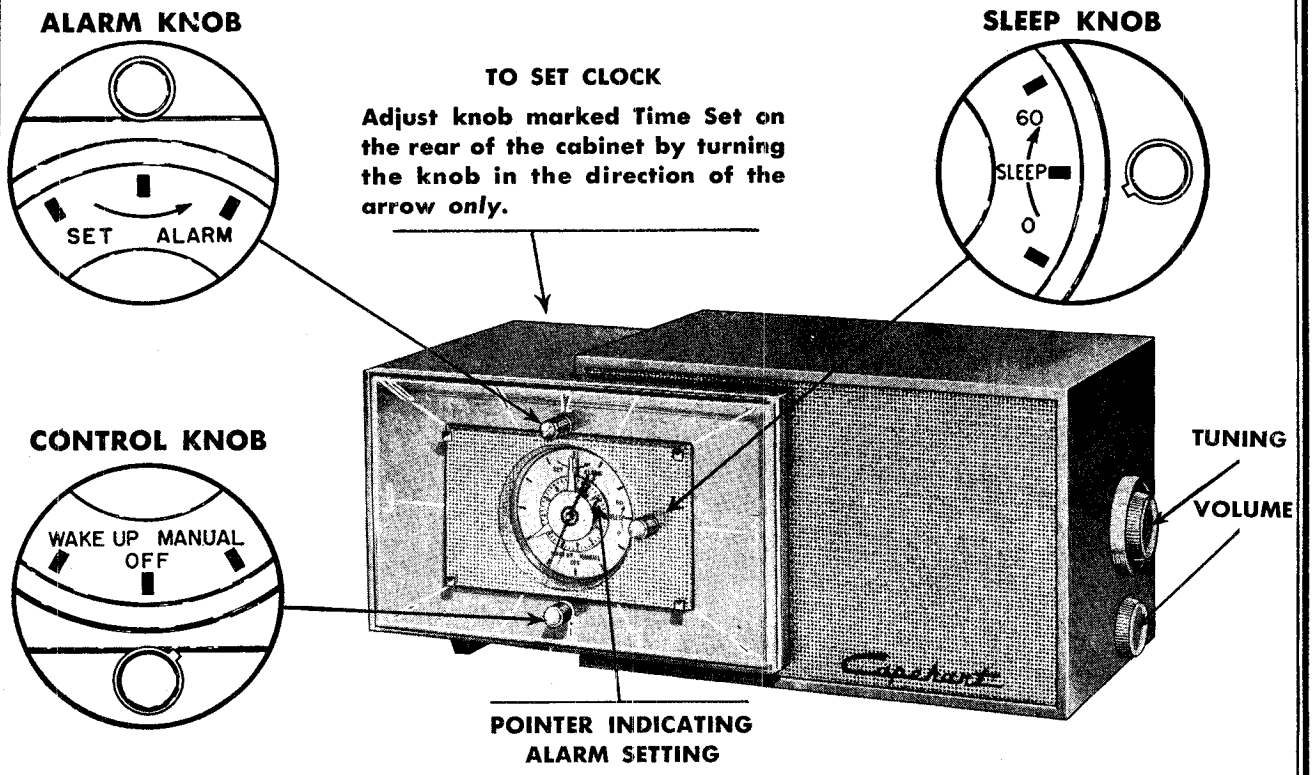
OPERATING INSTRUCTIONS

TO SET ALARM FOR EITHER AUTOMATIC RADIO OPERATION OR "BUZZER" OR COMBINATION OF BOTH

Pull out Alarm Knob and turn to the left, this motion will rotate the small disk in the center of the clock face. Set the pointer attached to the hour hand to the desired time indicated on the disk. When the Control Knob is on **Wake-Up** the radio will turn on automatically. Of course, the radio should be pre-tuned to a station and the Volume Control should be pre-set to the proper level to obtain proper automatic radio operation. If the Alarm Knob is in the out position the "buzzer" will be sounded shortly after the radio goes on.

If it is desired to have the alarm only, independent of the radio pull the Alarm Knob out and set the Control Knob to Off.

Another combination of operations is provided with the Sleep Knob, which will turn off the radio automatically at night (see "TO TURN RADIO AND APPLIANCE OFF AUTOMATICALLY") and, provided that Control Knob is in Wake-Up position, the radio will turn on automatically in the morning.



TO TURN RADIO AND APPLIANCE OFF AUTOMATICALLY

Turn the Sleep Knob to the right and if the small projection on the Sleep Knob is used as a rough indicator for a reasonable degree of accuracy can be obtained in adjusting for any period of operation up to 60 minutes. For instance, if 15 minutes of operation is desired the Sleep Knob should be adjusted approximately one-quarter of its full rotation. If it is not desired to have the radio turned on automatically in the morning, then set the Control Knob to **Off** before you set the Sleep Knob for automatic turnoff.

TO TURN ON APPLIANCE AUTOMATICALLY

Plug electrical appliance into outlet on rear of radio, set Control Knob at Wake-Up position and the appliance will be turned on at the time determined by the setting of the Alarm Knob. The radio will operate at the same time, but if radio music is not desired the Volume Knob should be turned fully to the left.

TO PLAY RADIO MANUALLY

1. Set the Control Knob to the manual position.
2. Adjust Tuning Knob for desired station.
3. Set the Volume Control for desired sound volume.

MODEL TC-20,
Ch. C-297

REMOVAL AND SERVICE OF CLOCK MECHANISM

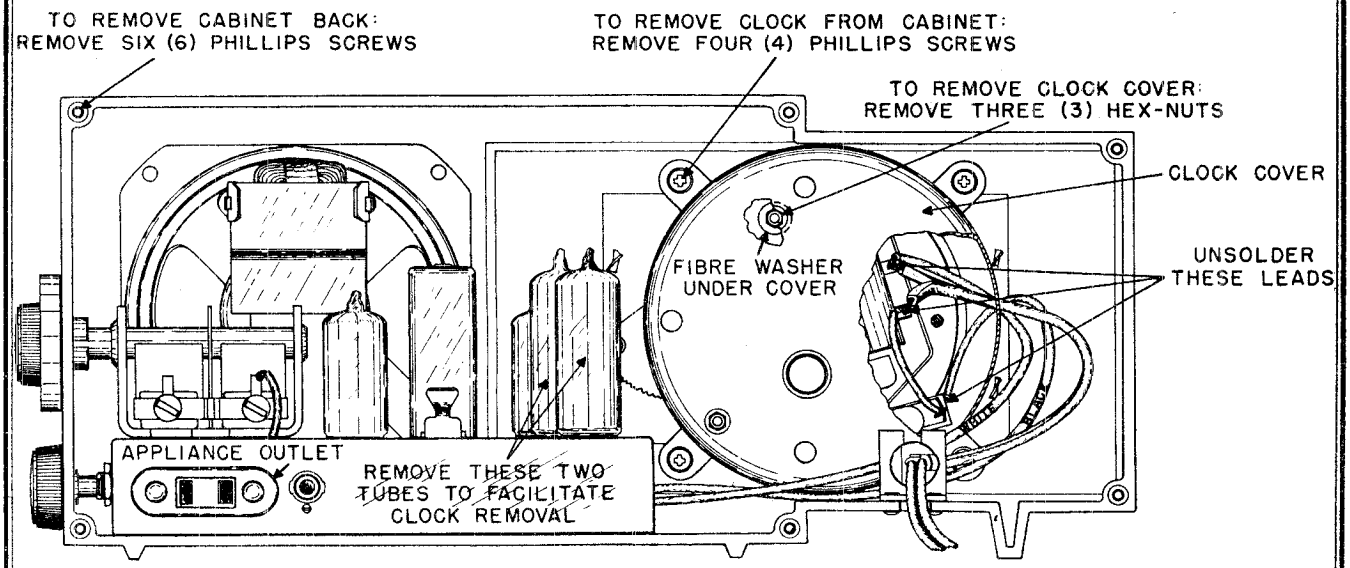
SERVICE

The clock mechanism used in this unit is not to be serviced by anyone other than an authorized Telechron Service Agency (see pages 7 and 8 of this manual for a listing of these agencies). When it is determined that the clock requires adjustment or repair, remove the clock mechanism from the cabinet (as per the following instructions) and return the clock mechanism to your Capehart distributor or an agency specified by him. If the clock mechanism is to be shipped by mail or express, be certain that it is adequately protected and properly packed.

TO REMOVE CLOCK

1. Remove (pull off) the three knobs from the front of the clock.
2. Remove the six (6) Phillips-head screws which fasten the back of the cabinet.
3. Remove the four (4) Phillips-head screws which secure the clock to the inside of the cabinet.
4. Remove the 35W4 and 50C5 tubes to facilitate removal of the clock.
5. Pull clock out of the cabinet by sliding it to the left and back.
6. Remove the three hex nuts which fasten the metal cover to the clock. Keep the metal cover and hardware (4 Phillips screws, 3 hex nuts, and 3 fibre washers) with the cabinet, do not return this material with the clock.
7. Unsolder four (4) electrical leads from the clock.

NOTE: To re-install the clock follow the above procedure in reverse.



MODEL TC-20,
Ch. C-297

ALIGNMENT INSTRUCTIONS

Equipment required:

1. Calibrated R.F. Signal Generator (Signal from 455KC to 1620KC).
2. Low Range Output Meter.

Alignment:

a. Turn set on, adjust volume to maximum.

b. See that dial pointer coincides with calibration marks at extremes of dial scale.

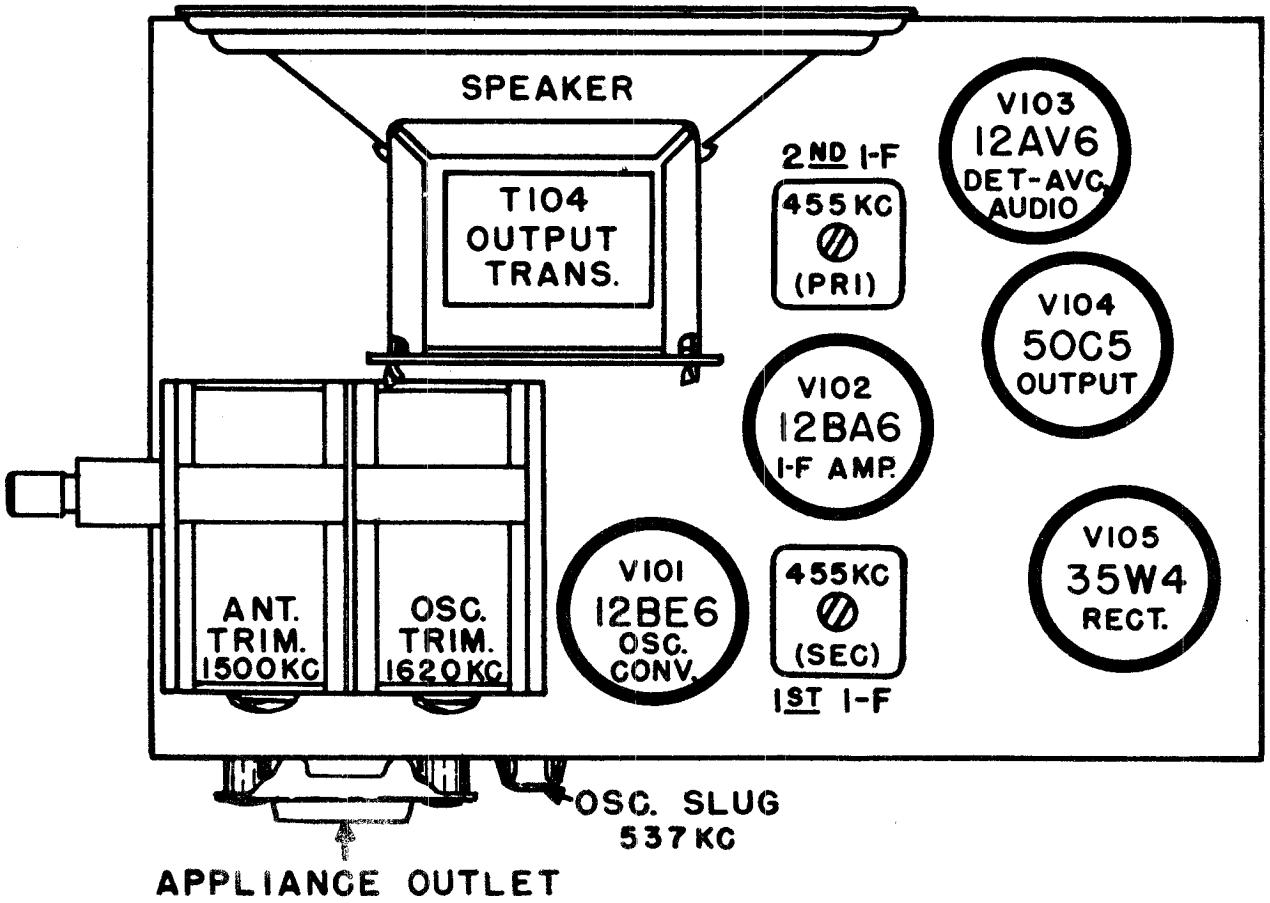
c. Connect output meter across the speaker voice coil.

d. Make a loop of the R-F Generator leads (connect the leads together through a .01mfd capacitor) and loosely couple to the Loop Antenna.

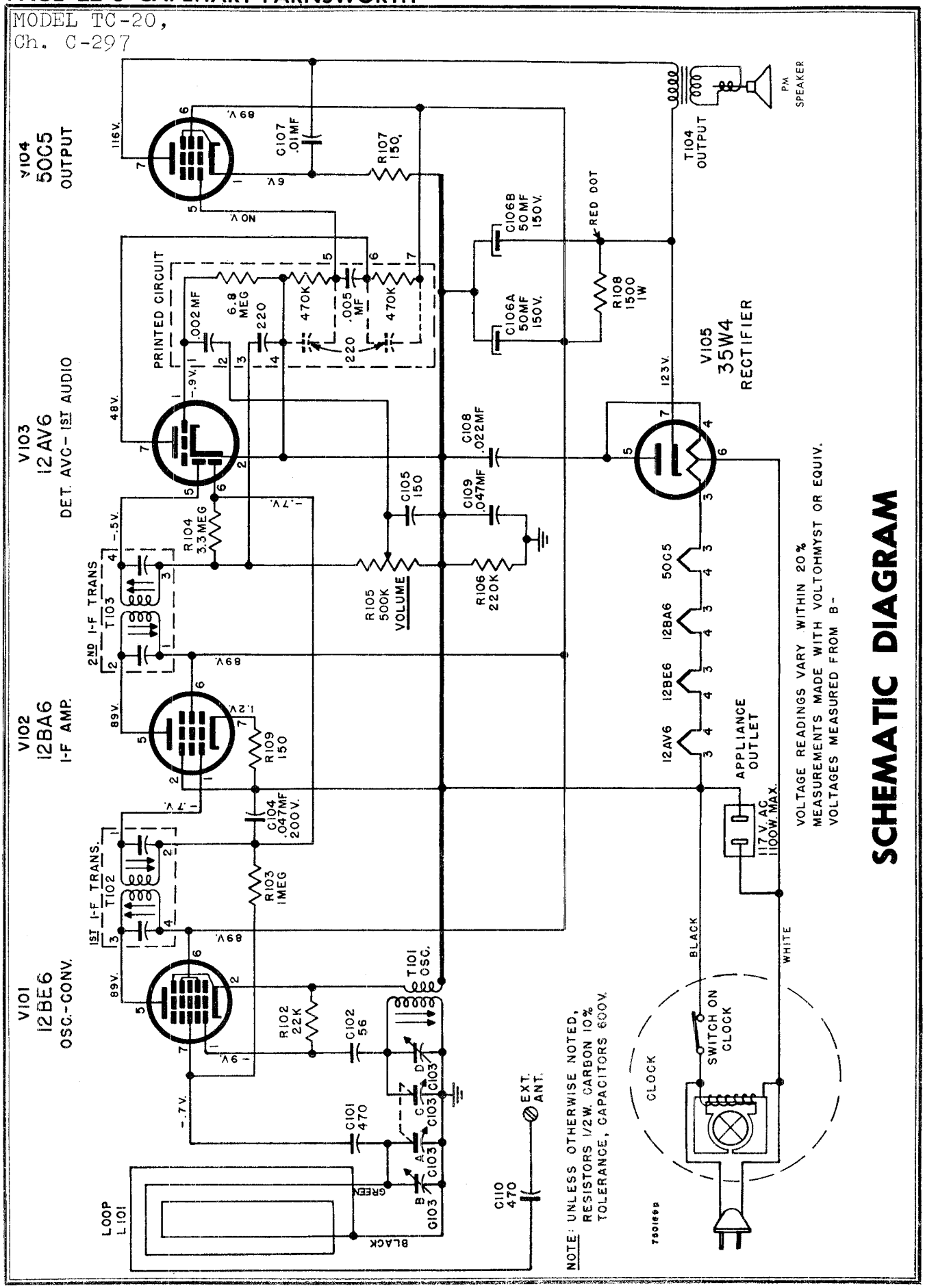
Step	Set RF Generator At	Set Condenser Gang At	Adjust	To Obtain
1	455KC	Fully Open. Disable Osc. Section of Tuning Gang	IF Slugs T103 T102	Max. Output
2	1620KC	1620KC	Osc. Trimmer C103D	Same
3	1500	1500	AF Trimmer C103D	Same
4	537KC	537KC	*T101 Osc. Slug	Same

* Adjust as Tuning Gang is Rocked

CHASSIS LAYOUT



MODEL TC-20,
Ch. C-297



MODEL TC-20,
Ch. C-297

PARTS PRICE LIST MODEL TC-20

Ref. No.	Description	Part No.
	INDUCTANCES	
L101	Loop Antenna	750207A-1
T101	Oscillator Coil	452242A-1
T102	1st IF Transformer	452243A-1
T103	2nd IF Transformer	452243A-1
T104	Output Transformer (part of assembly No. 750204A-1)	
	RESISTORS	
R102	22K, ½w, 10%	3229A-223
R103	1 meg. ½w, 10%	3229A-105
R104	3.3 meg, ½w, 10%	3229A-335
R105	500K volume control	452241A-1
R106	220K, ½w, 10%	3229A-224
R107 & R109	150 ohm, 1w, 10%	3229A-151
R108	1500 ohm, 1w, 10%	3229A-152
	Printed Circuit	452244A-1
	CAPACITORS	
C103A,B,C,D	Variable Tuning Capacitor	650327A-1
C101 & C110	470 mmf 20% Ceramic	2239A-013
C102	56 mmf 10% Ceramic	2241A-554
C104	.047 mf 200V (MOPT)	2246A-4730
C105	150 mmf 20% Ceramic	2240A-021
C106	(a. 50 mf 150V electrolytic)	
	(b. 50 mf 150V electrolytic)	650326A-1
C107	.01 mf 600V paper	2248A-1030
C108	.022 mf 600V (MOPT)	2244A-2230
C109	.047 mf 600V (MOPT)	2244A-4730
	P.M. Speaker and Output Trans. Assy.	750204A-1
	Clock Mechanism	750206A-1
	Appliance Outlet 117V AC 1100 Watts Maximum	450427A-1
	Line Cord	650171A-3
	MISCELLANEOUS	
	Cabinet Assembly	452234A-G1
	Cabinet Back	850130A-1
	Grille (speaker)	650324A-1
	Grille (clock)	650323A-1
	Capehart Insignia	452188A-2
	Escutcheon, Clock	750198A-1
	Stud Decorative	452235A-1
	Knob (dial)	650325A-1
	Pointer Hub Clamp	58549
	Knob Radio	452240A-1
	Knob Clock	452233A-1

MODELS 1005-B, 1005-M, 1005-W, Ch. C-296; 1006-B, 1006-M, 1006-W, Ch. C-287

SPECIFICATIONS

Tuning Range

AM Band 540 KC to 1620 KC

FM Band 88 mc to 108 mc

Radio IF Frequencies

AM IF 455KC

FM IF 10.7 mc

Chassis Tube Complement

Type	Description
6BA6	AM, FM RF Amplifier
6J6	AM, FM Mixer, Oscillator
6BA6	FM, AM IF Amplifier
6BA6	FM Driver
6AL5	FM Ratio Detector
6SQ7	1st Audio, AM Detector---FM AVC Clamp
6V6GT	Power Amplifier
6X5	Full Wave Rectifier

Total: 8 tube, including one rectifier.

Speaker . . . . . 12 inch PM

Audio Output . . . . . 4 watts

Power Source . . . . . 105 to 125 volts, 60 cycle AC only

ALIGNMENT INSTRUCTIONS

Equipment Required

AM (broadcast band) IF and RF Alignment

1. Calibrated RF Signal Generator (range, 455KC to 1620KC)
2. Low Range Output Meter

FM (Frequency Modulation) IF & RF Alignment

1. FM Sweep Generator (range 10.7 mc to 108.5 mc)
2. Oscilloscope
3. RF Signal Generator (range 10.7 mc to 108.5 mc)
4. Vacuum tube Voltmeter

AM Alignment (IF & RF)

a. Set Operation Selector to AM position

b. See that the dial pointer coincides with the calibration marks at the extremes of the dial scale.

c. Connect the Output Meter cable to Speaker socket on receiver.

d. Turn set on and adjust Volume to maximum.

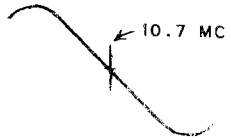
STEP	CONNECT GENERATOR	SET GENERATOR AT	SET GANG AT	ADJUST	TO OBTAIN
1	Green lead on mixer coil	455KC	fully open	T105 & T107 top & Bottom slugs	MAXIMUM OUTPUT
2	Loose Couple to loop Ant.	1620 KC	1620KC	C102E, AM Osc. coil Trimmer	
3	Same	1500KC	1500KC	C102B, Ant. Trimmer, C102C, AM Mixer coil Trimmer	
4	Same	600KC	600KC	T103, AM Mixer coil Slug	
5	Same	537KC	fully closed	T102, AM Osc. coil Slug	

MODELS 1005-B, 1005-M, 1005-W, Ch. C-296; 1006-B, 1006-M, 1006-W, Ch. C-287

FM Alignment

a. Connect the oscilloscope and FM or RF Generator as shown in the chart.
b. Set the Operation Selector in the FM position.
c. Turn the Receiver on.
d. During alignment, reduce the generator output to keep the signal just above noise level to avoid overloading.
e. For maximum signal transfer, Signal Generator should be balanced to 300 ohm FM Antenna terminal input.

IF SECTION

STEP	CONNECT FM (SWEEP) GENERATOR	SET GENERATOR AT	SET GANG AT	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	Grid 6BA6 (FM Driver) pin #1, V104	10.7 MC ± 100KC dev.	fully open	Across C127 hot lead to junction R129 C127, C130 & C134, Grd lead to chassis	Top & bottom slugs of T108	Adjust for "S" curve and centered so that the two curved portions are symmetrically spaced from the center.
2	Grid of 6BA6 (IF amp) pin #1, V103	10.7 MC ± 100KC dev.	open	Same	Top & bottom slugs of T106	Adjust for Max. Amplitude of "S" curve
3	Grid of 6J6 (Mixer) pin #5, V102A	10.7 MC ± 100KC dev.	open	Same	Top & bottom slugs of T104	 Ratio Det. "S" Curve

RF SECTION

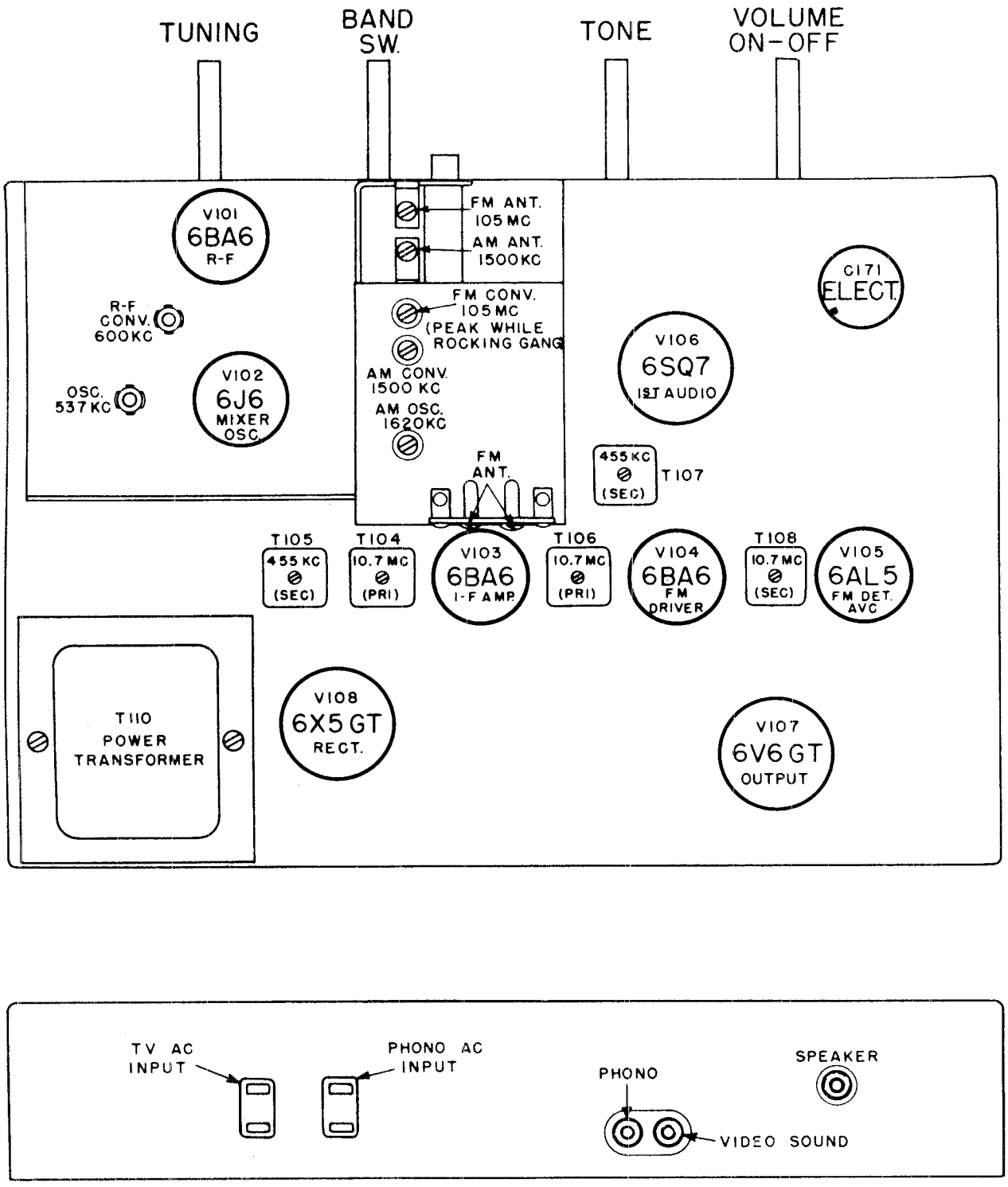
STEP	CONNECT RF GENERATOR	SET GENERATOR AT	SET POINTER OR GANG AT	ADJUST	REMARKS
1.	To FM Ant. Terminals	Modulated 106MC signal	dial point at 106 MC	*L103 osc. coil by adj. spacing of turns	For Max. Sound Output
2.	Same	Modulated 90 MC Signal	gang at 90 MC	Plates of FM tuning capacitor	Same
3.	Repeat steps 1 and 2 until signals are heard with dial pointer set to ½ a pointer's width below 90 MC and 106 MC respectively				
4.	To FM Ant. terminals	Modulated 106 MC	dial to 106 MC	C102B FM trimmer on Mix. Sec.	Max. output while rocking gang
5.	Same	Same	Same	C102A FM trimmer on Ant. section	Maximum Output
6.	Same	Same	Same	L103 (mixer)	Maximum Output
7.	Same	Same	Same	L102 FM Ant. Coil	Maximum Output

* Cement both coils on L103 after adjusting.

Check calibration of dial against known AM and FM stations.

MODELS 1005-B, 1005-M,
1005-W, Ch. C-296;
1006-B, 1006-M, 1006-W,
Ch. C-287

RADIO CHASSIS C-287 & C-296



CHASSIS
C-296, C-287

TUBE SOCKET TERMINAL VOLTAGES

Voltages measured with voltohmyst or equiv. from indicated Terminal to chassis. No signal input, all controls set for normal operation, Band Switch in AM position except where otherwise noted.

Tube No.	Tube Socket Terminal Numbers							
	#1	#2	#3	#4	#5	#6	#7	#8
V-101	-.85	0	0	6.3AC	170	90	0.7	
V-102	77	160	0	6.3AC	-1.6	-5.6* -7.5†	0	
V-103	-1.	0	0	6.3AC	170	80	0.6	
V-104	0	0	0	6.3AC	175	90	0.55	
V-105†	-.45	-.45	6.3AC	.0	0	0	-.7	
V-106	0	-.8	0	-.5	-1	87	6.3AC	0
V-107	0	0	225	180	0	87	6.3AC	9.5
V-108	0	6.3AC	205AC		205AC	0	0	240

* Reading at low frequency end of band.
† Reading at high frequency end of band.
† Band Switch in FM position.

PARTS LIST RADIO CHASSIS C-287 and C-296

- RESISTORS -

Ref. No.	Description	Part no.
R101	Carbon, 650 ohm, ½w, 10%	3229A-561
F102	Carbon, 27K, ½w, 10%	3229A-273
R103, R129	Carbon, 100 ohm ½w, 10%	3229A-101
R104	Carbon 18K ½w, 10%	3229A-183
R105	Carbon 8.2K, ½w, 10%	3229A-822
R106, R113, R118, R133, R135	Carbon 1K ½w, 10%	3229A-102
R107, R111, R112	Carbon 2.2 meg, ½w, 10%	3229A-225
R108, R127	Carbon 10 meg, ½w, 10%	3229A-106
R109	Carbon 33k, ½w, 10%	3229A-333
R110, R116, R131	Carbon 68 ohm, ½w, 10%	3229A-680
R114	Carbon 1.5K, 7w, 10%	650101A-12
R117, R132, R141	Carbon 39K, ½w, 10%	3229A-393
R120	Carbon 229K, ½w, 10%	3229A-224
R121	Carbon 330 ohm, 1w, 10%	3232A-331
R122, R134	Carbon 22k, ½w, 10%	3229A-223
R125	Carbon 100K ½w, 10%	3229A-104
R136	Carbon 330K, ½w, 10%	3229A-334
R138, R140	Carbon 470K ½w, 10%	3229A-474
R123	Control (tone) 3.2 meg.	78153
R124	Control (volume) 1.5 meg.	650290A-1

- CAPACITORS -

C101	Tuning Gang Capacitor Assembly	650278A-1
C102	Trimmer Condensers	Part of 650278A-1
C103, C107, C112, C114, C115, C117, C118, C125, C128, C129, C133, C138	Ceramic Disc 5000 mmf, 10% 500V	450469A-1
C104	Ceramic N330 56 mmf 10% 500V	2241A-554
C105	Ceramic 50 mmf 10%, 500V	25493
C106	Ceramic 4.7 mmf 10% 500V	650030A-10

MODELS 1005-B, 1005-M,
1005-W, Ch. C-296;
1006-B, 1006-M, 1006-W,
Ch. C-287

C108	Ceramic N750 100 mmf 10% 500V	2241A-766
C109	Ceramic N330 68 mmf 10% 500V	2241A-558
C110	Ceramic N750 4.7 mmf 10% 500V	650030A-12
C111	Ceramic N750 20 mmf 10% 500V	2241A-722
C113	Ceramic 240 mmf 10% 500V	25427
C116	OPT .047 mfd 20% 200V	2246A-4730
C119, C120, C126	OPT .01 mfd 20% 600V	2248A-1030
C121	Ceramic N750 33 mmf 10% 500V	2241A-337
C122, C131, C136	OPT .0033 mfd 20% 600V	2248A-3320
C127, C130	Mica 330 mmf 10% 500V	650162A-9
C132	Elect 2 mfd 50V	452132A-1
C135	OPT .022 mfd 20% 600V	2248A-2230
C134	Mica 100 mmf 10% 500V	25188
C139, C140	OPT .0047 mfd 20% 600V	2244A-4720
C142	Mica 150 mmf 10% 500V	650162A-8
C171A, C171B C171C	Elect 30 mfd 350V) Elect 20 mfd 25V)	750090B-18

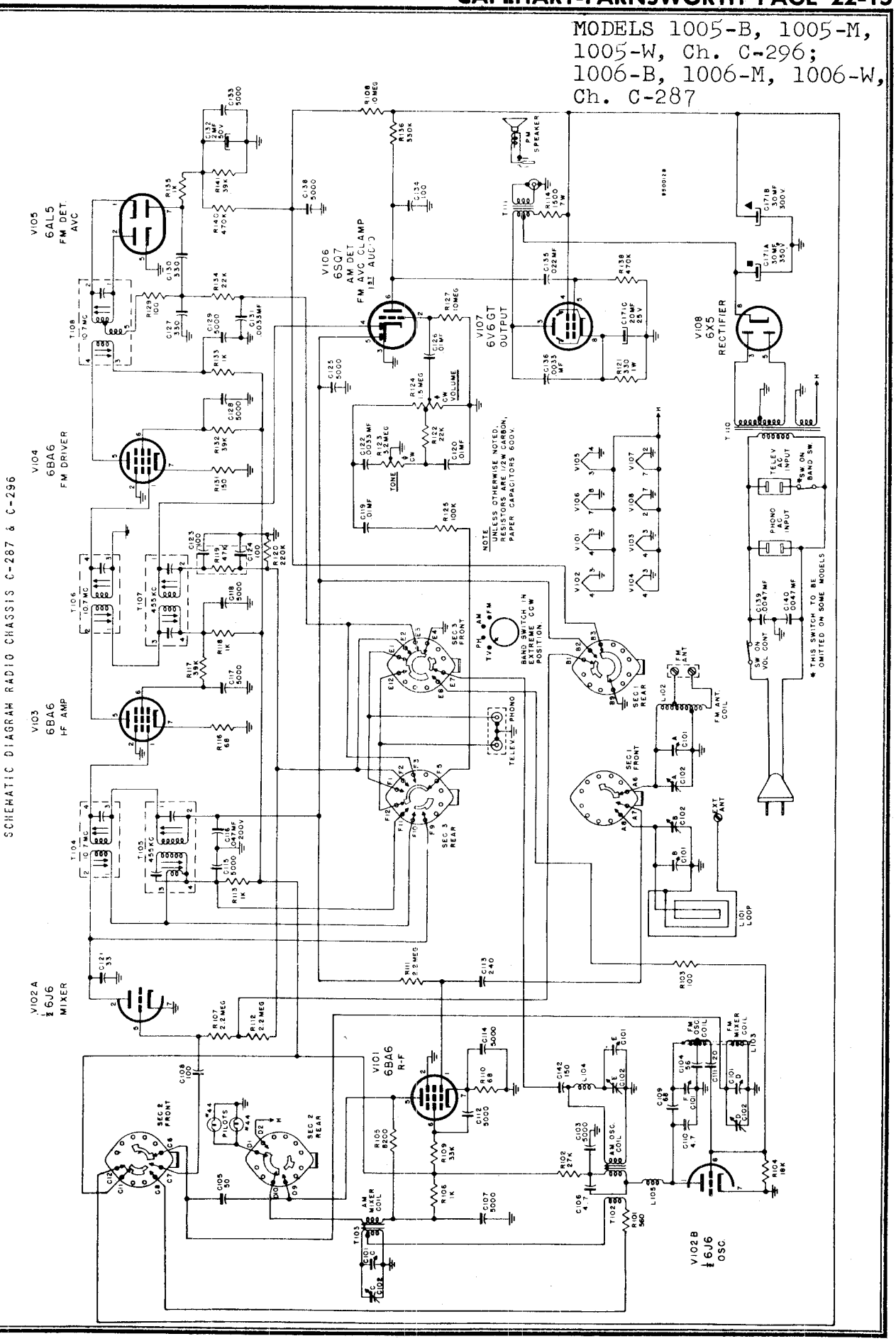
- INDUCTANCES -

T102	Am Osc Coil Assembly	452174A-1
T103	AM Mixer Coil Assembly	452175A-1
T104	Transformer, 1st FM IF	452178A-1
T105	Transformer, 1st AM IF	452176A-1
T106	Transformer, 2nd FM IF	452179A-1
T107	Transformer, 2nd AM IF	452177A-1
T108	Transformer, Ratio Detector	452028A-1
T110	Transformer, Power	750178A-1
T111	Transformer, Output	650307A-1
L102	FM Antenna Coil	452189A-1
L103	FM Mixer and Osc. Coil	452100A-1
L104, L105	RF Choke	38884

- MISCELLANEOUS -

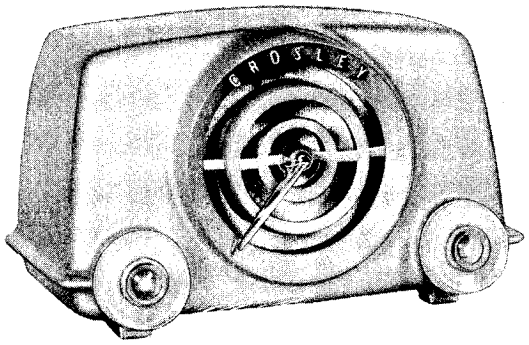
	Dial Glass, Vertical (1005)	750189A-1
	Dial Glass, Horizontal (1006)	650309A-1
	Dial Backplate	750188A-1
	Clips, Dial Mounting	452180A-1
	Pointer (Dial)	452208A-1
	Band Switch	750190A-2
L101	Loop Antenna Assembly	750194A-1
	Knob (off-on)	650186A-8
	Knob (tone)	650186A-7
	Knob (tuning)	650186A-6
	Knob (program)	650186A-5
	Speaker 12" PM	850129A-1
	Mounting Clips for IF & Detector Transformers	58514
	Printed Circuit (R119, C123, C124) Diode Filter	452171A-1

MODELS 1005-B, 1005-M, 1005-W, Ch. C-296; 1006-B, 1006-M, 1006-W, Ch. C-287



CHASSIS
10D, 10D-1

Model No.	Color
D10BE	Blue
D10CE	Chartreuse
D10GN	Green
D10TN	Tan
D10RD	Red
D10WE	White



DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

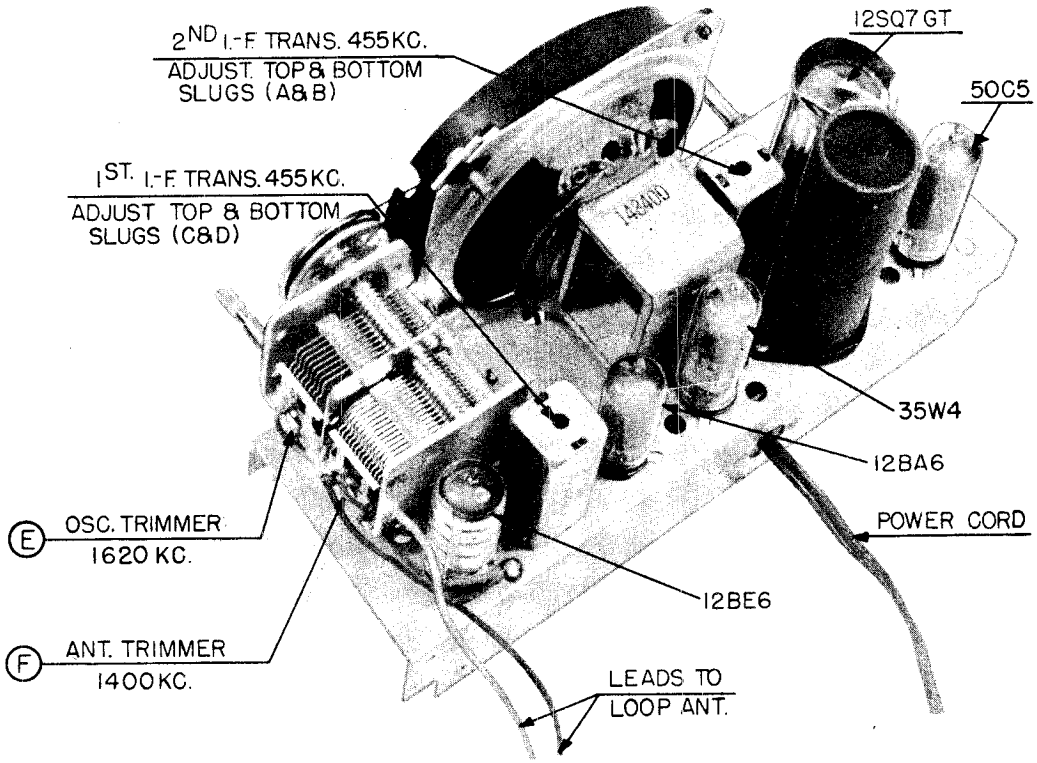
VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

POWER OUTPUT: 1.5 watts maximum.

TUBE COMPLEMENT:

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12SQ7GT	Detector, AVC, 1st. A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier



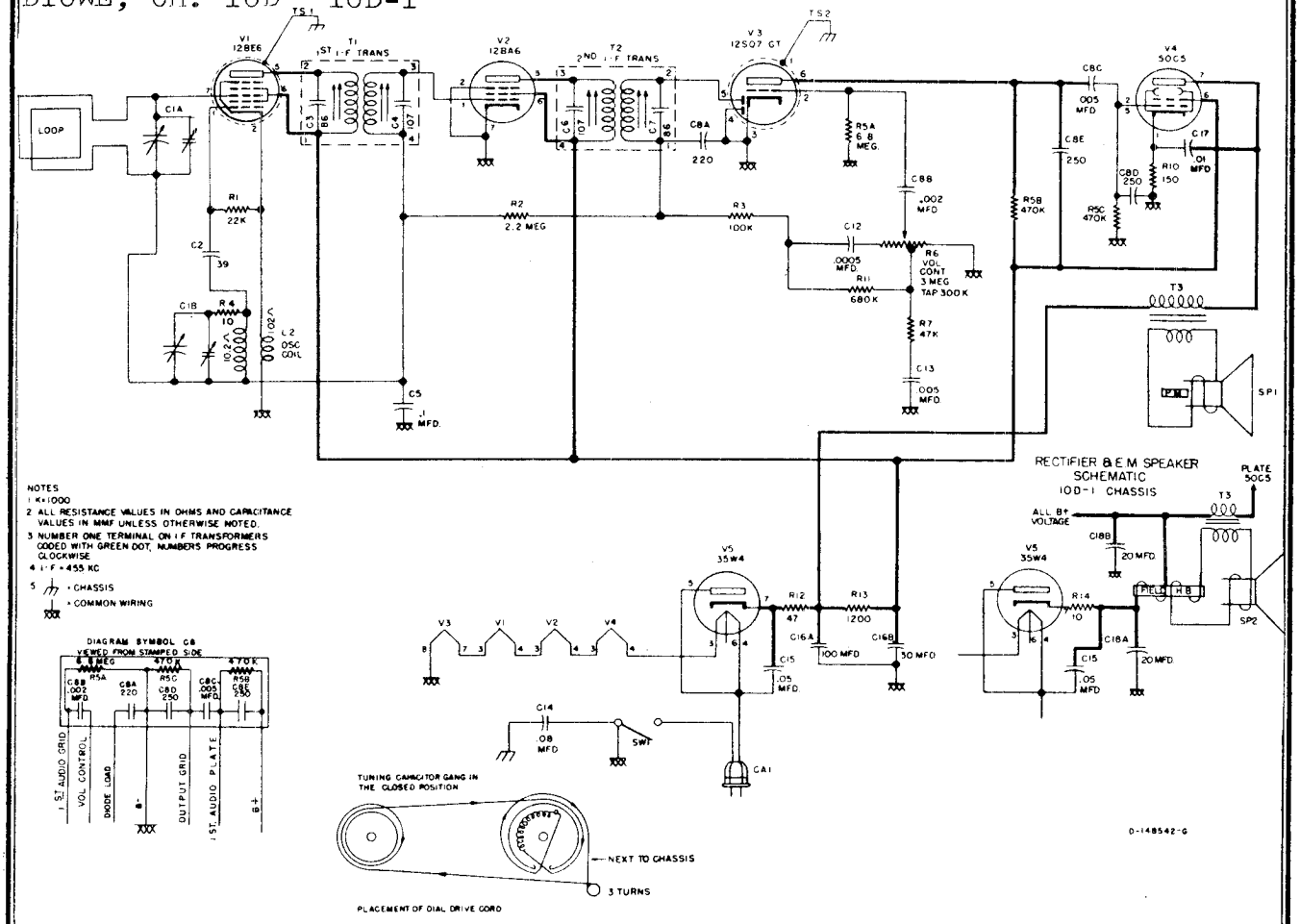
CHASSIS, TOP VIEW

When using direct current it may be necessary to reverse the position of the power plug in electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce hum.

Under no circumstances should a ground be connected to this receiver.

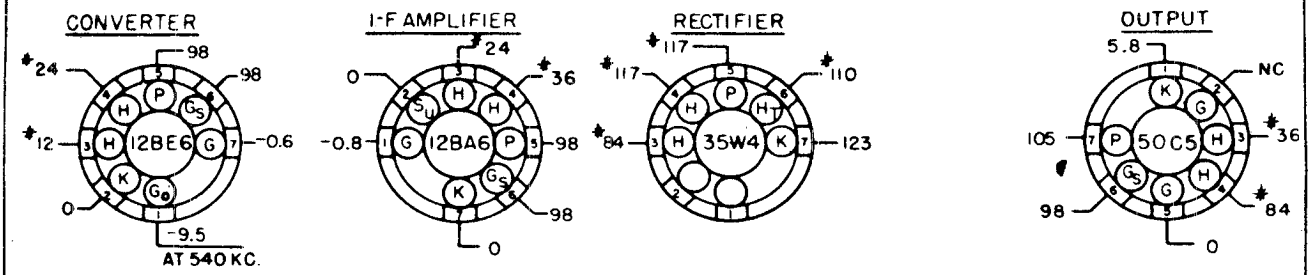
MODELS D10BE, D10CE,
D10GN, D10TN, D10RD,
D10WE, Ch. 10D, 10D-1



NOTES
1. K=1000
2. ALL RESISTANCE VALUES IN OHMS AND CAPACITANCE VALUES IN MMF UNLESS OTHERWISE NOTED.
3. NUMBER ONE TERMINAL ON I.F. TRANSFORMERS CODED WITH GREEN DOT, NUMBERS PROGRESS CLOCKWISE.
4. I.F. = 455 KC.
5. ⏚ = CHASSIS
   ⏚ = COMMON WIRING

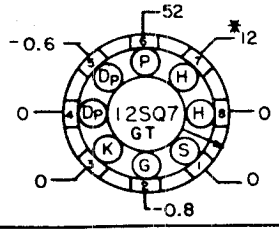
RECTIFIER & E.M. SPEAKER SCHEMATIC
10D-1 CHASSIS

SCHEMATIC DIAGRAM



NOTES.
1. BOTTOM VIEW OF TUBE SOCKETS.
2. MEASURE VOLTAGE WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO 8 - PIN 2 ON THE 12BA6.
3. LINE VOLTAGE 117 V. 60~
4. NC = NO CONNECTION.
5. ✱ = AC. VOLTAGE
6. SOCKET VOLTAGE TOLERANCE ±10%.

DET-AVC-1ST AUDIO AMPL.



SOCKET VOLTAGE CHART

ALIGNMENT PROCEDURE

MODELS D10BE, D10CE, D10GN, D10TN, D10RD, D10WE, Ch. 10D, 10D-1

1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected as indicated in the alignment chart. Connect the signal generator ground through a 0.1 mfd. condenser to B - (pin 2 on 12BA6 tube socket).
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on "CHASSIS, TOP VIEW."

Alignment Sequence	Signal Generator Output			Position of Dial pointer	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	200 mmf.	High Side of Loop	1620	A, B, C & D (See Note 1.)
2	1620	Radiated to Loop		1620	E (See Note 2.)
3	1400	Radiated to Loop		Tune to Signal	F (See Note 2.)

ALIGNMENT NOTES

1. Repeat adjustments (A, B, C & D) in sequence, until maximum output is obtained.
2. Place signal generator output lead near the loop antenna. The loop antenna must be positioned with respect to the chassis to simulate its position when chassis and loop are fastened in cabinet.

REPLACEMENT PARTS LIST

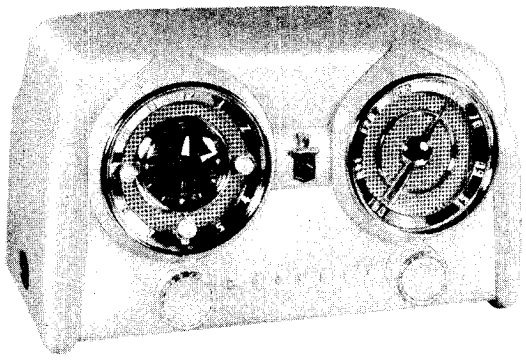
Symbol No.	Part No.	Description
C1A	B-148350	Capacitor, Variable } Two Section
C1B		Capacitor, Variable }
C2	C-137727-109	Capacitor, 39 mmf., 10%, 200 v., ceramic
C3	Part of T1	Capacitor, 86 mmf.
C4	Part of T1	Capacitor, 107 mmf.
C5	39001-19	Capacitor, .1 mfd., 600 v., paper
C6	Part of T2	Capacitor, 107 mmf.
C7	Part of T2	Capacitor, 86 mmf.
C8A	C-151550-1	Capacitor, 220 mmf., 450 v. } Capacitor-Resistor Unit
C8B		Capacitor, .002 mfd., 450 v. }
C8C		Capacitor, .005 mfd., 450 v. }
C8D		Capacitor, 220 mmf., 450 v. }
C8E		Capacitor, 220 mmf., 450 v. }
C12	39001-5	Capacitor, .005 mfd., 600 v., paper
C13	39001-11	Capacitor, .005 mfd., 600 v., paper
C14	39001-85	Capacitor, .08 mfd., 600 v., paper
C15	39001-17	Capacitor, .05 mfd., 600 v., paper
*C16A	B-148357	Capacitor, 100 mfd., 150 v. } Two Section Electrolytic
*C16B		Capacitor, 30 mfd., 150 v. }
C17	39001-13	Capacitor, .01 mfd., 600 v., paper
**C18A	B-151617	Capacitor, 20 mfd., 150 v. } Two Section Electrolytic
**C18B		Capacitor, 20 mfd., 150 v. }
R1	39373-60	Resistor, 22,000 ohm, ½ w.
R2	39373-97	Resistor, 2.2 megohm, ½ w.
R3	39373-74	Resistor, 100,000 ohm, ½ w.
R4	39373-1	Resistor, 10 ohm, ½ w.
R5A	Part of C8	Resistor, 6.8 megohm, 1/5 w.
R5B	Part of C8	Resistor, 470,000 ohm, 1/5 w.
R5C	Part of C8	Resistor, 470,000 ohm, 1/5 w.
R6	B-148327	Control, Volume (3 megohm, Tap 300,000 ohm)
R7	39373-67	Resistor, 47,000 ohm, ½ w.
R10	39373-16	Resistor, 150 ohm, ½ w.
R11	39373-90	Resistor, 680,000 ohm, ½ w.
*R12	39374-97	Resistor, 47 ohm, 10%, 1 w.
*R13	39374-114	Resistor, 1200 ohm, 10%, 1 w.
R14	39373-1	Resistor, 10 ohm, ½ w.
CA1	C142769-1	Cable & Plug Assy., Power

Symbol No.	Part No.	Description
L1	C-148399	Loop & Back Assy.
L2	AW-148259	Coil, Oscillator
*SP1	AD-148400	Speaker (4" P.M.)
**SP2	AD-151244	Speaker (4" E.M. 680 ohm)
SW1	Part of R6	Switch, Power
TS1	W-147784	Shield, Tube (V1)
TS2	W-46447-1	Shield, Tube (V3)
T1	C-139919-5	Transformer, 1st I.F.
T2	C-139919-5	Transformer, 2nd I.F.
	138131-1	Transformer, Output
	AB-152185	Baffle & Grille Cloth Assy.
	AB-152241-1	Cabinet (D10BE)
	AB-152241-4	Cabinet (D10CE)
	AB-152241-2	Cabinet (D10GN)
	AB-152241-5	Cabinet (D10TN)
	AB-152241-3	Cabinet (D10RD)
	AB-148465-1	Cabinet (D10WE)
	W-148434	Clip, I.F. Transformer Mtg.
	W-131154-1	Cotter (External), Tuning Shaft
	AB-150661	Gasket & Bushing Assy., Speaker
	W-148390-2	Grommet (3 used), chassis
	AB-152532-2	Knob (D10BE)
	AB-152532-6	Knob (D10CE)
	AB-152532-3	Knob (D10GN)
	AB-152532-5	Knob (D10TN)
	AB-152532-4	Knob (D10RD)
	AB-152532-1	Knob (D10WE)
	S-148555	Pad (Foot), Cabinet
	B-152176	Pointer, Dial
	AA-151144	Pulley & Shaft Assy., Dial Pointer
	39176-59	Screw Chassis Mtg.
	W-148379	Shaft, Tuning
	39462-2	Socket, Tube (V1, V2, V4, V5)
	W-149987	Socket, Tube (V3)
	W-51752	Spring, Drive Cord
	A-151085	Spring (Idler), Drive Cord
	W-132124	Stud (Trimount), Cabinet Back
	W-134916	Washer (Spring), Tuning Shaft

* Used on Chassis 10D, which is equipped with a P.M. speaker
** Used on Chassis 10D-1, which is equipped with an E.M. speaker.

MODELS D-25BE, D-25CE,
D-25GN, D-25MN, D-25TN,
D-25WE, Ch. 311, 311-1

Model No.	Color
D-25 WE	White
D-25 TN	Tan
D-25 CE	Chartreuse
D-25 MN	Maroon
D-25 BE	Metallic Blue
D-25 GN	Metallic Green

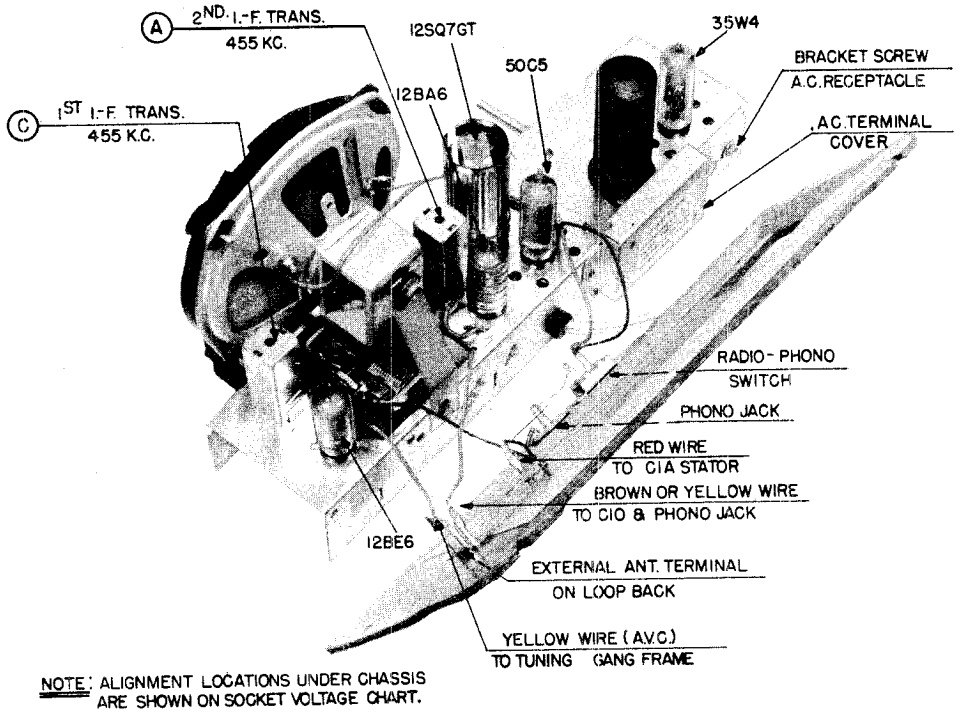


DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.
FREQUENCY RANGE: 540 to 1600 kc.
INTERMEDIATE FREQUENCY: 455 kc.
POWER SUPPLY: 60 cycle, a.c. only.
VOLTAGE RATING: 105-125 volts.
POWER OUTPUT: 1 watt maximum.
POWER CONSUMPTION:
Radio and Clock..... 35 watts
Clock ..... 2 watts

TUBE COMPLEMENT:

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12SQ7GT	Detector, AVC, 1st. A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier



NOTE: ALIGNMENT LOCATIONS UNDER CHASSIS ARE SHOWN ON SOCKET VOLTAGE CHART.

CHASSIS, TOP VIEW

MODELS D-25BE, D-25CE,
D-25GN, D-25MN, D-25TN,
D-25WE, Ch. 311, 311-1

Under no circumstances should a ground be connected to this receiver.

Phonograph connection — To use a record player with this receiver insert the pickup plug of the record player into the Phono jack on back of receiver. Then slide the Radio-Phono Switch on the back of the receiver to the "Phono" position. Connect the power cord of the record player to a convenient electric outlet of the correct voltage and frequency. Operate the record player in the normal manner. The controls of the receiver operate the same as for radio programs.

ALIGNMENT PROCEDURE

1. To remove the chassis from the cabinet, proceed as follows:

   a. Turn the tuning control completely counter-clockwise to close the gang.

   b. Remove the volume and tuning control knobs, and the dial pointer.

   c. Remove the cabinet back and loosen the screw on the terminal cover behind the electrolytic capacitor. Lift up the cover and disconnect the three leads to the clock.

   d. Connect a jumper between the terminal coded yellow and the center terminal on the terminal board.

   e. Remove the two screws in the top corners of the chassis apron that secure the chassis to the cabinet.

   f. Loosen the slotted hex head screw on the right rear of the chassis and slide the screw toward the center of the chassis to release power receptacle from opening in side of cabinet.

   g. Slide the chassis from the cabinet.

2. Connect an output meter across the speaker voice coil.

3. The r.f. signal input from the signal generator should be connected as indicated in the alignment chart. Connect the signal generator ground to the top lug on loop antenna back (See Chassis Top View, page 1).

4. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on "Chassis, Top View," and on "Socket Voltage Chart".

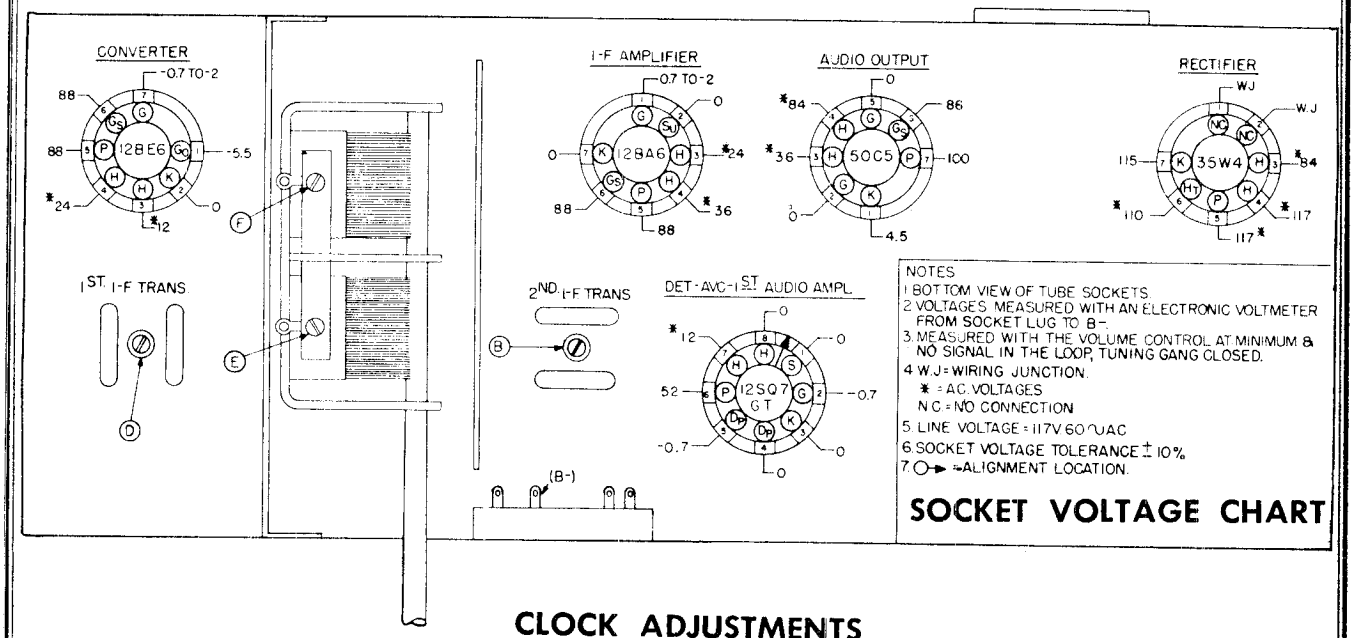
Alignment Sequence	Signal Generator Output			Position of Dial pointer	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	200 mmf.	External Ant. Screw	1620	A, B, C & D (See Note 1.)
2	1620	200 mmf.	External Ant. Screw	1620	E
3	1400	200 mmf.	External Ant. Screw	1400	F (See Note 2.)

ALIGNMENT NOTES

Repeat adjustments (A, B, C & D) in sequence, until maximum output is obtained.

After the chassis and loop antenna have been replaced in the cabinet, repeat alignment sequence "3". Adjust "F" by inserting screw driver through the hole provided in the bottom of the cabinet.

MODELS D-25BE, D-25CE,
D-25GN, D-25MN, D-25TN,
D-25WE, Ch. 311, 311-1



CLOCK ADJUSTMENTS

PROCEDURE FOR CHECKING TIMER SWITCH AND VIBRATOR:

1. With the time set knob, turn the clock hands so as to advance the time at least one (1) hour. (For ease in checking, it is recommended that the time be set to the hour.)
2. Attach test light to black and yellow switch leads.
3. Turn switch knob to "Radio" position - light must go on.
4. Turn switch knob to "Off" position - light must go out.
5. Set alarm disc so that small pointer on hour hand reads two (2) hours in advance of the time of the clock. EXAMPLE: If the clock hands are set to read 7 o'clock, set the alarm disc to read 9 o'clock.
6. Turn sleep switch to "60" - test light must go on.
7. Turn time set knob advancing clock hands to next hour - light must go out and SLEEP SWITCH SECTOR GEAR must be completely disengaged within one (1) hour plus or minus eight (8) minutes.
8. Manually push SLEEP SWITCH SECTOR GEAR in until it touches its mating pinion WITHOUT meshing - light must go on.
9. Turn switch knob to "Radio Alarm" position.
10. Turn time set knob to advance clock hands so they read 15 minutes until the next hour. Then slowly advance the hands until the test light lights, which indicates the contacts are closed. The contacts must close somewhere between 14 minutes to the hour and 4 minutes past the hour.
11. Remove test light and connect 110 volt supply to the black and red leads.
12. Turn time set knob to advance the clock hands 4 minutes - vibrator must NOT buzz. Then advance the hands 14 minutes - vibrator MUST buzz within this 14 minute period.

ADJUSTING CONTACTS:

1. Set the alarm disc so that the time indicated by the small pointer on the hour hand is different (at least 1 hour) from the time indicated by the hands of the clock. Then set switch to "Radio Alarm" position so that the TIMING CAM FOLLOWER rests on the TIMING CAM. Contacts shall be adjusted at .020" minimum gap.

2. With switch in "OFF" position contacts shall remain open as in step one and there shall be clearance between TIMING CAM FOLLOWER and TIMING CAM.

3. With switch in "Radio" position, contacts shall be closed. Check for proper contact pressure by depressing CONTACT (A), using a small pointed tool. If CONTACT (B) follows CONTACT (A), a noticeable amount before the contacts separate, the pressure is sufficient.

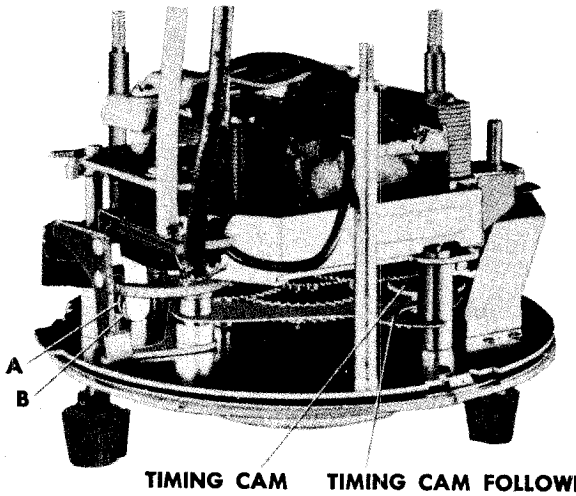
4. Set the switch to "Radio Alarm" position; pull out and turn alarm set knob counter-clockwise until the TIMING CAM FOLLOWER drops into the slot of TIMING CAM. The contacts shall be closed. Check contact pressure as previously described in step three.

5. SWITCH ARM (C) should clear CAM (D) by .008" minimum when in the "Radio Alarm" position.

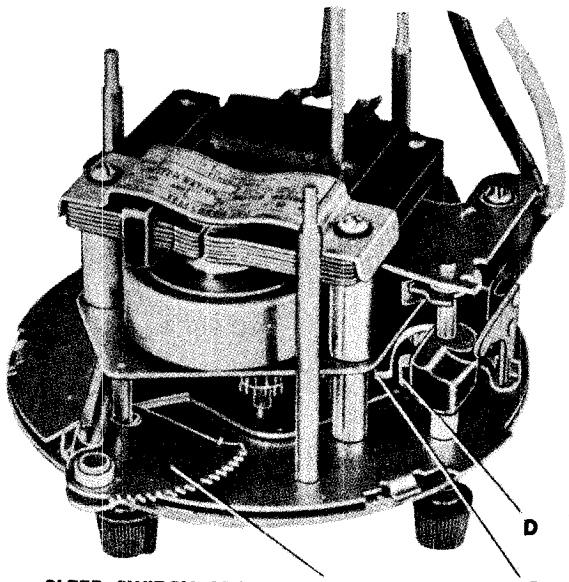
TIMING:

1. Adjust timer for contact closure at 6:55 o'clock. On repeat tests, contacts shall close at 6:55 plus or minus 3 minutes. At all other settings the contacts shall close between 12 minutes before and 2 minutes after the setting time.

2. Check time keeping for a minimum of twelve hours with power applied to the motor. Clock must be run with vibrator (buzzer) shut off.



TIMING CAM TIMING CAM FOLLOWER



SLEEP SWITCH SECTOR GEAR

VIBRATOR ADJUSTMENT:

1. Vibrator shall start buzzing 10 minutes plus or minus 5 minutes after contact closure occurs.

2. When the alarm set knob is pushed in ("shut-off" position of vibrator) the shut-off spring shall lift the vibrator sufficiently above the cam, so that the cam will not contact the vibrator in any position.

3. Adjust vibrator for good sounding position.

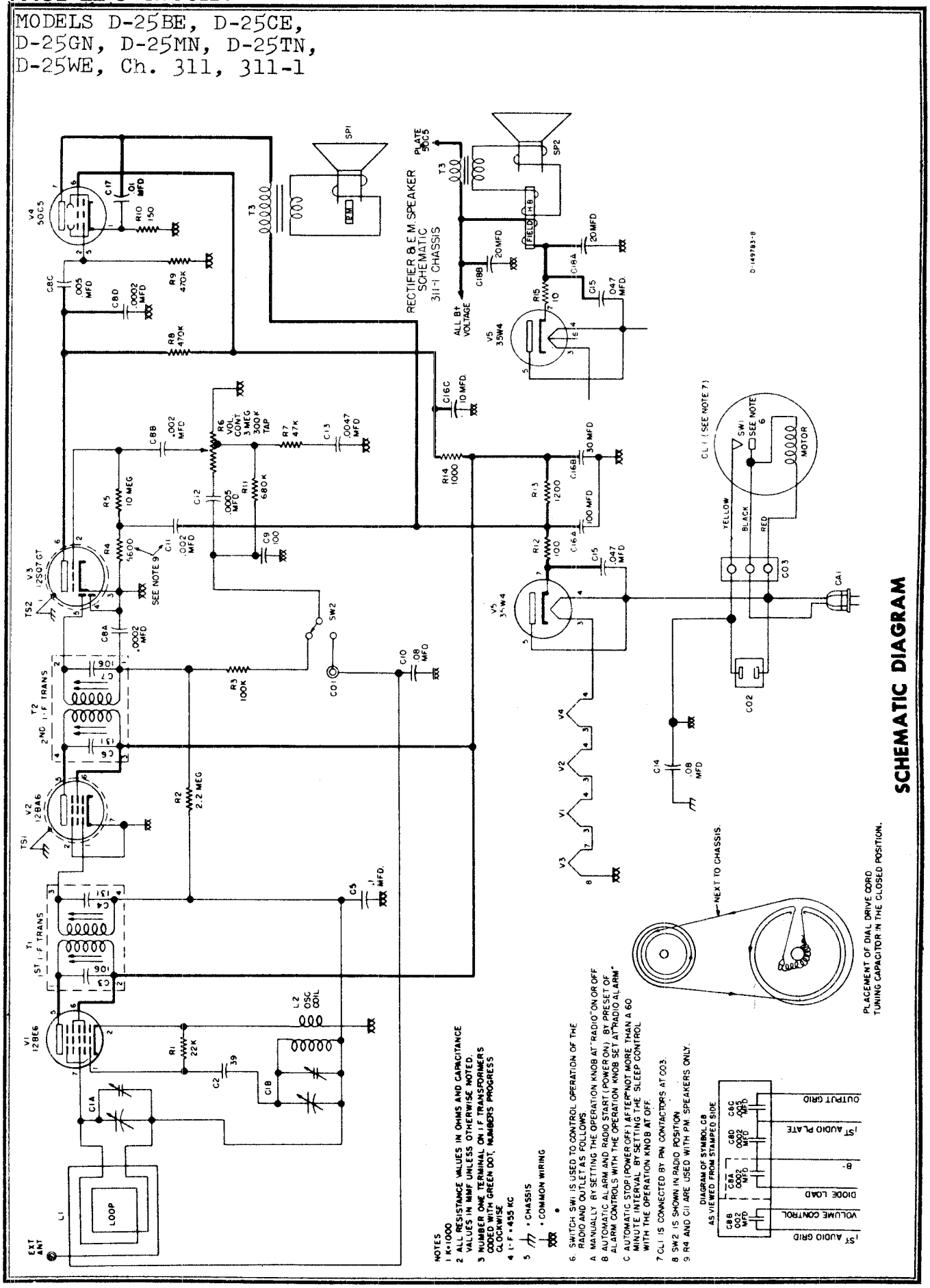
4. Vibrator shall be manually shut off before completion of buzzing period.

CLOCK LUBRICATION

1. Center stack bearing in base plate and hole in back gear pinion should be lubricated with Nye watch oil or equivalent.

2. Path of switch locating spring on bracket should be lubricated with Dixon graphite grease.

MODELS D-25BE, D-25CE,
D-25GN, D-25MN, D-25TN,
D-25WE, Ch. 311, 311-1



MODELS D-25BE, D-25CE, D-25GN, D-25MN, D-25TN, D-25WE, Ch. 311, 311-1

REPLACEMENT PARTS LIST
(Clock)

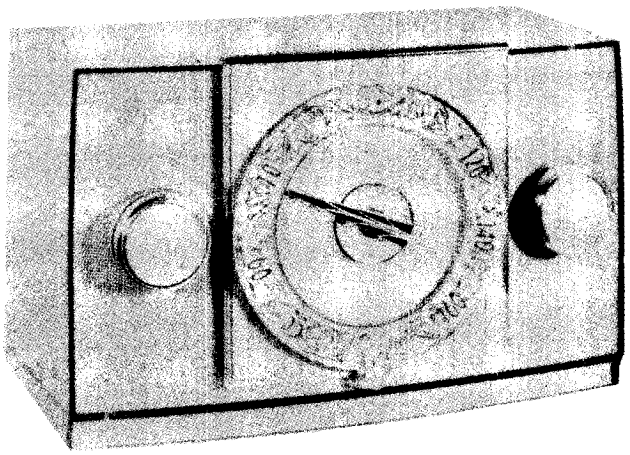
Part No.	Description	Part No.	Description
B-151389-1	Crystal, Dial	B-151389-6	Hands, Hour & Minute
B-151389-2	Rivet, Dial Crystal (3 required)	B-151389-8	Knob, Time Set (Bronze)
B-151389-3	Dial	B-151389-9	Field & Coil (60 cycle)
B-151389-4	Disc, Alarm	B-151389-10	Rotor Unit (60 cycle)
B-151389-5	Hand, Sweep Second (Gold)		

REPLACEMENT PARTS LIST

Symbol No.	Part No.	Description
C1A	B-149437	Capacitor, Variable } Two Section
C1B		Capacitor, Variable }
C2	C-137727-109	Capacitor, 39 mmf., 10%, 200 v., ceramic
C3	Part of T1	Capacitor, 106 mmf.
C4	Part of T1	Capacitor, 131 mmf.
C5	39001-19	Capacitor, .1 mfd., 600 v., paper
C6	Part of T2	Capacitor, 131 mmf.
C7	Part of T2	Capacitor, 106 mmf.
C8A	C-144675-1	Capacitor, .0002 mfd., 500 v. } Four Section disc ceramic
C8B		Capacitor, .002 mfd., 500 v. }
C8C		Capacitor, .005 mfd., 500 v. }
C8D		Capacitor, .002 mfd., 500 v. }
C9	B-143686-3	Capacitor, 100 mmf., 500 v., molded disc ceramic
C10	39001-85	Capacitor, .08 mfd., 600 v., paper
C11	39001-74	Capacitor, .002 mfd., 600 v., paper (Chassis 311)
C12	39001-5	Capacitor, .0005 mfd., 600 v., paper
C13	39477-39	Capacitor, .0047 mfd., 600 v., molded paper
C14	39001-85	Capacitor, .08 mfd., 600 v., paper
C15	39477-45	Capacitor, .047 mfd., 600 v., molded paper
C16A	B-149541	Capacitor, 100 mfd., 150 v. } Three Section Electrolytic
C16B		Capacitor, 30 mfd., 150 v. }
C16C		Capacitor, 10 mfd., 150 v. }
C17	39477-41	Capacitor, .01 mfd., 600 v., molded paper
C18A	B-151617	Capacitor, 20 mfd., 150 v. } Two Section Electrolytic (Chassis 311-1)
C18B		Capacitor, 20 mfd., 150 v. }
R1	39373-60	Resistor, 22,000 ohm, 1/2 w.
R2	39373-97	Resistor, 2.2 megohm, 1/2 w.
R3	39373-74	Resistor, 100,000 ohm, 1/2 w.
R4	39374-34	Resistor, 5600 ohm, 10%, 1/2 w. (Chassis 311)
R5	39373-107	Resistor, 10 megohm, 1/2 w.
R6	B-149382	Control, Volume (3 meg., Tap 300 K ohm)
R7	39373-67	Resistor, 47,000 ohm, 1/2 w.
R8	39373-87	Resistor, 470,000 ohm, 1/2 w.
R9	39373-87	Resistor, 470,000 ohm, 1/2 w.
R10	39373-16	Resistor, 150 ohm, 1/2 w.
R11	39373-90	Resistor, 680,000 ohm, 1/2 w.
R12	39374-189	Resistor, 100 ohm, 10%, 2 w. (Chassis 311)
R13	39374-114	Resistor, 1200 ohm, 10%, 1 w. (Chassis 311)
R14	39373-33	Resistor, 1000 ohm, 1/2 w. (Chassis 311)
R15	39373-1	Resistor, 10 ohm, 1/2 w. (Chassis 311-1)
TS1	W-147784	Shield, Tube (V2)
TS2	W-46447-1	Shield, Tube (V3)
CA1	C-149780	Cable & Plug Assy., Power
CO1	W-136998	Connector, Phono
L1	AC-149557	Loop Antenna & Back Assy.
L2	AW-148259	Coil, Oscillator
SP1	AD-145956-2	Speaker, 5 1/4" P.M. (Chassis 311)
SP2	AD-151190-2	Speaker, 5 1/4" E.M. 680 ohm (Chassis 311-1)
SW1	Part of CL1	Switch, On-Off
SW2	W-148260	Switch, Radio-Phono
CL1	AW-149689	Clock Assy.
T1	AC-139919-3	Transformer, 1st I.F.
T2	AC-139919-3	Transformer, 2nd I.F.
T3	B-147171	Transformer, Output
CO2	AB-149562	Outlet & Bracket Assy.
CO3	W-149673	Contact Strip
	W-149366	Bracket, Speaker Support
	AD-149598-1	Cabinet & Medallion Assy.(D-25WE)
	AD-149598-7	Cabinet & Medallion Assy.(D-25GN)
	AD-149598-3	Cabinet & Medallion Assy.(D-25CE)
	AD-149598-4	Cabinet & Medallion Assy.(D-25MN)
	AD-149598-8	Cabinet & Medallion Assy.(D-25BE)
	AD-149598-9	Cabinet & Medallion Assy.(D-25TN)
	W-139921	Clip, I.F. Transformer Mtg.
	W-131154-1	Cotter (External), Pointer Pulley
	B-149398	Cover, Clock
	W-147216	Cups, Suction
	B-149667-1	Escutcheon, Outlet
	D-149963-1	Escutcheon, Radio
	C-149964-1	Escutcheon, Clock
	D-149742	Gasket, Speaker
	W-149341	Gasket, Clock Dial Grille & Ring
	AC-149962-1	Grille & Ring Assy., Clock Dial(D-25WE)
	AC-149962-7	Grille & Ring Assy., Clock Dial(D-25GN)
	AC-149962-3	Grille & Ring Assy., Clock Dial(D-25CE)
	AC-149962-4	Grille & Ring Assy., Clock Dial(D-25MN)
	AC-149962-8	Grille & Ring Assy., Clock Dial(D-25BE)
	AC-149962-9	Grille & Ring Assy., Clock Dial(D-25TN)
	AB-149524-1	Grille, Radio Dial (D-25WE)
	AB-149524-7	Grille, Radio Dial (D-25GN)
	AB-149524-3	Grille, Radio Dial (D-25CE)
	AB-149524-4	Grille, Radio Dial (D-25MN)
	AB-149524-8	Grille, Radio Dial (D-25BE)
	AB-149524-9	Grille, Radio Dial (D-25TN)
	W-45580-2	Grommet (Rubber), Speaker Mtg.
	AC-149952-1	Knob, Volume-Tuning (D-25WE)
	AC-149952-7	Knob, Volume-Tuning (D-25GN)
	AC-149952-3	Knob, Volume-Tuning (D-25CE)
	AC-149952-4	Knob, Volume-Tuning (D-25MN)
	AC-149952-8	Knob, Volume-Tuning (D-25BE)
	AC-149952-9	Knob, Volume-Tuning (D-25TN)
	B-149311-1	Knob, Switch (D-25WE)
	B-149311-7	Knob, Switch (D-25GN)
	B-149311-3	Knob, Switch (D-25CE)
	B-149311-4	Knob, Switch (D-25MN)
	B-149311-8	Knob, Switch (D-25BE)
	B-149311-9	Knob, Switch (D-25TN)
	B-149339-1	Knob, Alarm Set (D-25WE)
	B-149339-7	Knob, Alarm Set (D-25GN)
	B-149339-3	Knob, Alarm Set (D-25CE)
	B-149339-4	Knob, Alarm Set (D-25MN)
	B-149339-8	Knob, Alarm Set (D-25BE)
	B-149339-9	Knob, Alarm Set (D-25TN)
	B-150140-1	Medallion (D-25WE, D-25GN, D-25MN, D-25TN)
	B-150140-2	Medallion (D-25CE, D-25BE)
	C-149621-1	Pointer, Tuning
	W-149368	Pulley, Pointer Mtg.
	W-51752	Spring, Drive Cord
	W-148469	Spring, Pointer Pulley
	39462-2	Socket, Tube (V1, V2, V4, V5)
	W-149987	Socket, Tube (V3)
	AB-149438	Support & Bushing Assy., Pointer Pulley
	W-149676	Washer (Rubber), Speaker Mtg.

MODELS 11-110U, 11-111U, 11-112U, 11-113U, 11-130U, 11-132U, Ch. 299

Model No.	Color
11-110U	White Pearl
11-111U	Malay Gray
11-112U	Horizon Gray
11-113U	Peruvian Gold
11-130U	Versailles Red
11-132U	Antique Sterling



DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

VOLTAGE RATING: 105-125 volts.

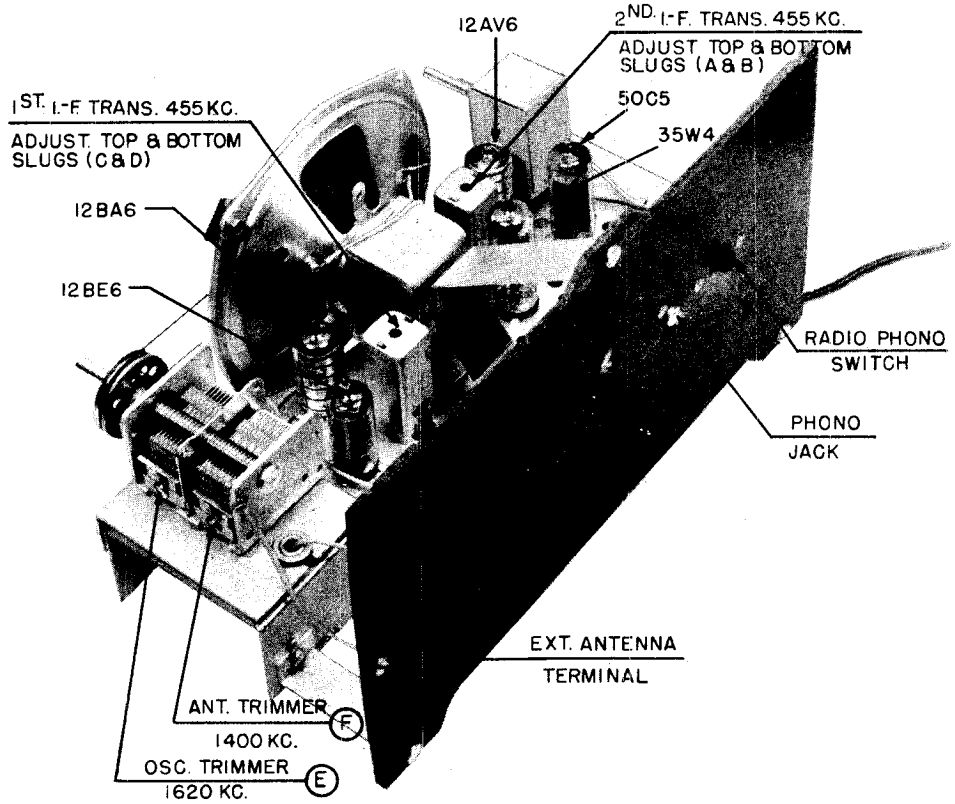
POWER CONSUMPTION: 30 watts maximum.

POWER OUTPUT: 1 watt maximum.

TUBE COMPLEMENT:

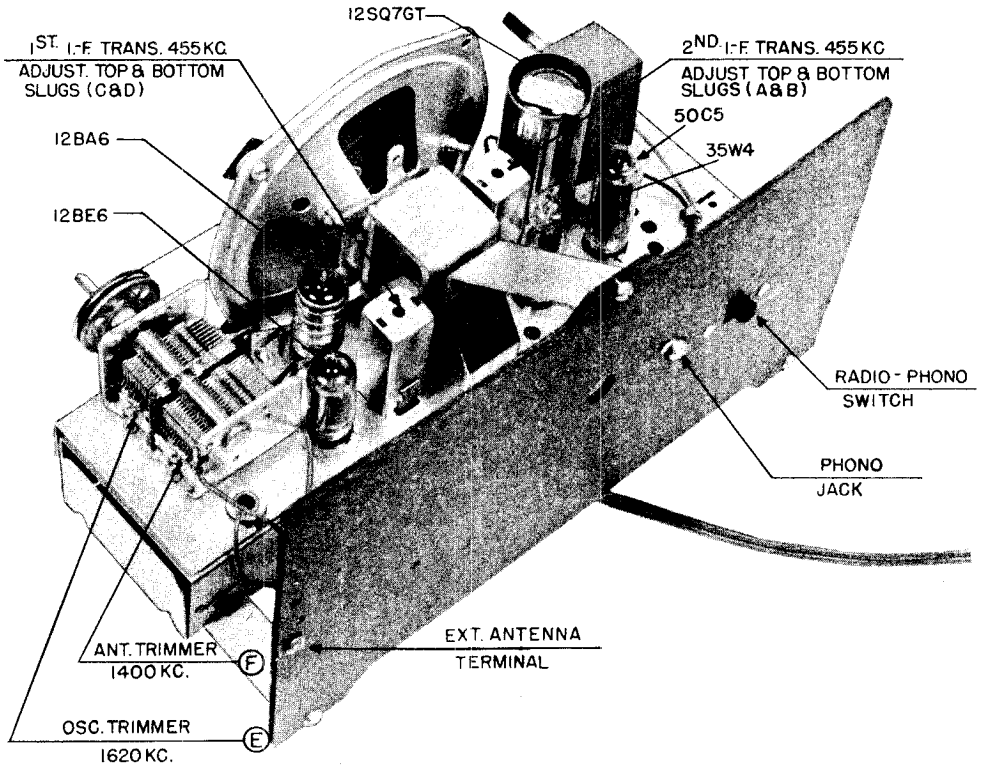
Type	Function
12BE6	Converter
12BA6	I.F. Amplifier
*12AV6	Detector, AVC, 1st A.F. Amplifier
50C5	A.F. Power Output
35W4	Rectifier

* Some sets are equipped with a 12SQ7GT tube.



CHASSIS, TOP VIEW (Sets equipped with 12AV6 Tube)

MODELS 11-110U, 11-111U, 11-112U, 11-113U, 11-130U, 11-132U, Ch. 299



CHASSIS, TOP VIEW (Sets equipped with 12SQ7GT Tube)

When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce hum.

Under no circumstances should a ground be connected to this receiver.

Phonograph connection —To use a record player with this receiver insert the pickup plug of the record player into the Phono jack on back of receiver. Then slide the Radio-Phono Switch on the back of the receiver to the "Phono" position. Connect the power cord of the record player to a convenient electric outlet of the correct voltage and frequency. Operate the record player in the normal manner. The controls of the receiver operate the same as for radio programs.

ALIGNMENT PROCEDURE

1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected as indicated in the alignment chart. Connect the signal generator ground to the top lug on loop antenna back.
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

MODELS 11-110U, 11-111U, 11-112U, 11-113U, 11-130U, 11-132U, Ch. 299

ALIGNMENT CHART

Alignment adjustment locations are shown on "CHASSIS, TOP VIEW."

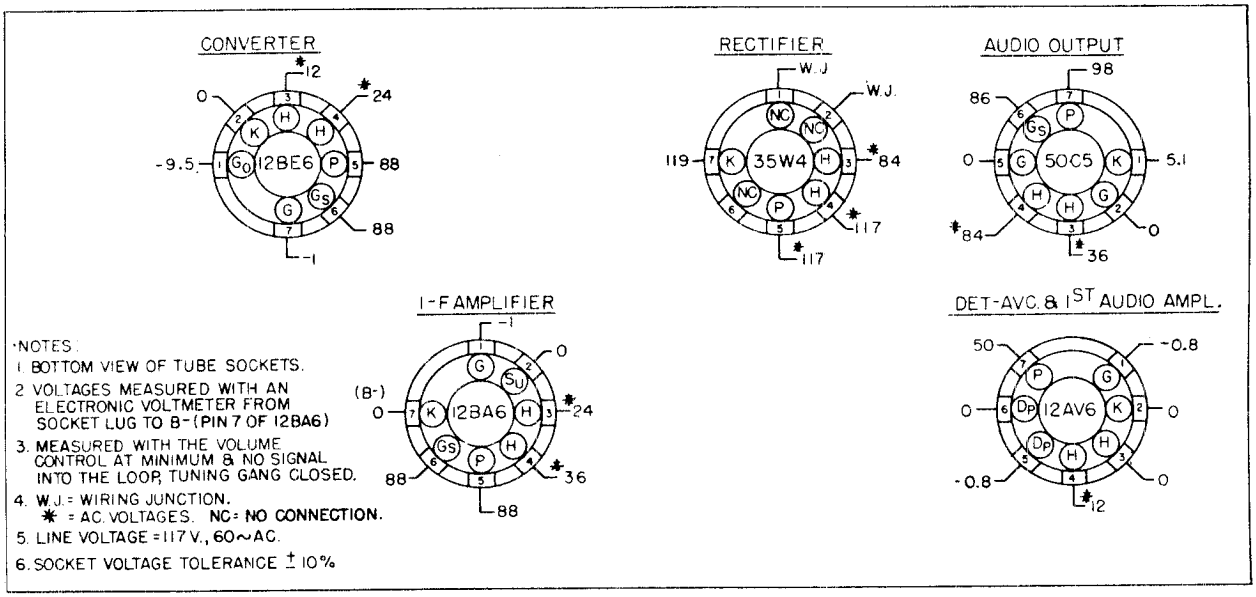
Alignment Sequence	Signal Generator Output			Position of Dial pointer	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	200 mmf.	External Ant. Screw	1620	A, B, C & D (See Note 1.)
2	1620	200 mmf.	External Ant. Screw	1620	E (See Note 2.)
3	1400	200 mmf.	External Ant. Screw	Tune to Signal	F (See Note 2.)

ALIGNMENT NOTES

1. Repeat adjustments (A, B, C & D) in sequence, until maximum output is obtained.
2. The loop antenna must be positioned with respect to the chassis to simulate its position when chassis and loop are fastened in cabinet.

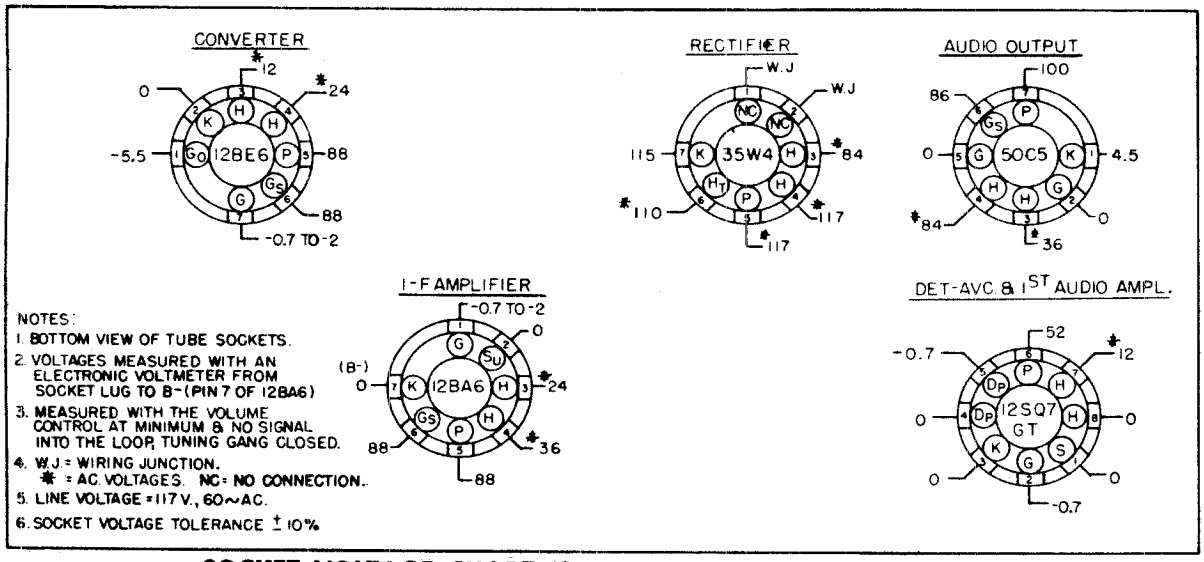
DIAL POINTER CALIBRATION

If it is necessary to calibrate the dial pointer after the chassis has been installed in the cabinet, remove the pointer and with a proper size screwdriver inserted into the screwdriver slots (notches on opposite sides at end of pointer pulley bushing), rotate clockwise or counter-clockwise as required.



SOCKET VOLTAGE CHART (Sets equipped with 12AV6 Tube)

MODELS 11-110U, 11-111U, 11-112U, 11-113U, 11-130U, 11-132U, Ch. 299



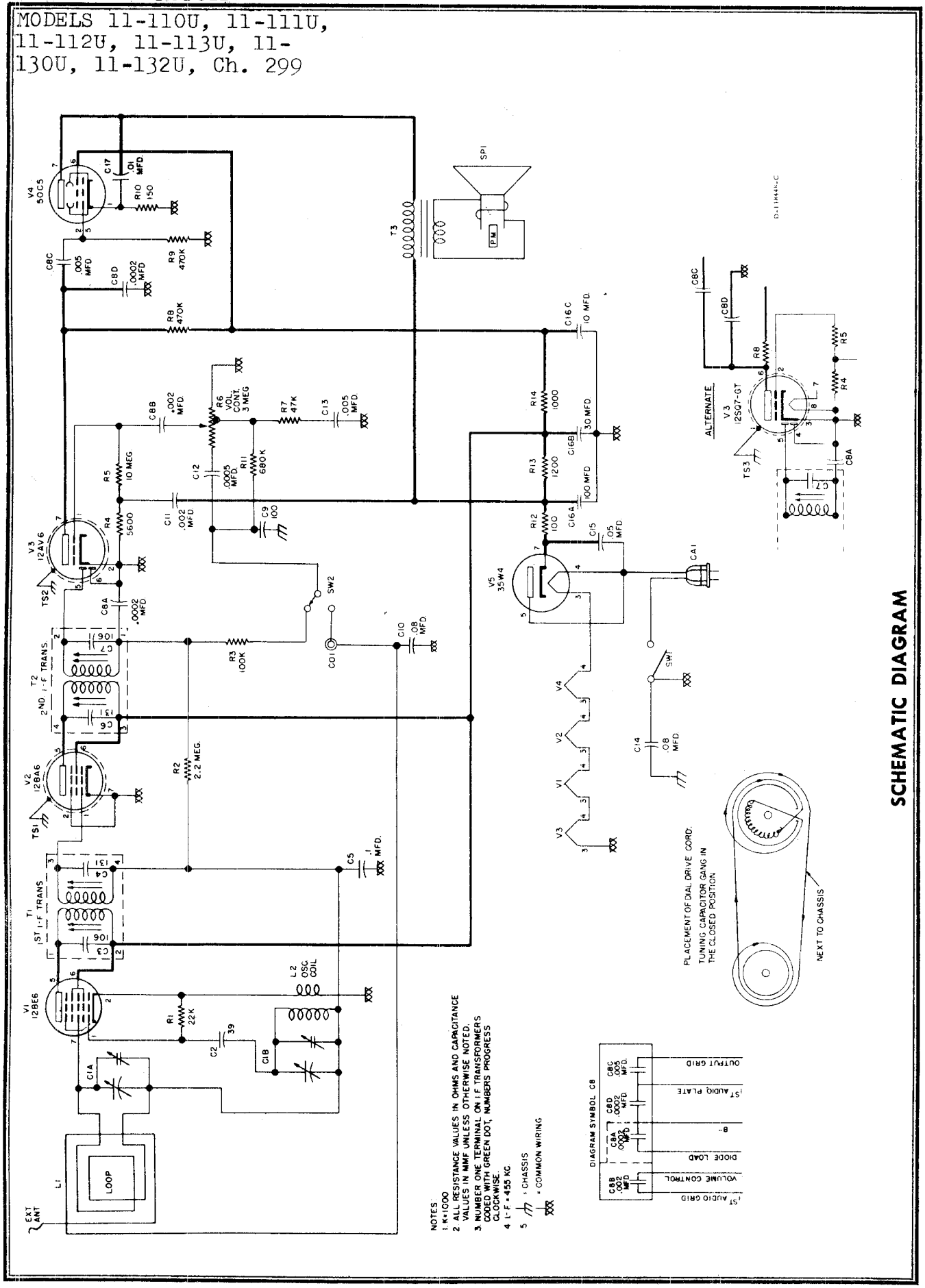
SOCKET VOLTAGE CHART (Sets equipped with 12SQ7GT Tube)

REPLACEMENT PARTS LIST

Symbol No.	Part No.	Description
C1A	B-147924	Capacitor, Variable } Two Section
C1B		Capacitor, Variable }
C2	C-137727-109	Capacitor, 39 mmf., 10%, 200 v., ceramic
C3	Part of T1	Capacitor, 106 mmf.
C4	Part of T1	Capacitor, 131 mmf.
C5	39001-19	Capacitor, .1 mfd., 600 v., paper
C6	Part of T2	Capacitor, 131 mmf.
C7	Part of T2	Capacitor, 106 mmf.
C8A	C-144675-1	Capacitor, .0002 mfd., 500 v. } Four Section disc ceramic
C8B		Capacitor, .002 mfd., 500 v. }
C8C		Capacitor, .005 mfd., 500 v. }
C8D		Capacitor, .0002 mfd., 500 v. }
C9	B-143686-3	Capacitor, 100 mmf., 500 v., Molded disc ceramic
C10	39001-85	Capacitor, .08 mfd., 600 v., paper
C11	39001-74	Capacitor, .002 mfd., 600 v., paper
C12	39001-5	Capacitor, .0005 mfd., 600 v., paper
C13	39001-11	Capacitor, .005 mfd., 600 v., paper
C14	39001-85	Capacitor, .08 mfd., 600 v., paper
C15	39001-17	Capacitor, .05 mfd., 600 v., paper
C16A	B-147174	Capacitor, 100 mfd., 150 v. } Three Section Electrolytic
C16B		Capacitor, 30 mfd., 150 v. }
C16C		Capacitor, 10 mfd., 150 v. }
C17	39001-13	Capacitor, .01 mfd., 600 v., paper
R1	39373-60	Resistor, 22,000 ohm, 1/2 w.
R2	39373-97	Resistor, 2.2 megohm, 1/2 w.
R3	39373-74	Resistor, 100,000 ohm, 1/2 w.
R4	39374-34	Resistor, 5600 ohm, 10%, 1/2 w.
R5	39373-107	Resistor, 10 megohm, 1/2 w.
R6	B-147945	Control, Volume (3 megohm)
R7	39373-67	Resistor, 47,000 ohm, 1/2 w.
R8	39373-87	Resistor, 470,000 ohm, 1/2 w.
R9	39373-87	Resistor, 470,000 ohm, 1/2 w.
R10	39373-16	Resistor, 150 ohm, 1/2 w.
R11	39373-90	Resistor, 680,000 ohm, 1/2 w.
R12	39374-189	Resistor, 100 ohm, 10%, 2 w.
R13	39374-114	Resistor, 1200 ohm, 10%, 1 w.
R14	39373-33	Resistor, 1000 ohm, 1/2 w.
CA1	C132300-2	Cable & Plug Assy., Power
CO1	W-136998	Connector, Phono
L1	AC-147963	Loop & Back Assy.
L2	AW-148259	Coil, Oscillator
SP1	AD-145956-2	Speaker (5-1/4" P.M.)
SW1	Part of R6	Switch, Power
SW2	W-148260	Switch, Phono
T1	AC-139919-3	Transformer, 1st I.F.
T2	AC-139919-3	Transformer, 2nd I.F.

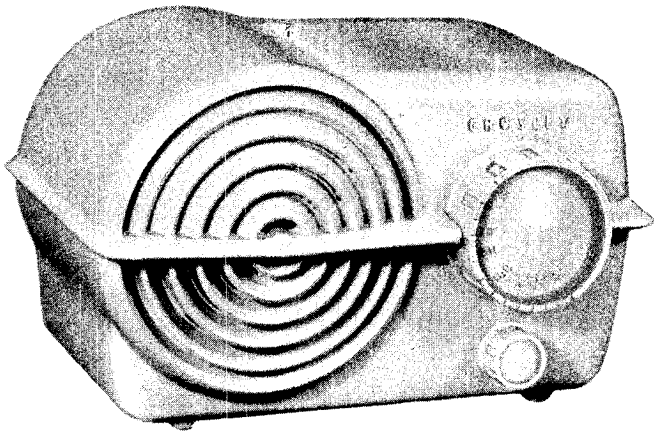
Symbol No.	Part No.	Description
T3	B-147171	Transformer, Output
TS1	W-147784	Shield, Tube (V2)
TS2	W-147784	Shield, Tube (V3)
TS3	W-46447-1	Shield, Tube (V3), sets equipped with 12SQ7GT tube
	C-147934	Bottom, Chassis
	W-147967	Bracket, Back Mtg.
	R-147922-1	Cabinet (11-110U)
	R-147922-2	Cabinet (11-111U)
	R-147922-3	Cabinet (11-112U)
	R-147922-4	Cabinet (110113U)
	R-147922-5	Cabinet (11-130U)
	R-147922-6	Cabinet (11-132U)
	W-139921	Clip, I.F. Transformer Mtg.
	W-131154-1	Cotter (External), Pointer Pulley
	D-148377-1	Escutcheon (11-110U)
	D-148377-2	Escutcheon (11-111U)
	D-148377-3	Escutcheon (11-112U)
	D-148377-4	Escutcheon (11-113U)
	D-148377-5	Escutcheon (11-130U)
	D-148377-6	Escutcheon (11-132U)
	B-147160	Gasket, Speaker
	B-147923	Gasket, Grille Cloth & Screen Assy.
	AB-147981-1	Grille Cloth & Screen Assy. (11-110U, 11-111U, 11-113U)
	AB-147981-2	Grille Cloth & Screen Assy. (11-112U, 11-130U)
	AB-147981-3	Grille Cloth & Screen Assy. (11-132U)
	AC-148277-1	Knob (11-110U)
	AC-148277-2	Knob (11-111U)
	AC-148277-3	Knob (11-112U)
	AC-148277-4	Knob (11-113U)
	AC-148277-5	Knob (11-130U)
	AC-148277-6	Knob (11-132U)
	W-147275	Mounting, Rubber (2 used)
	W-45580-2	Mounting, Rubber (4 used)
	B-94704-20	Nut (Push-On), Escutcheon
	C-147913	Pointer, Dial
	W-147929	Pulley, Dial Pointer
	39462-2	Socket, Tube
	W-149987	Socket, Tube (V3), sets equipped with 12SQ7GT tube
	W-49829	Spring (Lock), Pointer Pulley
	W-51752	Spring, Drive Cord
	W-136630	Stud (Trimount), Chassis Bottom
	AW-148203	Support & Bushing Assy., Pointer Pulley
	B-147968	Support, Speaker

MODELS 11-110U, 11-111U, 11-112U, 11-113U, 11-130U, 11-132U, Ch. 299



MODELS 11-114U, 11-115U, 11-116U, 11-117U, 11-118U, 11-119U, Ch. 330, 330-1

Model No.	Color
11-114U	India Ivory
11-115U	Firebird Red
11-116U	Mist Gray
11-117U	Gulf Green
11-118U	Bahama Beige
11-119U	Smoke Blue



DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

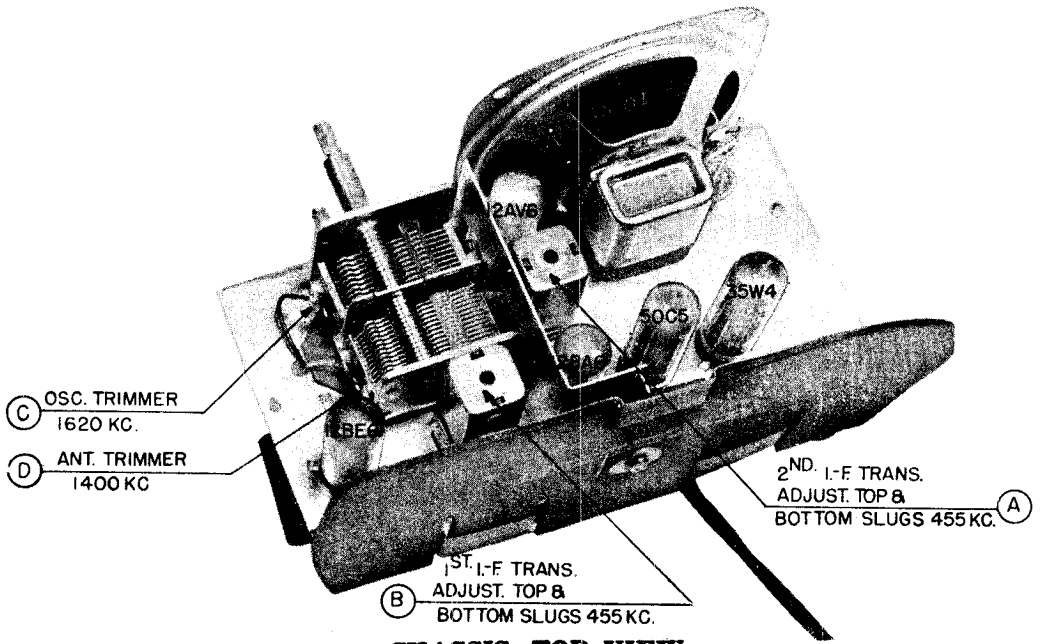
VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

POWER OUTPUT: 1.5 watts maximum.

TUBE COMPLEMENT:

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12AV6	Detector, AVC, 1st. A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier



CHASSIS, TOP VIEW

MODELS 11-114U, 11-115U,
11-116U, 11-117U, 11-118U,
11-119U, Ch. 330, 330-1

ALIGNMENT CHART

Alignment adjustment locations are shown on "CHASSIS, TOP VIEW."

Alignment Sequence	Signal Generator Output			Position of Dial pointer	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	200 mmf.	High Side of Loop	1620	A & B (See Note 1.)
2	1620	Radiated to Loop		1620	C (See Note 2.)
3	1400	Radiated to Loop		Tune to Signal	D (See Note 2.)

ALIGNMENT NOTES.

1. Repeat adjustments (A & B) until maximum output is obtained.
2. Place signal generator output lead near the loop antenna.

When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce hum.

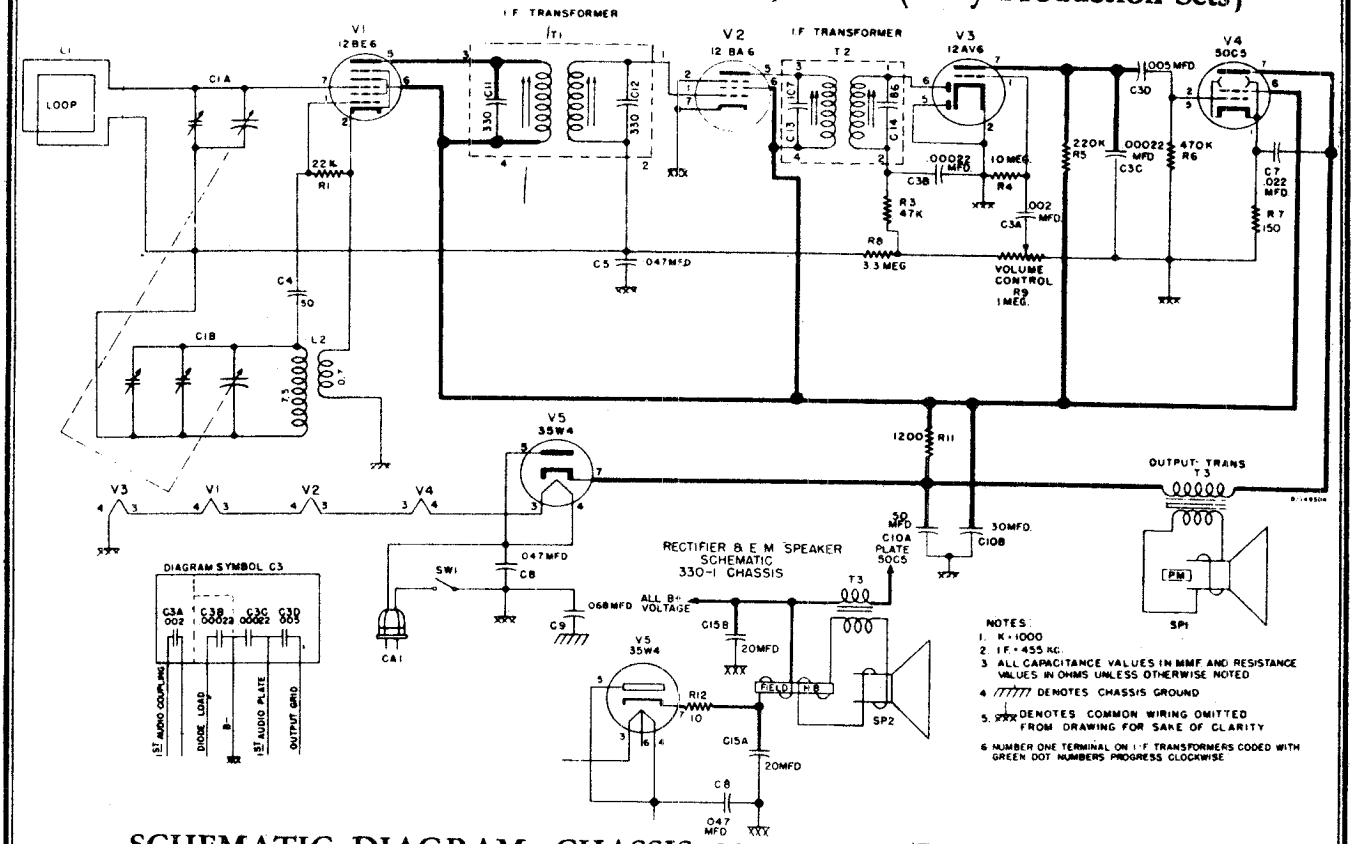
Under no circumstances should a ground be connected to this receiver.

ALIGNMENT PROCEDURE

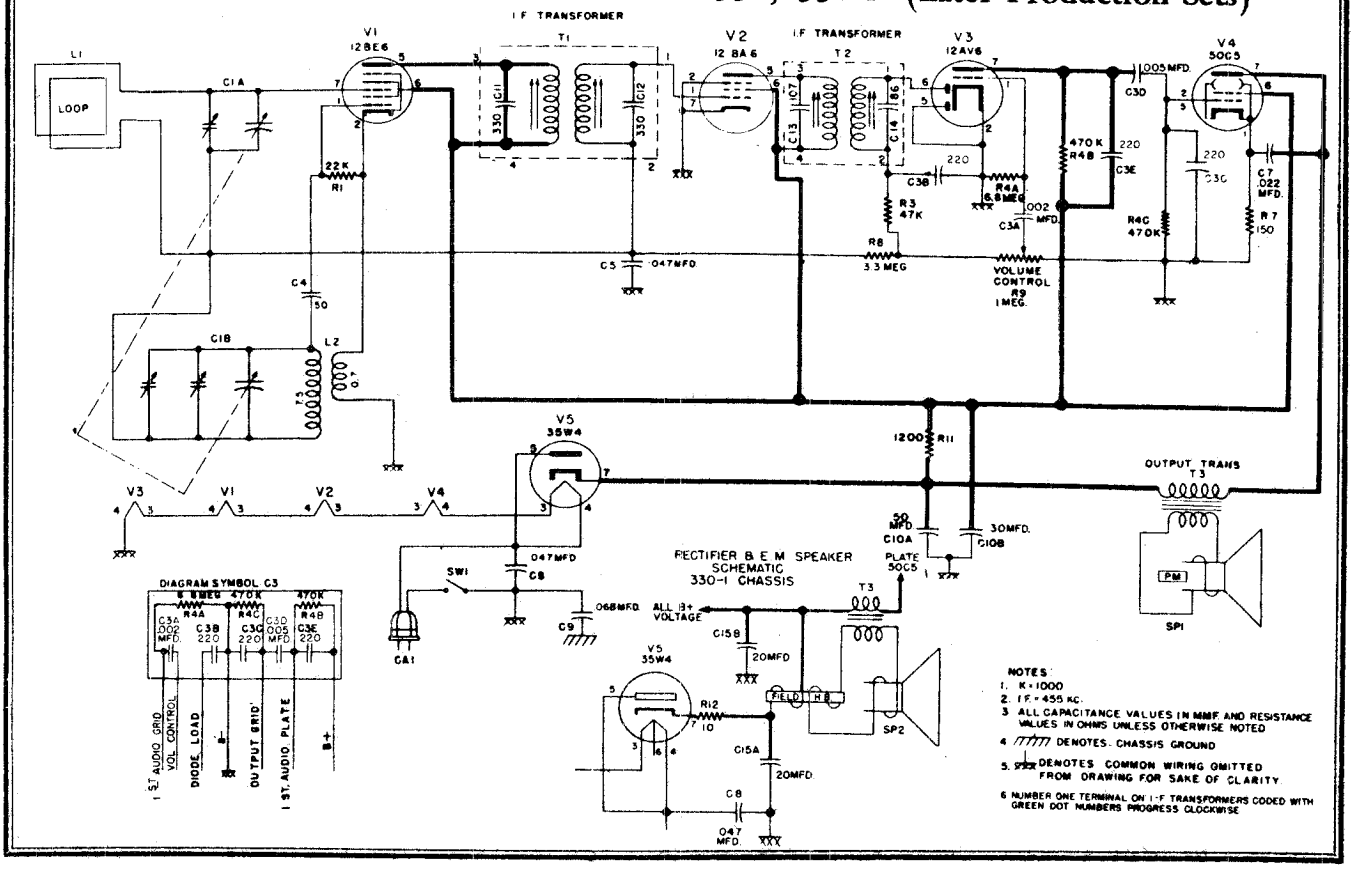
1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected as indicated in the alignment chart. Connect the signal generator ground through a 0.1 mfd. condenser to B - (pin 2 on 12BA6 tube socket).
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

MODELS 11-114U, 11-115U,
11-116U, 11-117U, 11-118U,
11-119U, Ch. 330, 330-1

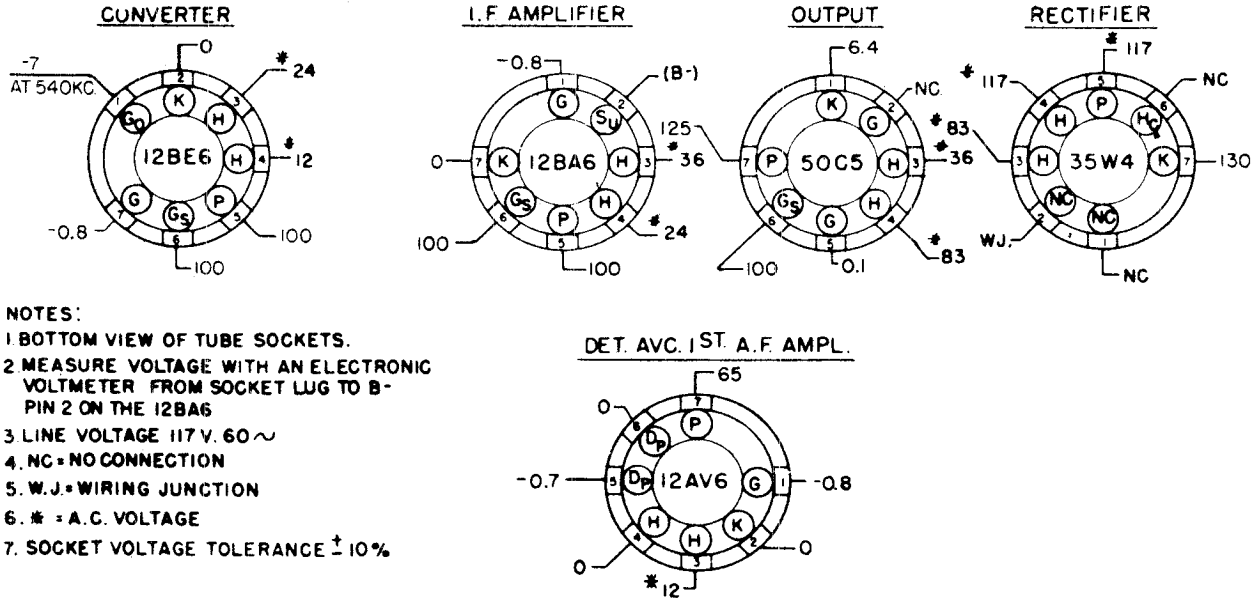
SCHEMATIC DIAGRAM: CHASSIS 330, 330-1 (Early Production Sets)



SCHEMATIC DIAGRAM: CHASSIS 330, 330-1 (Later Production Sets)



MODELS 11-114U, 11-115U,
11-116U, 11-117U, 11-118U,
11-119U, Ch. 330, 330-1



NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. MEASURE VOLTAGE WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO B- PIN 2 ON THE 12BA6
3. LINE VOLTAGE 117 V. 60 ~
4. NC = NO CONNECTION
5. W.J. = WIRING JUNCTION
6. * = A.C. VOLTAGE
7. SOCKET VOLTAGE TOLERANCE ± 10%

SOCKET VOLTAGE CHART

REPLACEMENT PARTS LIST

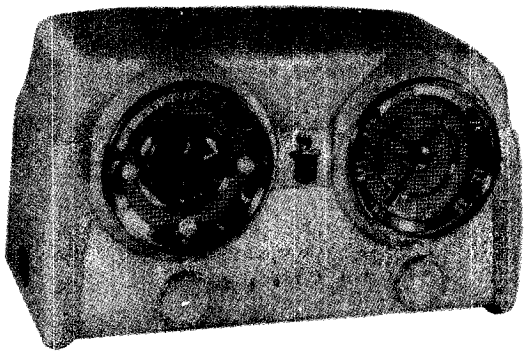
MODELS: 11-114U, 11-115U, 11-116U, 11-117U, 11-118U, 11-119U-Chassis 330, 330-1

Symbol No.	Part No.	Description
C1-A	B-149473	Capacitor, Variable } Two Section
C1-B		Capacitor, Variable }
†C3-A	C-144675-1	Capacitor, .002 mfd., 500 v. } Four Section disc ceramic
†C3-B		Capacitor, .00022 mfd., 500 v.
†C3-C		Capacitor, .00022 mfd., 500 v.
†C3-D		Capacitor, .005 mfd., 500 v.
††C3-A	C-151550-1	Capacitor, .002 mfd., 450 v. } Resistor-Capacitor Unit; Includes R4A, R4B, R4C.
††C3-B		Capacitor, 220 mmf., 450 v.
††C3-C		Capacitor, 220 mmf., 450 v.
††C3-D		Capacitor, .005 mfd., 450 v.
††C3-E		Capacitor, 220 mmf., 450 v.
C4	C-137727-21	Capacitor, 50 mmf., 500 v., ceramic
C5	39477-45	Capacitor, .047 mfd., 600 v., molded paper
C7	39477-43	Capacitor, .022 mfd., 600 v., molded paper
C8	39477-45	Capacitor, .047 mfd., 600 v., molded paper
C9	39477-46	Capacitor, .068 mfd., 600 v., molded paper
▲C10A	B-149457	Capacitor, 50 mfd., 150 v. } Two Section Electrolytic
▲C10B		Capacitor, 30 mfd., 150 v. }
C11	Part of T1	Capacitor, 330 mmf.
C12	Part of T1	Capacitor, 330 mmf.
C13	Part of T2	Capacitor, 107 mmf.
C14	Part of T2	Capacitor, 86 mmf.
▲▲C15A	B-151645	Capacitor, 20 mfd., 150 v. } Two Section Electrolytic
▲▲C15B		Capacitor, 20 mfd., 150 v. }
R1	39373-60	Resistor, 22,000 ohm, ½ w.
R3	39373-67	Resistor, 47,000 ohm, ½ w.
†R4	39373-107	Resistor, 10 megohm, ½ w.
†R5	39373-80	Resistor, 220,000 ohm, ½ w.
†R6	39373-87	Resistor, 470,000 ohm, ½ w.
††R4A	Part of C3	Resistor, 6.8 megohm, 1/5 w.
††R4B	Part of C3	Resistor, 470,000 ohm, 1/5 w.
††R4C	Part of C3	Resistor, 470,000 ohm, 1/5 w.
R7	39373-16	Resistor, 150 ohm, ½ w.
R8	39373-100	Resistor, 3.3 megohm, ½ w.
R9	39368-14	Control, Volume (1 megohm)
▲R11	39374-114	Resistor, 1200 ohm, 10%, 1 w.
▲▲R12	39373-1	Resistor, 10 ohm, ½ w.
CA1	C-142769-1	Cable & Plug Assy., Power
L1	AC-149480	Loop Antenna & Black Assy.
L2	AW-148259	Coil, Oscillator
SW1	39369-1	Switch, Power
▲SP1	139631	Speaker (4" P.M.)
▲▲	C-151996	Speaker (4" E.M., 680 ohm Field)
T1	AC-139919-4	Transformer, 1st. I. F.
T2	AC-139919-5	Transformer, 2nd. I. F.
T3	138131-1	Transformer, Output
	AB-149495-1	Cabinet (11-114U)
	AB-149495-2	Cabinet (11-115U)
	AB-149495-3	Cabinet (11-116U)
	AB-149495-4	Cabinet (11-117U)
	AB-149495-5	Cabinet (11-118U)
	AB-149495-6	Cabinet (11-119U)
	W-145837	Clip, Spring
	B-149433-1	Knob, Volume (11-114U)
	B-149433-2	Knob, Volume (11-115U)
	B-149433-3	Knob, Volume (11-116U)
	B-149433-4	Knob, Volume (11-117U)
	B-149433-5	Knob, Volume (11-118U)
	B-149433-6	Knob, Volume (11-119U)
	C-149434-1	Knob, Tuning (11-114U)
	C-149434-2	Knob, Tuning (11-115U)
	C-149434-3	Knob, Tuning (11-116U)
	C-149434-4	Knob, Tuning (11-117U)
	C-149434-5	Knob, Tuning (11-118U)
	C-149434-6	Knob, Tuning (11-119U)
	39462-1	Socket, Tube

▲ Used on Chassis 330 only. † Used on early production sets.
▲▲ Used on Chassis 330-1 only. †† Used on later production sets.

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U. 11-125U, Ch. 311

Model No.	Color
11-120U	Dulux White
11-121U	Ebony
11-122U	Chartreuse
11-123U	Maroon
11-124U	Regal Blue
11-125U	Sumatra Green



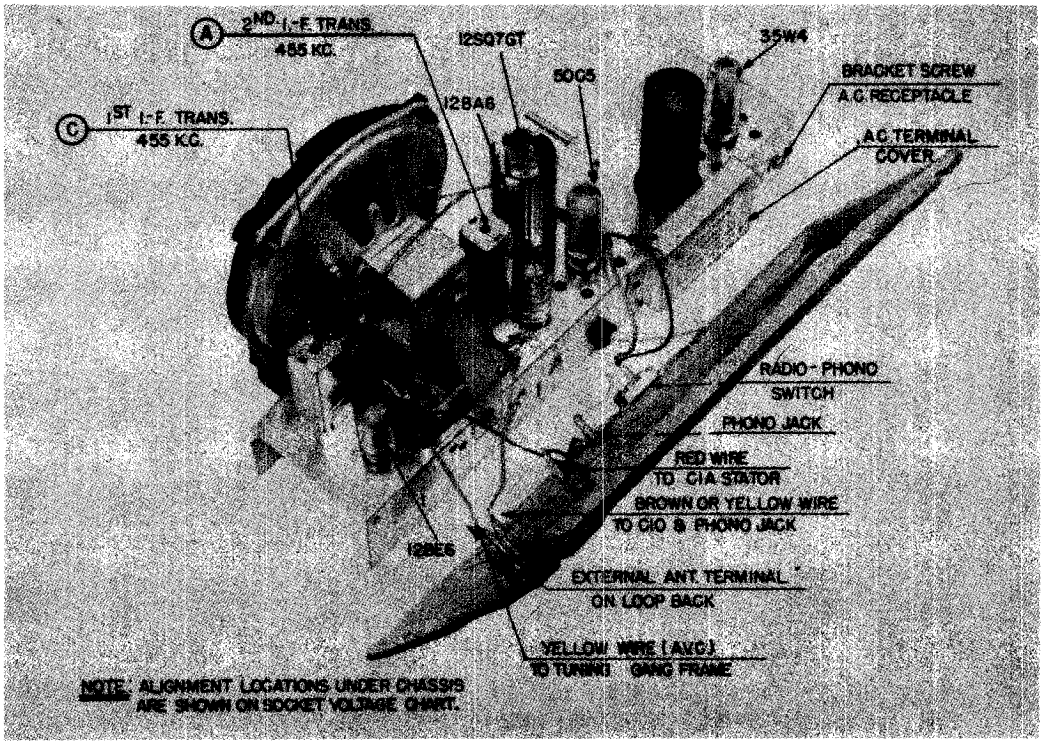
DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.
FREQUENCY RANGE: 540 to 1600 kc.
INTERMEDIATE FREQUENCY: 455 kc.
POWER SUPPLY: 60 cycle, a.c. only.
VOLTAGE RATING: 105-125 volts.
POWER OUTPUT: 1 watt maximum.
POWER CONSUMPTION:

Radio and Clock..... 35 watts
Clock ..... 2 watts

TUBE COMPLEMENT:

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12SQ7GT	Detector, AVC, 1st. A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier



CHASSIS, TOP VIEW

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U, 11-125U, Ch. 311

Under no circumstances should a ground be connected to this receiver.

Phonograph connection — To use a record player with this receiver insert the pickup plug of the record player into the Phono jack on back of receiver. Then slide the Radio-Phono Switch on the back of the receiver to the "Phono" position. Connect the power cord of the record player to a convenient electric outlet of the correct voltage and frequency. Operate the record player in the normal manner. The controls of the receiver operate the same as for radio programs.

ALIGNMENT PROCEDURE

1. To remove the chassis from the cabinet, proceed as follows:
   a. Turn the tuning control completely counter-clockwise to close the gang.
   b. Remove the volume and tuning control knobs, and the dial pointer.
   c. Remove the cabinet back and loosen the screw on the terminal cover behind the electrolytic capacitor. Lift up the cover and disconnect the three leads to the clock.
   d. Connect a jumper between the terminal coded yellow and the center terminal on the terminal board.
   e. Remove the two screws in the top corners of the chassis apron that secure the chassis to the cabinet.
   f. Loosen the slotted hex head screw on the right rear of the chassis and slide the screw toward the center of the chassis to release power receptacle from opening in side of cabinet.
   g. Slide the chassis from the cabinet.
2. Connect an output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be connected as indicated in the alignment chart. Connect the signal generator ground to the top lug on loop antenna back (See Chassis Top View, page 1).
4. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on "Chassis, Top View," and on "Socket Voltage Chart".

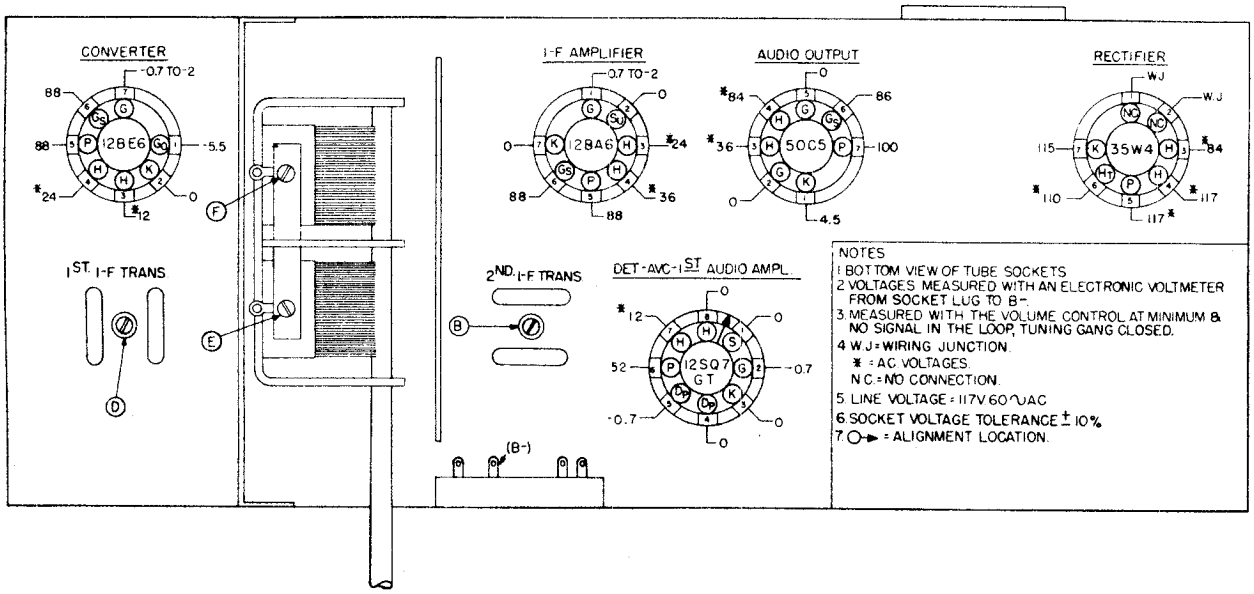
Alignment Sequence	Signal Generator Output			Position of Dial pointer	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	200 mmf.	External Ant. Screw	1620	A, B, C & D (See Note 1.)
2	1620	200 mmf.	External Ant. Screw	1620	E
3	1400	200 mmf.	External Ant. Screw	1400	F (See Note 2.)

ALIGNMENT NOTES

1. Repeat adjustments (A, B, C & D) in sequence, until maximum output is obtained.
2. After the chassis and loop antenna have been replaced in the cabinet, repeat alignment sequence "3". Adjust "F" by inserting screw driver through the hole provided in the bottom of the cabinet.

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U, 11-125U, Ch. 311

SOCKET VOLTAGE CHART

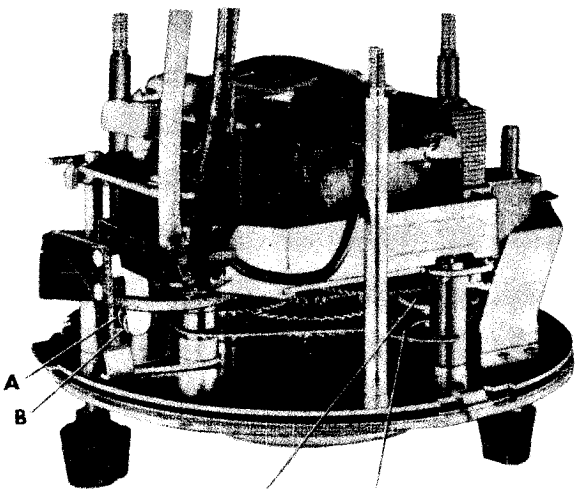


CLOCK ADJUSTMENTS

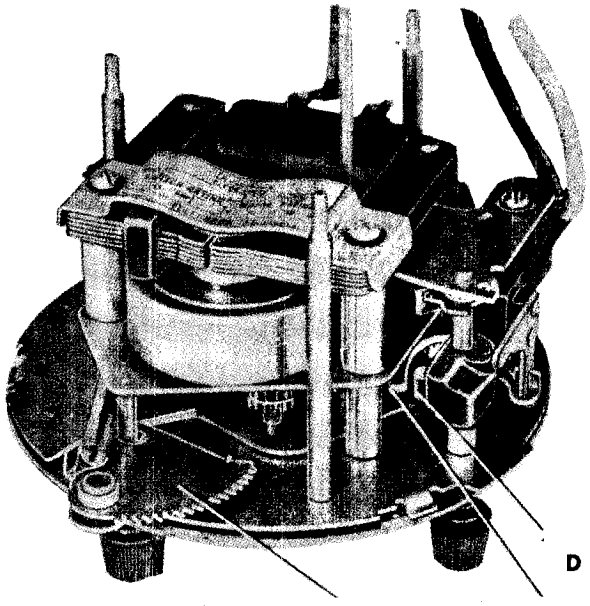
PROCEDURE FOR CHECKING TIMER SWITCH AND VIBRATOR:

1. With the time set knob, turn the clock hands so as to advance the time at least one (1) hour. (For ease in checking, it is recommended that the time be set to the hour.)
2. Attach test light to black and yellow switch leads.
3. Turn switch knob to "Radio" position - light must go on.
4. Turn switch knob to "Off" position - light must go out.
5. Set alarm disc so that small pointer on hour hand reads two (2) hours in advance of the time of the clock. EXAMPLE: If the clock hands are set to read 7 o'clock, set the alarm disc to read 9 o'clock.
6. Turn sleep switch to "60" - test light must go on.
7. Turn time set knob advancing clock hands to next hour - light must go out and SLEEP SWITCH SECTOR GEAR must be completely disengaged within one (1) hour plus or minus eight (8) minutes.
8. Manually push SLEEP SWITCH SECTOR GEAR in until it touches its mating pinion WITHOUT meshing - light must go on.
9. Turn switch knob to "Radio Alarm" position.
10. Turn time set knob to advance clock hands so they read 15 minutes until the next hour. Then slowly advance the hands until the test light lights, which indicates the contacts are closed. The contacts must close somewhere between 14 minutes to the hour and 4 minutes past the hour.
11. Remove test light and connect 110 volt supply to the black and red leads.
12. Turn time set knob to advance the clock hands 4 minutes - vibrator must NOT buzz. Then advance the hands 14 minutes - vibrator MUST buzz within this 14 minute period.

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U, 11-125U, Ch. 311



TIMING CAM TIMING CAM FOLLOWER



SLEEP SWITCH SECTOR GEAR C

ADJUSTING CONTACTS:

1. Set the alarm disc so that the time indicated by the small pointer on the hour hand is different (at least 1 hour) from the time indicated by the hands of the clock. Then set switch to "Radio Alarm" position so that the TIMING CAM FOLLOWER rests on the TIMING CAM. Contacts shall be adjusted at .020" minimum gap.

2. With switch in "OFF" position contacts shall remain open as in step one and there shall be clearance between TIMING CAM FOLLOWER and TIMING CAM.

3. With switch in "Radio" position, contacts shall be closed. Check for proper contact pressure by depressing CONTACT (A), using a small pointed tool. If CONTACT (B) follows CONTACT (A), a noticeable amount before the contacts separate, the pressure is sufficient.

4. Set the switch to "Radio Alarm" position; pull out and turn alarm set knob counter-clockwise until the TIMING CAM FOLLOWER drops into the slot of TIMING CAM. The contacts shall be closed. Check contact pressure as previously described in step three.

5. SWITCH ARM (C) should clear CAM (D) by .008" minimum when in the "Radio Alarm" position.

TIMING:

1. Adjust timer for contact closure at 6:55 o'clock. On repeat tests, contacts shall close at 6:55 plus or minus 3 minutes. At all other settings the contacts shall close between 12 minutes before and 2 minutes after the setting time.

2. Check time keeping for a minimum of twelve hours with power applied to the motor. Clock must be run with vibrator (buzzer) shut off.

VIBRATOR ADJUSTMENT:

1. Vibrator shall start buzzing 10 minutes plus or minus 5 minutes after contact closure occurs.

2. When the alarm set knob is pushed in ("shut-off" position of vibrator) the shut-off spring shall lift the vibrator sufficiently above the cam, so that the cam will not contact the vibrator in any position.

3. Adjust vibrator for good sounding position.

4. Vibrator shall be manually shut off before completion of buzzing period.

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U, 11-125U, Ch. 311

CLOCK LUBRICATION

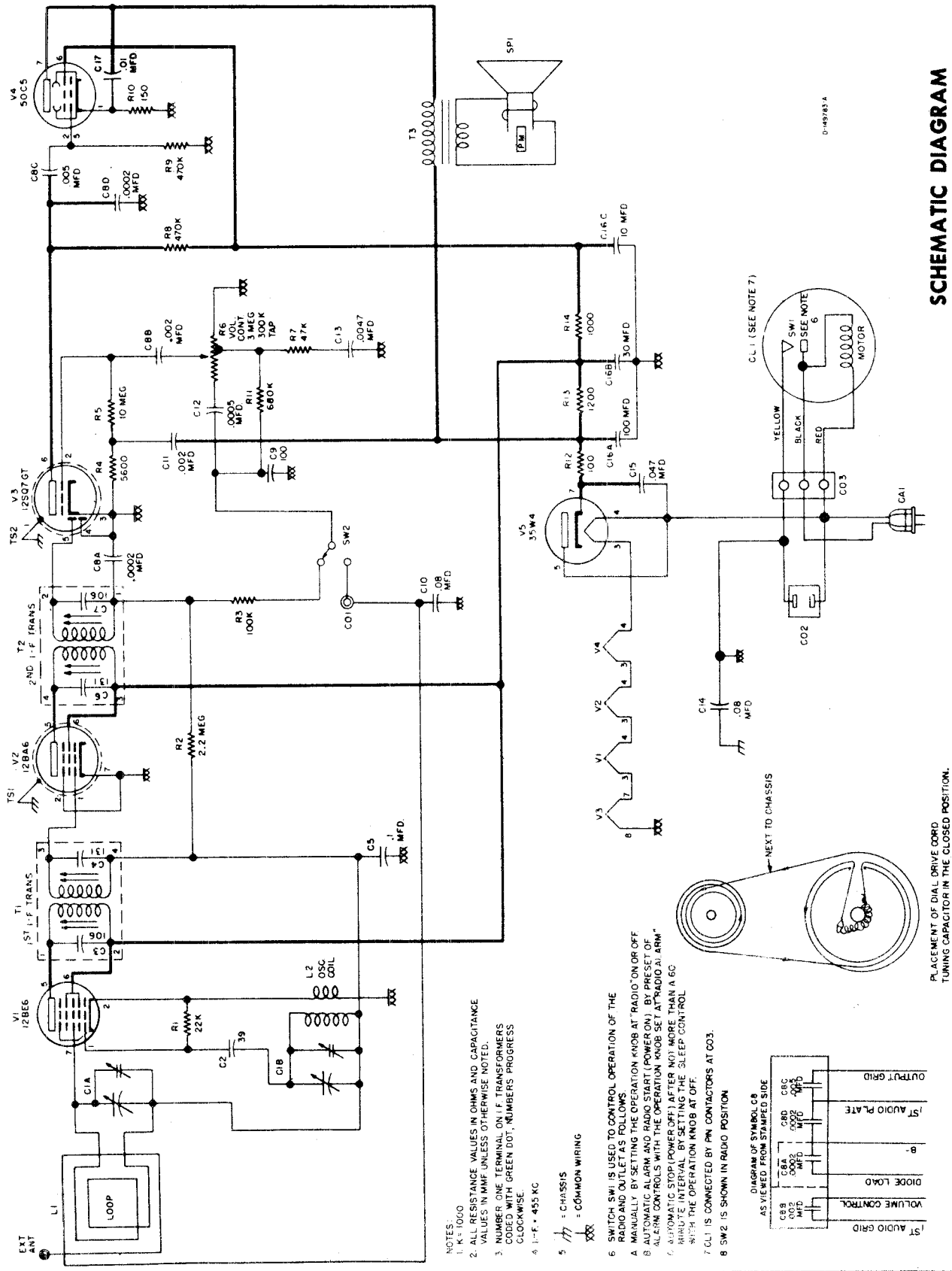
1. Center stack bearing in base plate and hole in back gear pinion should be lubricated with Nye watch oil or equivalent.

2. Path of switch locating spring on bracket should be lubricated with Dixon graphite grease.

REPLACEMENT PARTS LIST

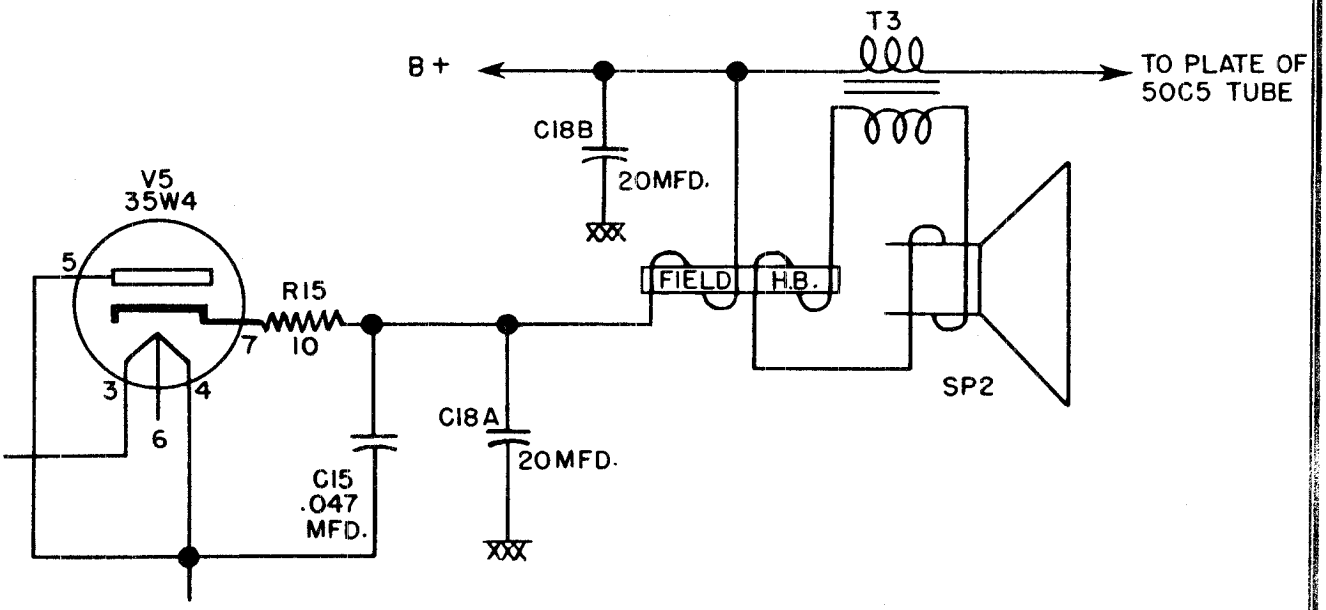
Symbol No.	Part No.	Description
C1A	B-149437	Capacitor, Variable } Two Section
C1B		Capacitor, Variable }
C2	C-137727-109	Capacitor, 39 mmf., 10%, 200 v., ceramic
C3	Part of T1	Capacitor, 106 mmf.
C4	Part of T1	Capacitor, 131 mmf.
C5	39001-19	Capacitor, .1 mfd., 600 v., paper
C6	Part of T2	Capacitor, 131 mmf.
C7	Part of T2	Capacitor, 106 mmf.
C8A	C-144675-1	Capacitor, .0002 mfd., 500 v. } Four Section disc ceramic
C8B		Capacitor, .002 mfd., 500 v. }
C8C		Capacitor, .005 mfd., 500 v. }
C8D		Capacitor, .0002 mfd., 500 v. }
C9	B-143686-3	Capacitor, 100 mmf., 500 v., molded disc ceramic
C10	39001-85	Capacitor, .08 mfd., 600 v., paper
C11	39001-74	Capacitor, .002 mfd., 600 v., paper
C12	39001-5	Capacitor, .0005 mfd., 600 v., paper
C13	39477-39	Capacitor, .0047 mfd., 600 v., molded paper
C14	39001-85	Capacitor, .08 mfd., 600 v., paper
C15	39477-45	Capacitor, .047 mfd., 600 v., molded paper
C16A	B-149541	Capacitor, 100 mfd., 150 v. } Three Section Electrolytic
C16B		Capacitor, 30 mfd., 150 v. }
C16C		Capacitor, 10 mfd., 150 v. }
C17	39477-41	Capacitor, .01 mfd., 600 v., molded paper
R1	39373-60	Resistor, 22,000 ohm, 1/2 w.
R2	39373-97	Resistor, 2.2 megohm, 1/2 w.
R3	39373-74	Resistor, 100,000 ohm, 1/2 w.
R4	39374-34	Resistor, 5600 ohm, 10%, 1/2 w.
R5	39373-107	Resistor, 10 megohm, 1/2 w.
R6	B-149382	Control, Volume (3 meg., Tap 300 K ohm)
R7	39373-67	Resistor, 47,000 ohm, 1/2 w.
R8	39373-87	Resistor, 470,000 ohm, 1/2 w.
R9	39373-87	Resistor, 470,000 ohm, 1/2 w.
R10	39373-16	Resistor, 150 ohm, 1/2 w.
R11	39373-90	Resistor, 680,000 ohm, 1/2 w.
R12	39374-189	Resistor, 100 ohm, 10%, 2 w.
R13	39374-114	Resistor, 1200 ohm, 10%, 1 w.
R14	39373-33	Resistor, 1000 ohm, 1/2 w.
TS1	W-147784	Shield, Tube (V2)
TS2	W-46447-1	Shield, Tube (V3)
CA1	C-149780	Cable & Plug Assy., Power
CO1	W-136998	Connector, Phono
L1	AC-149557	Loop Antenna & Back Assy.
L2	AW-148259	Coil, Oscillator
SP1	AD-145956-2	Speaker, 5-1/4" P.M.
SW1	Part of CL1	Switch, On-Off
SW2	W-148260	Switch, Radio-Phono
CL1	AW-149689	Clock Assy.
T1	AC-139919-3	Transformer, 1st I.F.
T2	AC-139919-3	Transformer, 2nd I.F.
T3	B-147171	Transformer, Output
CO2	AB-149562	Outlet & Bracket Assy.
CO3	W-149673	Contact Strip
	W-149366	Bracket, Speaker Support
	AD-149598-1	Cabinet & Medallion Assy. (11-120U)
	AD-150015	Cabinet & Medallion Assy. (11-121U)
	AD-149598-3	Cabinet & Medallion Assy. (11-122U)
	AD-149598-4	Cabinet & Medallion Assy. (11-123U)
	AD-149598-5	Cabinet & Medallion Assy. (11-124U)
	AD-149598-6	Cabinet & Medallion Assy. (11-125U)
	W-139921	Clip, I.F. Transformer Mtg.
	W-131154-1	Cotter (External), Pointer Pulley
	B-149398	Cover, Clock
	W-147216	Cups, Suction
	B-149667-1	Escutcheon, Outlet
	D-149963-1	Escutcheon, Radio
	C-149964-1	Escutcheon, Clock
	D-149742	Gasket, Speaker
	W-149341	Gasket, Clock Dial Grille & Ring
	AC-149962-1	Grille & Ring Assy., Clock Dial (11-120U)
	AC-149962-2	Grille & Ring Assy., Clock Dial (11-121U)
	AC-149962-3	Grille & Ring Assy., Clock Dial (11-122U)
	AC-149962-4	Grille & Ring Assy., Clock Dial (11-123U)
	AC-149962-5	Grille & Ring Assy., Clock Dial (11-124U)
	AC-149962-6	Grille & Ring Assy., Clock Dial (11-125U)
	AB-149524-1	Grille, Radio Dial (11-120U)
	AB-149524-2	Grille, Radio Dial (11-121U)
	AB-149524-3	Grille, Radio Dial (11-122U)
	AB-149524-4	Grille, Radio Dial (11-123U)
	AB-149524-5	Grille, Radio Dial (11-124U)
	AB-149524-6	Grille, Radio Dial (11-125U)
	W-45580-2	Grommet (Rubber), Speaker Mtg.
	AC-149952-1	Knob, Volume-Tuning (11-120U)
	AC-149952-2	Knob, Volume-Tuning (11-121U)
	AC-149952-3	Knob, Volume-Tuning (11-122U)
	AC-149952-4	Knob, Volume-Tuning (11-123U)
	AC-149952-5	Knob, Volume-Tuning (11-124U)
	AC-149952-6	Knob, Volume-Tuning (11-125U)
	B-149311-1	Knob, Switch (11-120U)
	B-149311-2	Knob, Switch (11-121U)
	B-149311-3	Knob, Switch (11-122U)
	B-149311-4	Knob, Switch (11-123U)
	B-149311-5	Knob, Switch (11-124U)
	B-149311-6	Knob, Switch (11-125U)
	B-149339-1	Knob, Alarm Set (11-120U)
	B-149339-2	Knob, Alarm Set (11-121U)
	B-149339-3	Knob, Alarm Set (11-122U)
	B-149339-4	Knob, Alarm Set (11-123U)
	B-149339-5	Knob, Alarm Set (11-124U)
	B-149339-6	Knob, Alarm Set (11-125U)
	B-150140-1	Medallion (11-120U, 11-121U, 11-123U, 11-124U, 11-125U)
	B-150140-2	Medallion (11-122U)
	C-149621-1	Pointer, Tuning
	W-149368	Pulley, Pointer Mtg.
	W-51752	Spring, Drive Cord
	W-148469	Spring, Pointer Pulley
	39462-2	Socket, Tube (V1,V2,V4,V5)
	W-149987	Socket, Tube (V3)
	AB-149438	Support & Bushing Assy., Pointer Pulley
	W-149676	Washer (Rubber), Speaker Mtg.

MODELS 11-120U, 11-121U, 11-122U, 11-123U, 11-124U, 11-125U, Ch. 311



MODELS 11-120U, 11-121U,
11-122U, 11-123U, 11-124U,
11-125U, Ch. 311-1

To service the chassis 311-1, which is equipped with an E.M. speaker, refer to the following schematic sketch and parts list.



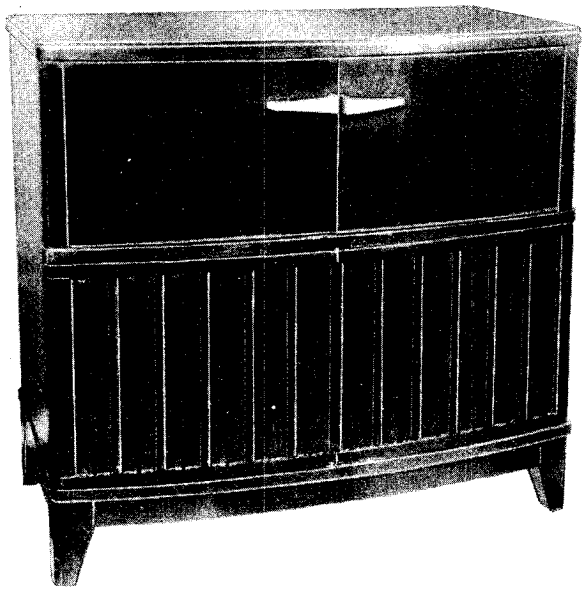
PARTS LIST

Symbol No.	Part No.	Description
C15	39477-45	Capacitor, .047 mfd. 600 V, molded paper
C18A	B-151617	Capacitor, 20 mfd., 150 V. } Two Section
C18B		Capacitor, 20 mfd., 150 V. } Electrolytic
R15	39373-1	Resistor, 10 ohm, 1/2 w.
SP2	151190-2	Speaker (5 " E.M., 680 ohm field)
T3	B-147171	Transformer, Output

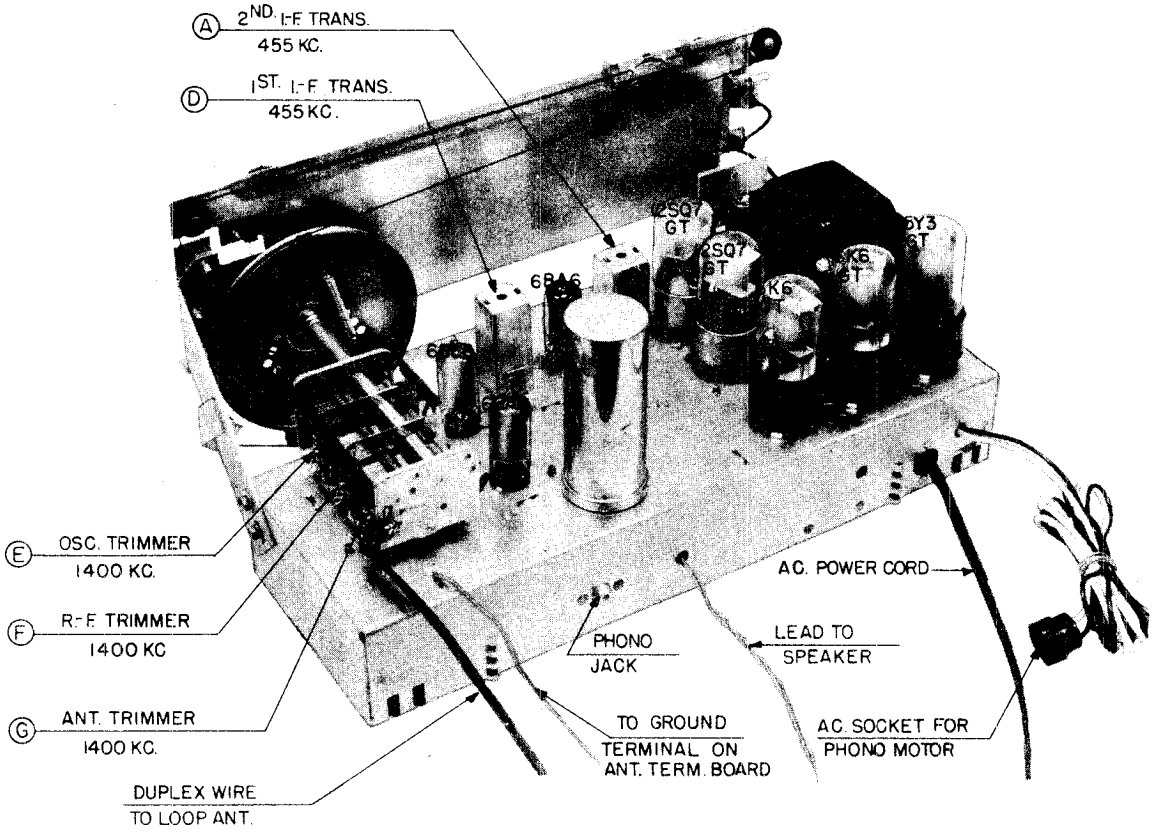
ELECTRIC CLOCK PARTS LIST

	Part No.	Description
	151389-1	Crystal, Dial
	151389-2	Rivet, Crystal (3 Required)
	151389-3	Dial
	151389-4	Disc, Alarm
	151389-5	Hand, Sweep Second (Gold)
	151389-6	Hands, Hour & Minute
	151389-8	Knob, Time Set (Bronze)
	151389-9	Field & Coil, 60 Cycle
	151389-10	Rotor Unit, 60 Cycle

MODELS 11-207MU,
11-208BU, Ch. 333



Model 11-207MU (Mahogany) — Model 11-208BU (Blond)



CHASSIS, TOP VIEW

DESCRIPTION

TYPE: Eight-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle, a.c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION:

Radio Position ..... 65 watts

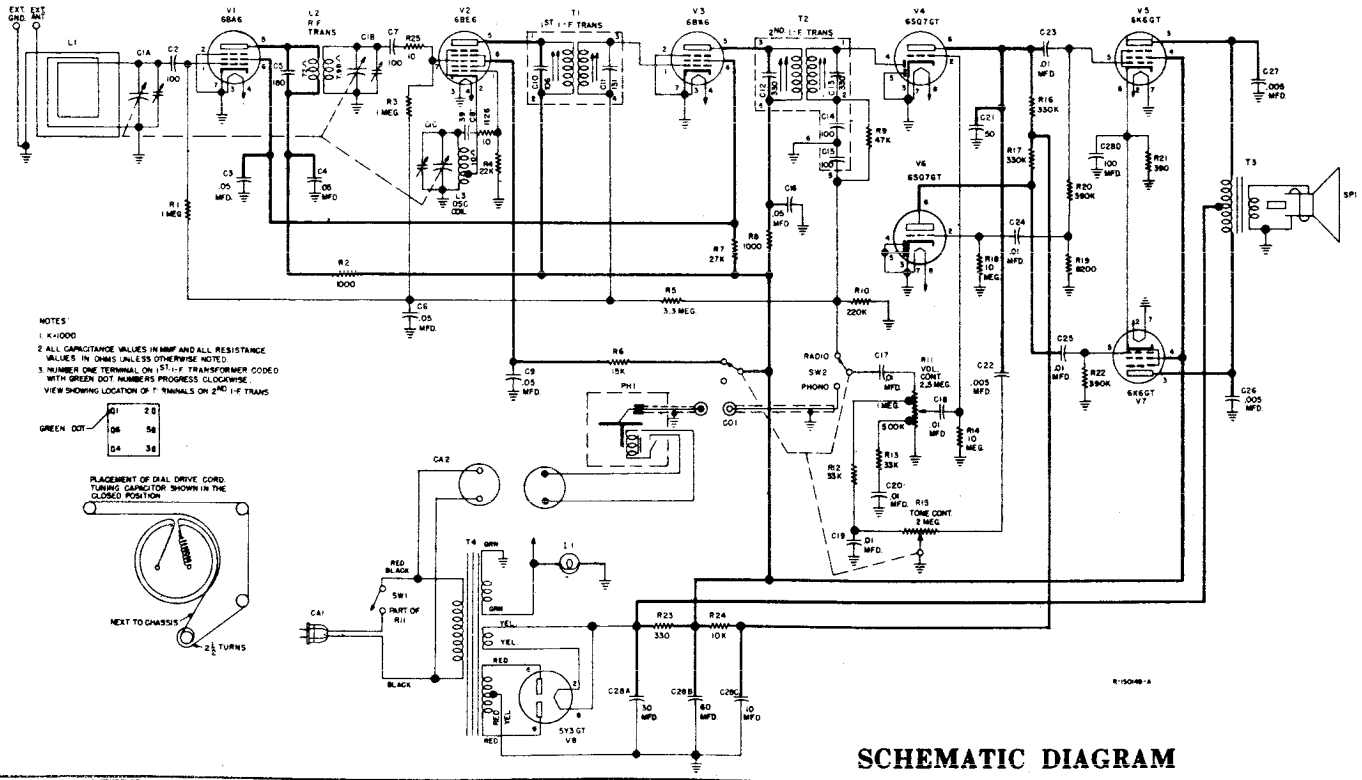
Phono Position..... 85 watts

Phono Motor only..... 20 watts

TUBE COMPLEMENT:

Symbol No.	Type	Function
V1	6BA6	R.F. Amplifier
V2	6BE6	Converter
V3	6BA6	I.F. Amplifier
V4	6SQ7GT	Diode Det., AVC, Audio Amplifier
V5	6K6GT	Audio Output
V6	6SQ7GT	Phase Inverter
V7	6K6GT	Audio Output
V8	5Y3GT	Rectifier

DIAL BULB: Type 47, 6.3V., .15 amp.



SCHEMATIC DIAGRAM

MODELS 11-207MU,
11-208BU, Ch. 333

ALIGNMENT PROCEDURE

1. Turn the tuning capacitor to full mesh against stop and set the dial pointer to the reference point on the dial to the left of "55".
2. Connect output meter across speaker voice coil leads.
3. Feed an r.f. signal modulated 30% at 400 cycles to the receiver as indicated in the Alignment chart. Connect the signal generator ground terminal to the chassis of the receiver.
4. Turn the volume control to maximum clockwise position and the tone control to maximum treble position. Adjust the signal generator output to produce a noticeable output meter reading, keeping the signal generator output as low as possible to prevent AVC action in the receiver.
5. For all alignments the loop antenna must remain connected.

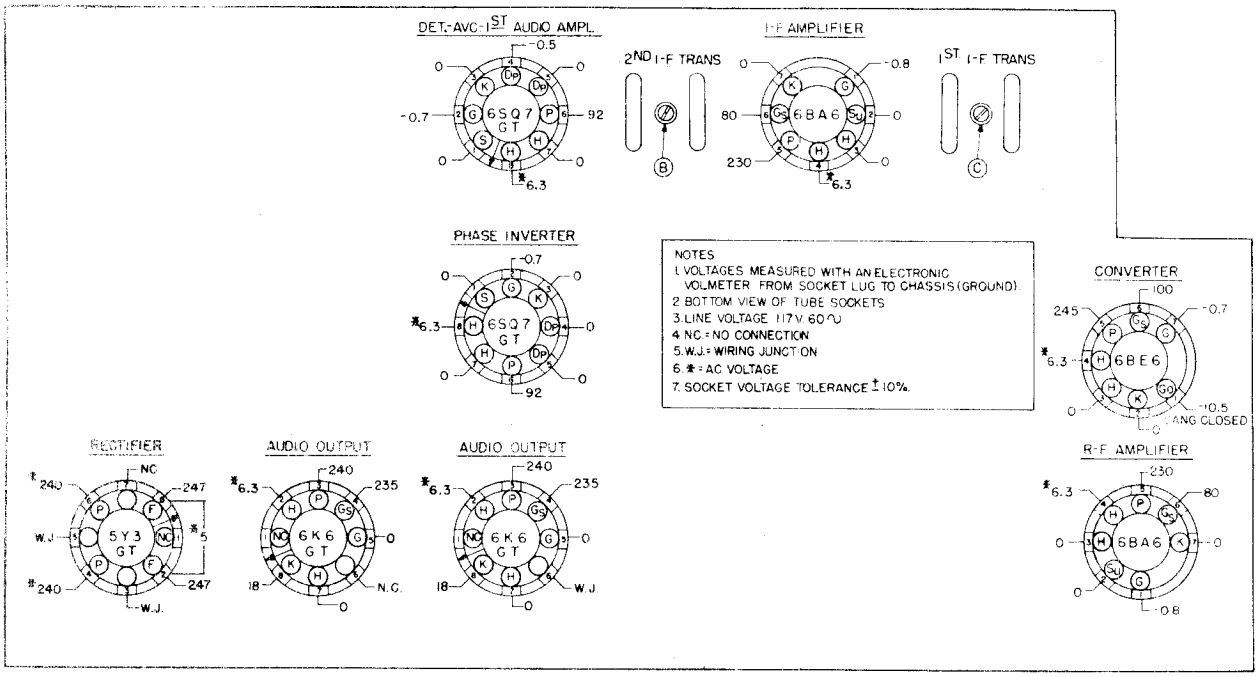
ALIGNMENT CHART

Alignment adjustment locations are shown on "CHASSIS, TOP VIEW."

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Tun. Cap.	Adjust for Maximum Output	
	Frequency in kc.	In Series with	To			
1	455	.05 mfd.	Stator plates of C1B (center sect.)	Gang open	A & B	
2	455	.05 mfd.	Stator plates of C1B (center sect.)	Gang open	C & D	
3	1400	200 mmf.	Ext. Ant. Term.	1400	E	(See Note 1)
4	1400	200 mmf.	Ext. Ant. Term.	1400	F	(See Note 1)
5	1400	200 mmf.	Ext. Ant. Term.	1400	G	(See Notes 1 & 2)

ALIGNMENT NOTES

1. Rock gang while adjusting r.f. and antenna trimmers for maximum sensitivity.
2. Antenna trimmer must be realigned at 1400 kc., after chassis is installed in its cabinet. A weak signal must be used so that the trimmer can be adjusted to maximum receiver sensitivity.



SOCKET VOLTAGE CHART

MODELS 11-207MU, 11-208BU, Ch. 333

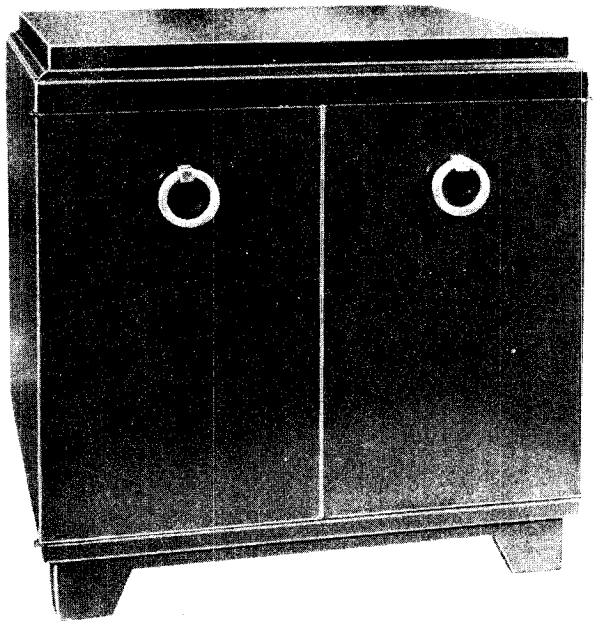
REPLACEMENT PARTS LIST

MODELS 11-207MU, 11-208BU (Chassis No. 333)

Symbol No.	Part No.	Description
C1A	B-150011	Capacitor, Variable } Three Section
C1B		Capacitor, Variable } Three Section
C1C		Capacitor, Variable } Three Section
C2	C-137727-25	Capacitor, 100 mmf., 500 v., ceramic
C3	39001-17	Capacitor, .05 mfd., 600 v., paper
C4	39001-17	Capacitor, .05 mfd., 600 v., paper
C5	C-137727-24	Capacitor, 180 mmf., 500 v., ceramic
C6	39001-17	Capacitor, .05 mfd., 600 v., ceramic
C7	C-137727-25	Capacitor, 100 mmf., 500 v., ceramic
C8	C-137727-109	Capacitor, 39 mmf., 10%, 200 v., ceramic
C9	39001-17	Capacitor, .05 mfd., 600 v., paper
C10	Part of T1	Capacitor, 106 mmf., 5%.
C11	Part of T1	Capacitor, 131 mmf., 5%.
C12	Part of T2	Capacitor, 330 mmf., 5%.
C13	Part of T2	Capacitor, 330 mmf., 5%.
C14	Part of T2	Capacitor, 100 mmf.
C15	Part of T2	Capacitor, 100 mmf.
C16	39001-17	Capacitor, .05 mfd., 600 v., paper
C17	39001-13	Capacitor, .01 mfd., 600 v., paper
C18	39001-13	Capacitor, .01 mfd., 600 v., paper
C19	39001-13	Capacitor, .01 mfd., 600 v., paper
C20	39001-13	Capacitor, .01 mfd., 600 v., paper
C21	B-143686-1	Capacitor, 50 mmf., 500 v., molded disc ceramic
C22	39001-11	Capacitor, .005 mfd., 600 v., paper
C23	39001-13	Capacitor, .01 mfd., 600 v., paper
C24	39001-13	Capacitor, .01 mfd., 600 v., paper
C25	39001-13	Capacitor, .01 mfd., 600 v., paper
C26	39001-11	Capacitor, .005 mfd., 600 v., paper
C27	39001-11	Capacitor, .005 mfd., 600 v., paper
C28A	B-150035	Capacitor, 30 mfd., 350 v. } Four Section
C28B		Capacitor, 60 mfd., 350 v. } Four Section
C28C		Capacitor, 10 mfd., 350 v. } Four Section
C28D		Capacitor, 100 mfd., 25 v. } Four Section
R1	39373-92	Resistor, 1 megohm, ½ w.
R2	39373-33	Resistor, 1000 ohm, ½ w.
R3	39373-92	Resistor, 1 megohm, ½ w.
R4	39373-60	Resistor, 22,000 ohm, ½ w.
R5	39373-100	Resistor, 3.3 megohm, ½ w.
R6	39374-215	Resistor, 15,000 ohm, 10%, 2 w.
R7	39374-130	Resistor, 27,000 ohm, 10%, 1 w.
R8	39373-33	Resistor, 1000 ohm, ½ w.
R9	39373-67	Resistor, 47,000 ohm, ½ w.
R10	39373-80	Resistor, 220,000 ohm, ½ w.
R11	B-150018	Control, Volume (2.5 meg. Taps 1 meg. & 500,000 ohm)
R12	39373-64	Resistor, 33,000 ohm, ½ w.
R13	39373-64	Resistor, 33,000 ohm, ½ w.
R14	39373-107	Resistor, 10 megohm, ½ w.
R15	B-150019	Control, Tone (2 megohm) & Radio-Phono Switch
R16	39374-55	Resistor, 330,000 ohm, 10%, ½ w.
R17	39374-55	Resistor, 330,000 ohm, 10%, ½ w.
R18	39373-107	Resistor, 10 megohm, ½ w.
R19	39374-36	Resistor, 8200 ohm, 10%, ½ w.
R20	39374-56	Resistor, 390,000 ohm, 10%, ½ w.
R21	39374-196	Resistor, 390 ohm, 10%, 2 w.
R22	39374-56	Resistor, 390,000 ohm, 10%, ½ w.
R23	39374-107	Resistor, 330 ohm, 10%, 1 w.
R24	39373-54	Resistor, 10,000 ohm, ½ w.
R25	39373-1	Resistor, 10 ohm, ½ w.
R26	39373-1	Resistor, 10 ohm, ½ w.
L1	B-150260	Antenna Loop Assembly
L2	AW-150151	Transformer, R.F.
L3	AW-150150	Coil, Oscillator
I1	138437-1	Bulb (Dial), Type 47, 6.3 v., .15 amp.

Symbol No.	Part No.	Description
SW1	Part of R11	Switch, Power (ON-OFF)
SW2	Part of R15	Switch, Radio-Phono
T1	AC-139919-3	Transformer, 1st. I.F.
T2	D-145025-5	Transformer, 2nd. I.F.
T3	B-150028	Transformer, Output
T4	B-150029	Transformer, Power
PH1	D-148279-1	Record Changer (V950)
CA1	C-132300-2	Cable & Plug Assy., Power
CA2	B-139727-7	Cable & Plug Assy., Phono Motor
CO1	W-136998	Connector, Phono
SP1	138762-5	Speaker, 10" P.M.
	AB-150013	Background Assy., Dial
	148824	Baffle, Speaker (11-207MU)
	150308	Baffle, Speaker (11-208BU)
	W-149709	Bracket, Drive Shaft Support
	R-148738	Cabinet, (11-207MU)
	R-150299	Cabinet, (11-208BU)
	W-136201	Clip, Dial Glass
	W-139921	Clip, I.F. Transformer
	W-136999-1	Connector (Male), Shielded Wire
	W-131154-1	Cotter (External), Drive Shaft
	W-136853	Cushion (Rubber), Dial Glass
	150009	Decal (Off-On-Volume, Tone-Radio-Phono, Tuning)
	C-149991	Dial Glass
	148825	Drawer Assy., Record Changer (11-207MU)
	150302	Drawer Assy., Record Changer (11-208BU)
	C-148995-1	Escutcheon
	149097	Grille Cloth (11-207MU)
	149939	Grille Cloth (11-208BU)
	W-148390	Grommet, Variable Capacitor Mtg.
	148828	Hinge, Door (11-207MU)
	150306	Hinge, Door (11-208BU)
	C-148708	Knob
	148831	Leg, Left Rear } 11-207MU Cabinet
	148832	Leg, Right Rear } 11-207MU Cabinet
	148829	Leg, Left Front } 11-207MU Cabinet
	148830	Leg, Right Front } 11-207MU Cabinet
	148833	Leg & Base Assy. } 11-207MU Cabinet
	150300	Leg, Left Rear } 11-208BU Cabinet
	150301	Leg, Right Rear } 11-208BU Cabinet
	150304	Leg, Left Front } 11-208BU Cabinet
	150303	Leg, Right Front } 11-208BU Cabinet
	150305	Leg & Base Assy. } 11-208BU Cabinet
	W-148788-2	Name (CROSLEY)
	C-149431	Pointer, Dial
	W-137939-1	Pulley, Drive Cord Idler
	148827	Pull, Door Handle
	W-137170	Retainer, Record Changer Mtg.
	W-137940-1	Rivet, Drive Cord Idler Pulley
	W-150083	Shaft, Dial Pointer Drive
	AC-143896-9	Shielded Wire Assy., Phono
	W-33055-2	Sleeve (Rubber) Chassis Mtg.
	143478	Slide, Record Changer
	D-136565-16	Socket, Dial Light
	39462-2	Socket, Tube (V1, V2, V3)
	W-149987	Socket, Tube (V4, V5, V6, V7, V8)
	W-145757	Spring, Dial Drive Cord
	139319SB	Strike & Catch Assy., Door (11-207MU)
	149951	Strike & Catch Assy., Door (11-208BU)
	W-143552	Strip, Dial Pointer
	AW-150208	Terminal Assy., Antenna
	W-134916	Washer (Spring), Drive Shaft

MODELS 11-550MU,
11-560BU, Ch. 337



Model 11-550MU (Mahogany) — Model 11-560BU (Blond)

DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle, a.c. only.

VOLTAGE RATING: 105-125 volts.

POWER OUTPUT: 1 watt maximum.

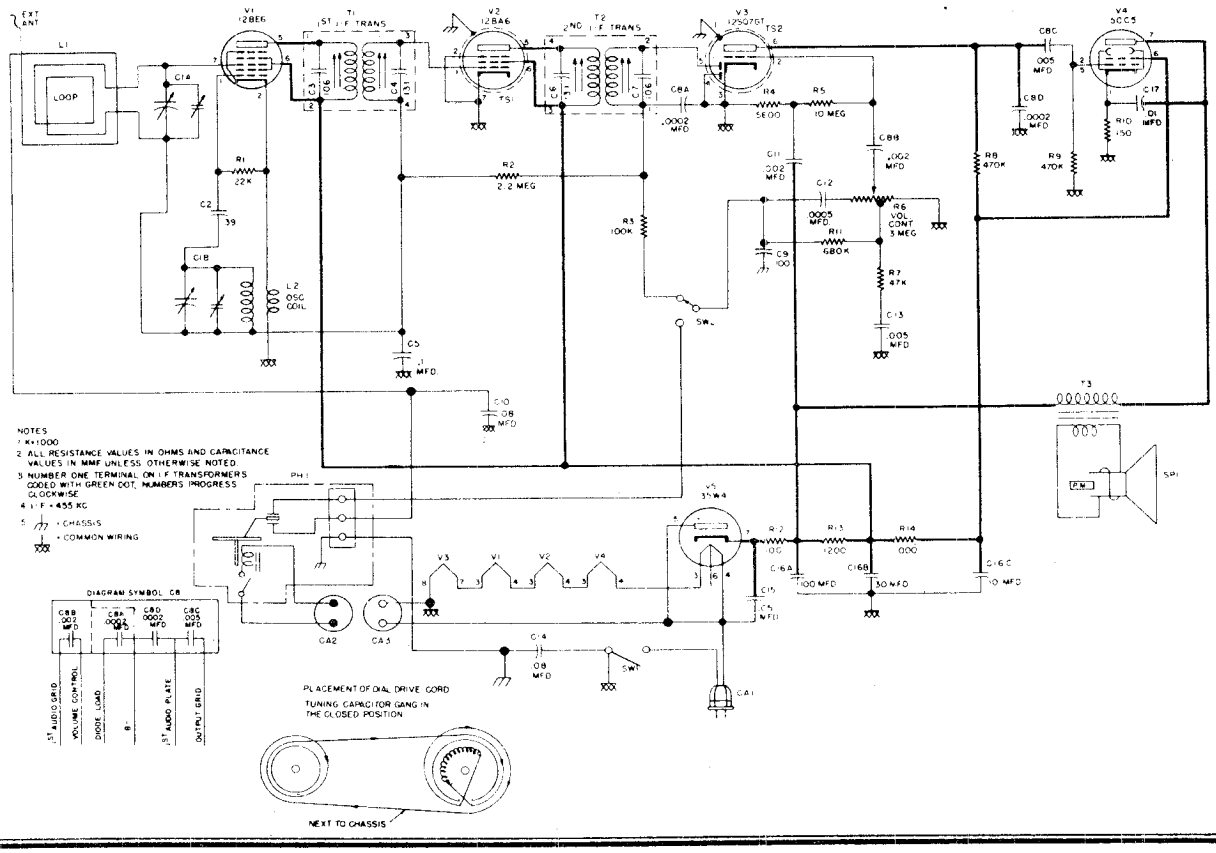
POWER CONSUMPTION:

Radio Position ..... 35 watts

Phono Position ..... 55 watts

TUBE COMPLEMENT:

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12SQ7GT	Detector, AVC, 1st. A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier



Under no circumstances should a ground be connected to this receiver.

ALIGNMENT PROCEDURE

1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected, through a 200 mmf. capacitor, to the external antenna screw. Connect the signal generator ground to the top lug on loop antenna (see Chassis Top View)
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

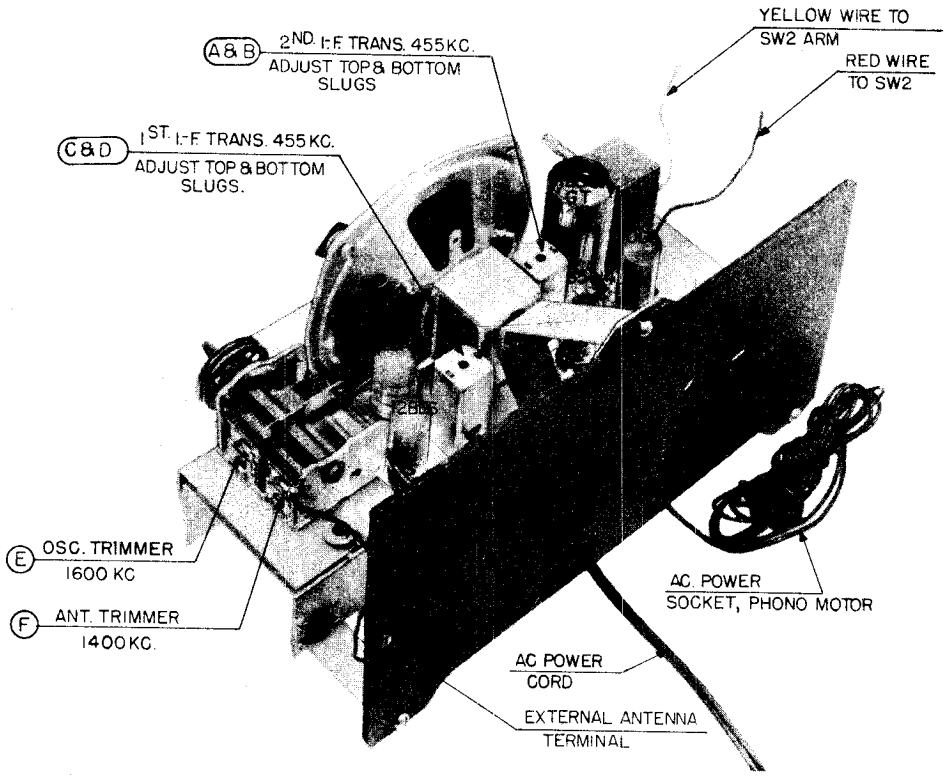
ALIGNMENT CHART

Alignment adjustment locations are shown on "CHASSIS, TOP VIEW."

Alignment Sequence	Signal Generator Output			Position of Dial Pointer	Adjust for Maximum Output
	Frequency in kc.	In Series with	To		
1	455	200 mmf.	External Ant. Screw	1620	* A, B, C & D
2	1620	200 mmf.	External Ant. Screw	1620	E
3	1400	200 mmf.	External Ant. Screw	1400	F

* Repeat adjustments until maximum output is obtained.

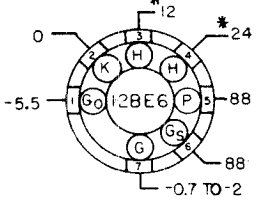
SCHEMATIC DIAGRAM



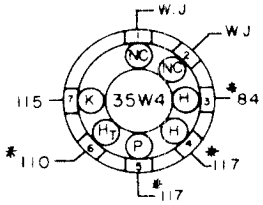
CHASSIS, TOP VIEW

MODELS 11-550MU,
11-560BU, Ch. 337

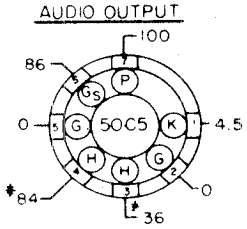
CONVERTER



RECTIFIER



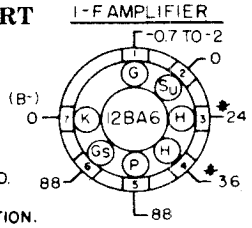
AUDIO OUTPUT



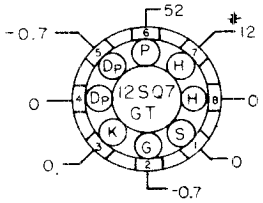
SOCKET VOLTAGE CHART

NOTES:
1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO B- (PIN 7 OF 12BA6)
3. MEASURED WITH THE VOLUME CONTROL AT MINIMUM & NO SIGNAL INTO THE LOOP, TUNING GANG CLOSED.
4. W.J = WIRING JUNCTION.
   * = AC VOLTAGES. NC = NO CONNECTION.
5. LINE VOLTAGE = 117 V., 60~AC.
6. SOCKET VOLTAGE TOLERANCE ± 10%

I-F AMPLIFIER



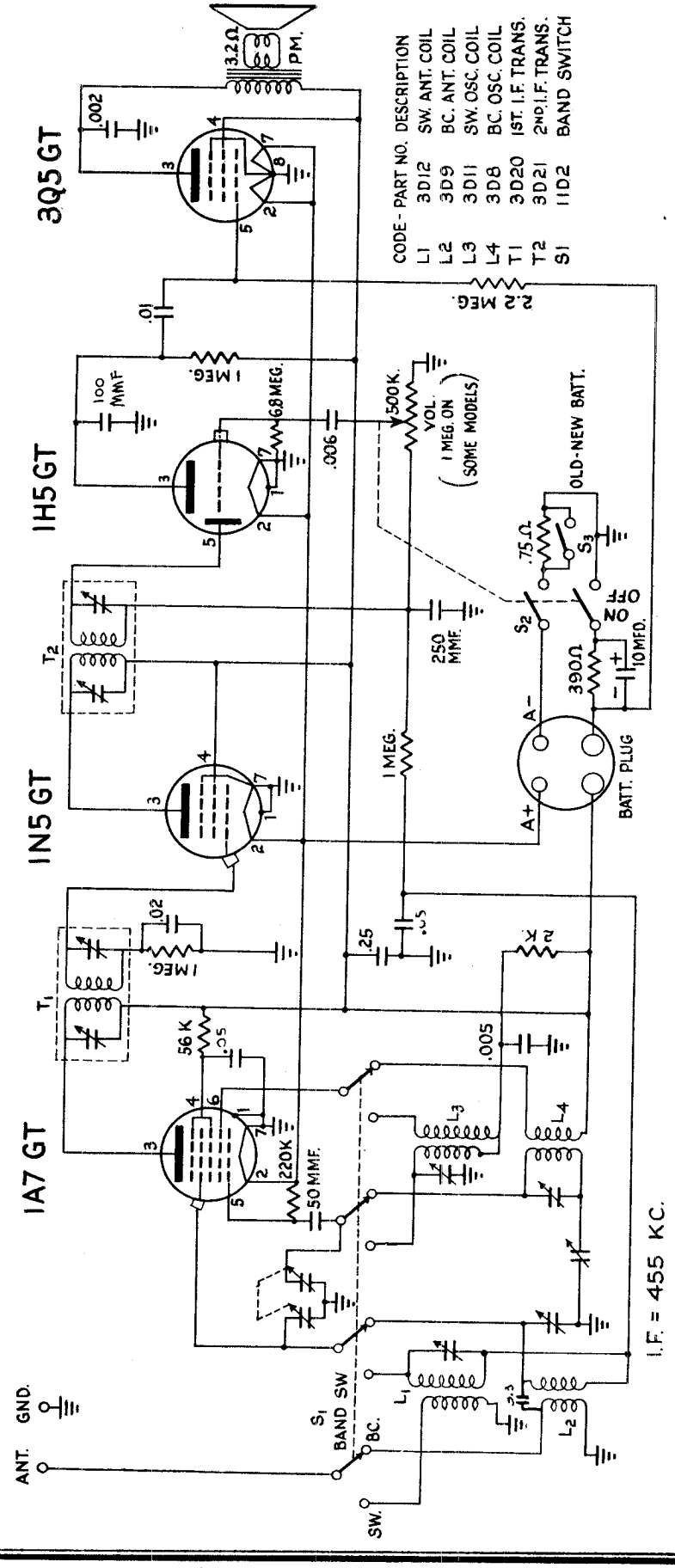
DET-AVC & 1ST AUDIO AMPL.



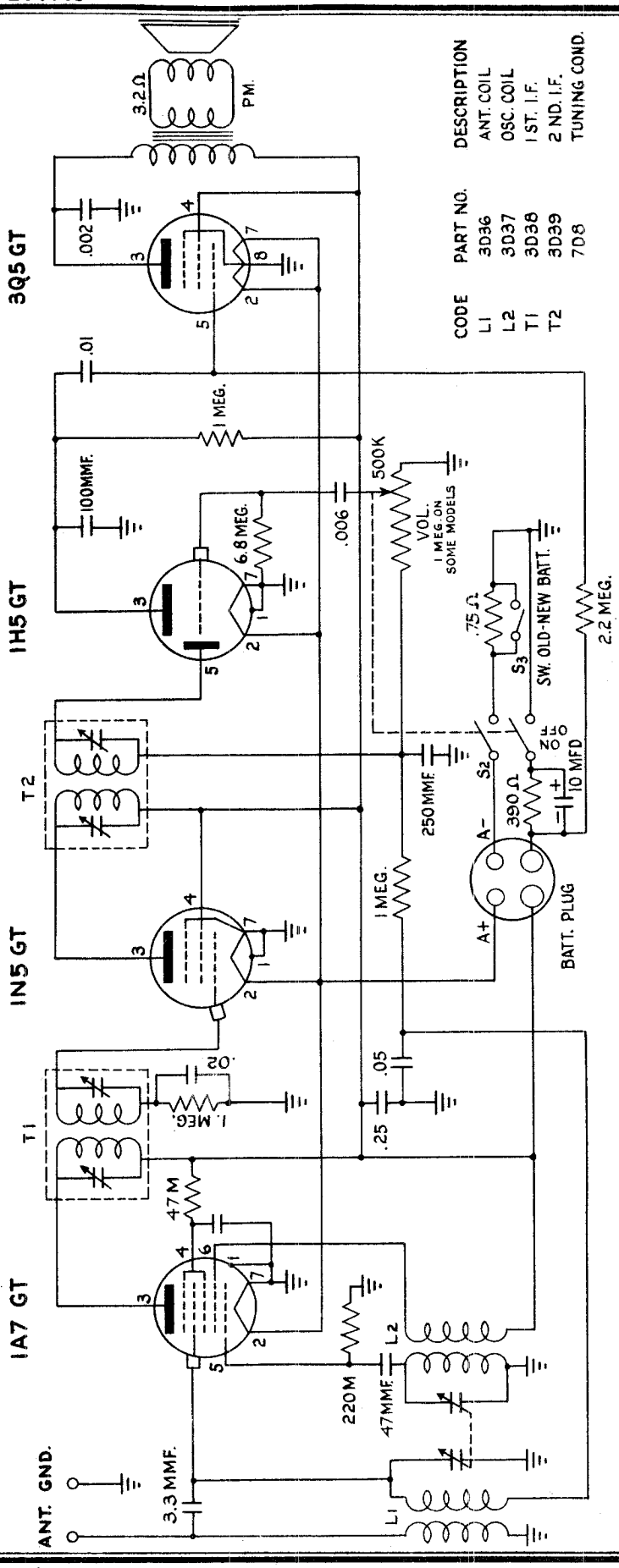
REPLACEMENT PARTS LIST

Symbol No.	Part No.	Description
C1A	B-150043	Capacitor, Variable } Two Section
C1B		Capacitor, Variable }
C2	C-137727-109	Capacitor, 39 mmf., 10%, 200 v. ceramic
C3	Part of T1	Capacitor, 106 mmf.
C4	Part of T1	Capacitor, 131 mmf.
C5	39001-19	Capacitor, .1 mfd., 600 v., paper
C6	Part of T2	Capacitor, 131 mmf.
C7	Part of T2	Capacitor, 106 mmf.
C8A	C-144675-1	Capacitor, .0002 mfd., 500 v. } Four Section disc ceramic
C8B		Capacitor, .002 mfd., 500 v. }
C8C		Capacitor, .005 mfd., 500 v. }
C8D		Capacitor, .0002 mfd., 500 v. }
C9	B-143686-3	Capacitor, 100 mmf., 500 v., molded disc ceramic
C10	39001-85	Capacitor, .08 mfd., 600 v., paper
C11	39001-74	Capacitor, .002 mfd., 600 v., paper
C12	39001-5	Capacitor, .0005 mfd., 600 v., paper
C13	39001-11	Capacitor, .005 mfd., 600 v., paper
C14	39001-85	Capacitor, .08 mfd., 600 v., paper
C15	39001-17	Capacitor, .05 mfd., 600 v., paper
C16A	B-147174	Capacitor, 100 mfd., 150 v. } Three Section Electrolytic
C16B		Capacitor, 30 mfd., 150 v. }
C16C		Capacitor, 10 mfd., 150 v. }
C17	39001-13	Capacitor, .01 mfd., 600 v., paper
R1	39373-60	Resistor, 22,000 ohm, 1/2 w.
R2	39373-97	Resistor, 2.2 megohm, 1/2 w.
R3	39373-74	Resistor, 100,000 ohm, 1/2 w.
R4	39374-34	Resistor, 5600 ohm, 10%, 1/2 w.
R5	39373-107	Resistor, 10 megohm, 1/2 w.
R6	B-150044	Control, Volume (3 megohm)
R7	39373-67	Resistor, 47,000 ohm, 1/2 w.
R8	39373-87	Resistor, 470,000 ohm, 1/2 w.
R9	39373-87	Resistor, 470,000 ohm, 1/2 w.
R10	39373-16	Resistor, 150 ohm, 1/2 w.
R11	39373-90	Resistor, 680,000 ohm, 1/2 w.
R12	39374-189	Resistor, 100 ohm, 10%, 2 w.
R13	39374-114	Resistor, 1200 ohm, 10%, 1 w.
R14	39373-33	Resistor, 1000 ohm, 1/2 w.
CA1	C-132300-10	Cable & Plug Assy., Power
CA2	Part of PH1	Cable & Connector (Male), Phono Motor
CA3	B-139727-1	Cable & Connector (Female), Phono Motor
L1	C-147961	Loop Antenna & Back Assy.
L2	AW-148259	Coil, Oscillator
PH1	D-148279-2	Record Changer (V950)
SP1	AD-145956-2	Speaker
SW1	Part of R6	Switch, Power
SW2	B-150042	Switch, Phono
T1	AC-139919-3	Transformer, 1st I.F.
T2	AC-139919-3	Transformer, 2nd I.F.
T3	B-147171	Transformer, Output
TS1	W-147784	Shield, Tube (V2)
TS2	W-46447-1	Shield, Tube (V3)
	R-150181	Base, 11-551M: Solid Front (11-550MU)
	R-150254	Base, 11-552M: with Doors (11-550MU)
	R-150182	Base, 11-561B: Solid Front (11-560BU)
	R-150311	Base, 11-562B: with Doors (11-560BU)
	W-147967	Bracket, Back Mtg.
	B-147968	Bracket, Speaker Support
	W-147184	Bracket, Volume Control
	AW-148203	Bushing & Support, Pointer Pulley
	R-150070	Cabinet (11-550MU)
	R-150268	Cabinet (11-560BU)
	AC-143896-12	Cable Assembly (53"-Shielded)
	W-131154-1	Cotter (External), Pointer Pulley
	150233	Doors, 1 pair (11-550MU)
	150255	Doors, 1 pair (11-552M Base)
	150270	Doors, 1 pair (11-560BU)
	150312	Doors, 1 pair (11-562B Base)
	150236	Drawer, Record Changer (11-550MU)
	150271	Drawer, Record Changer (11-560BU)
	D-150195	Escutcheon
	B-147160	Gasket, Speaker
	AB-150062-1	Grille & Cloth Assy. (11-550MU)
	AB-150062-2	Grille & Cloth Assy. (11-560BU)
	160273-1	Hinge, Upper L & Lower R (11-550MU, 11-552M Base)
	160273-2	Hinge, Upper R & Lower L (11-550MU, 11-552M Base)
	150269	Hinge, Upper L & Lower R (11-560BU, 11-562B Base)
	150273	Hinge, Upper R & Lower L (11-560BU, 11-562B Base)
	C-148708	Knob, Volume-Tuning
	W-139925-4	Knob, Radio-Phono (11-550MU)
	W-139925-3	Knob, Radio-Phono (11-560BU)
	W-147275	Mounting (Rubber), Speaker Support
	W-45580-2	Mounting (Rubber), Speaker
	W-147149-3	Pointer, Tuning
	W-147181	Pulley, Pointer
	150232	Pull, Door (11-550MU Cabinet, 11-552M Base, 11-560BU Cabinet, 11-562B Base)
	149977	Pull, Record Changer Drawer
	W-137170	Retainer, Record Changer
	143478	Slide, Record Changer Drawer
	39462-2	Socket, Tube (V1, V2, V4, V5)
	W-149987	Socket, Tube (V3)
	W-51752	Spring, Drive Cord
	139319SB	Strike & Catch, Door (11-550MU, 11-552M Base)
	149951	Strike & Catch, Door (11-560BU, 11-562B Base)
	150235	Top, Cabinet (11-550MU)
	150272	Top, Cabinet (11-560BU)
	150313	Top, Base (11-562B)

MODEL 502



MODEL 505



Model E-520 is a three band superheterodyne receiver, having one broadcast range and two short wave ranges. This receiver is designed to operate at 105-125 volts, 50-60 cycles AC or DC unless otherwise specified.

B.C. BAND	1680-525 K.C.	178-570 METERS
S.W. 2 BAND	8.0-2.5 M.C.	37.5-120 "
S.W. 1 BAND	24.2-7.5 M.C.	12.4-40 "

INSTALLATION: Make certain that all tubes are in place and pressed down in their sockets. A label showing the location of each tube will be found underneath the cabinet. A loop-tenna is incorporated which makes the use of an antenna unnecessary, in most localities, for broadcast reception. If it is found that additional pick-up is desired on the standard broadcast band, an antenna may be connected to the red lead extending from the rear of the chassis, and the black lead connected to an external ground. On short wave reception an external antenna and ground should be used.

VOLUME CONTROL AND POWER SWITCH: The second knob from the left is the power switch and volume control. When the control is in the extreme counterclockwise position, the power is "off". From this position, a slight clockwise rotation will turn the power "on", and by further rotation in this direction, volume may be increased to any degree until the full output of the receiver is obtained.

TUNING CONTROL: The knob on the right is the tuning control knob which operates the pointer and tuning condenser through a reduction drive to insure ease and accuracy in the selection of stations.

WAVE BAND SWITCH: The second knob from the right of the receiver is the wave band switch. This switch has three positions. When in the extreme counter-clockwise position, Standard Broadcast stations may be tuned in. When the switch is in the extreme clockwise position, Short Wave Band #1 may be tuned in. The intermediate position is for tuning in Short Wave Band #2.

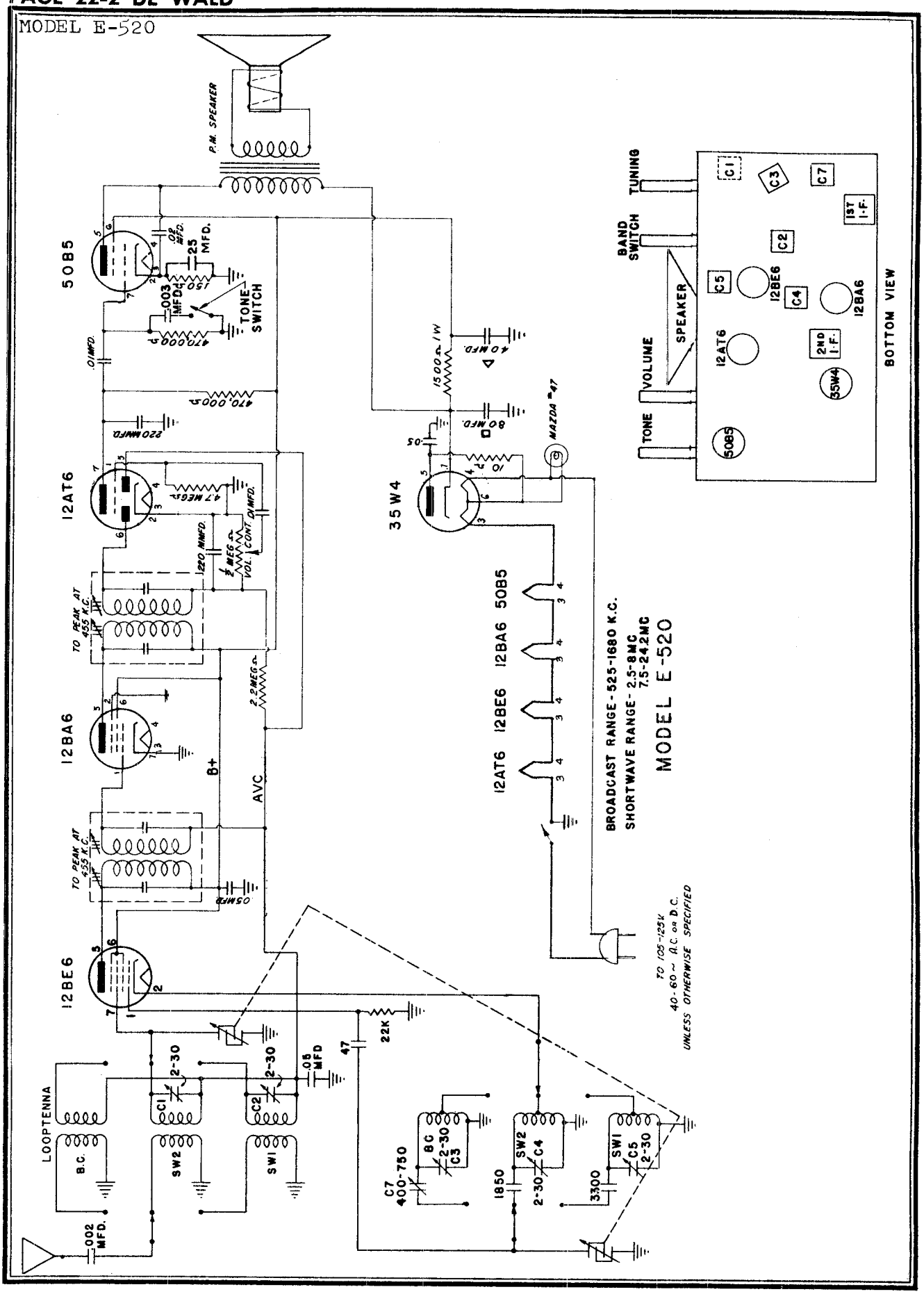
TONE CONTROL SWITCH: The extreme left knob is the tone control which allows the selection of two degrees of tone response.

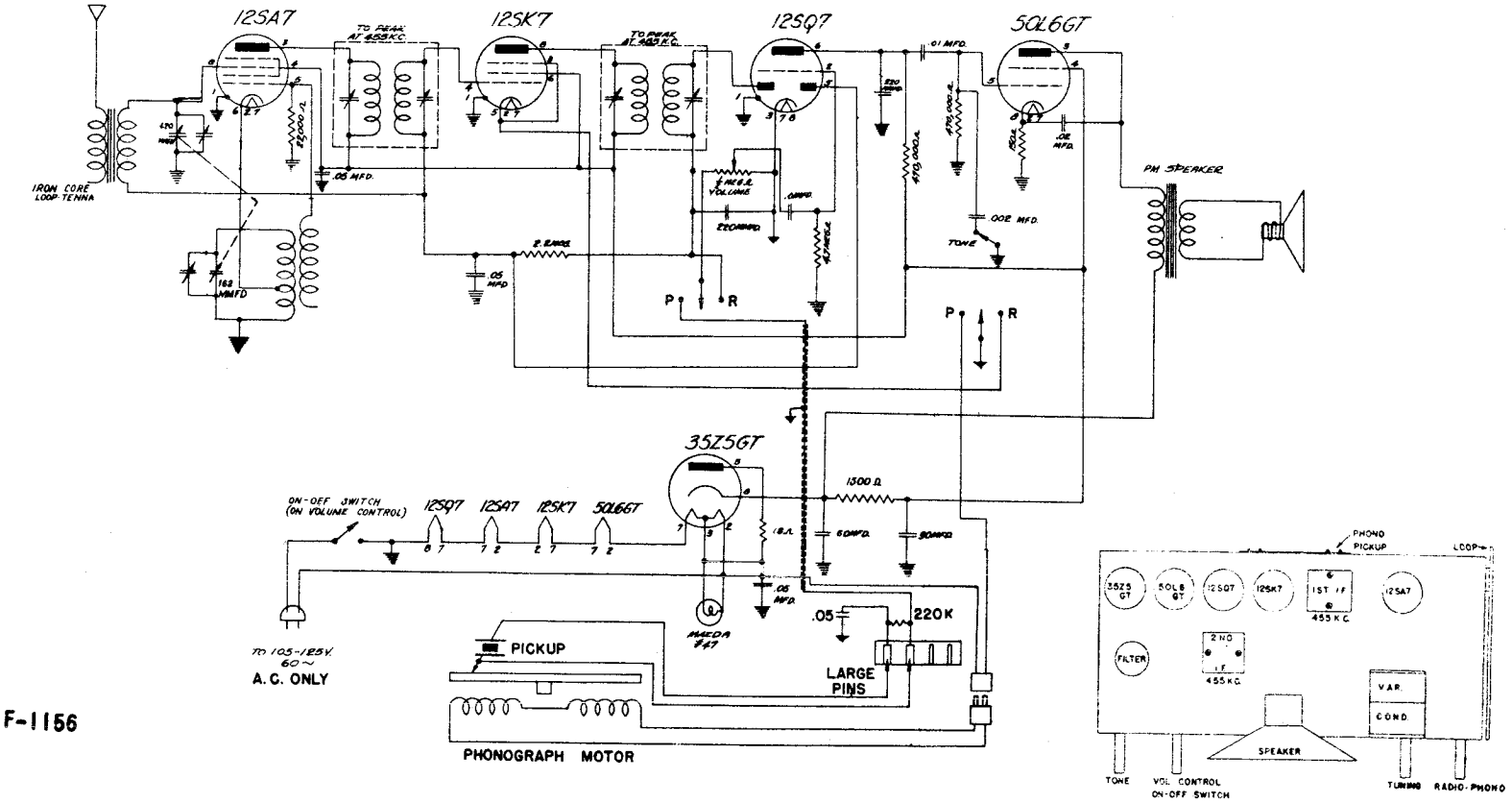
To calibrate receiver, connect the output of signal generator in series with a 200 MMFD fixed condenser to the flexible antenna lead attached to the loop. Connect the low side of generator through a 0.1 MFD condenser to receiver chassis. The wave band switch should be in broadcast position. Adjust the generator to 455 K.C. and adjust both I.F. transformers (both top and bottom) for maximum signal. Open the variable condenser for minimum capacity. Turn the wave band switch to short wave #1 position. Set generator at 24.2 M.C. Peak the short wave #1 oscillator trimmer screw (C5) for maximum signal. Next set generator at 23 M.C. Tune in this signal. Adjust short wave #1 R.F. trimmer screw (C2) for maximum signal. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to short wave #2 position. Rotate drive shaft until variable condenser is all the way open. Adjust generator to 8 M.C. Adjust the short wave #2 oscillator trimmer screw (C4) until maximum signal is heard. Next set generator at 7 M.C. Tune in this signal and adjust short wave #2 R.F. trimmer screw (C1) for maximum signal strength. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to broadcast position. Adjust generator to 1500 K. C. and tune in this signal. Adjust the broadcast oscillator trimmer screw (C3) for maximum signal. To adjust the low end of the dial, set the generator and receiver at 600 K.C.. Peak the broadcast padder (C7) for maximum output. The variable condenser should be rocked slightly during the operation. Keep the signal generator output as low as possible when making all these adjustments. It is extremely necessary in making the short wave adjustments, that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental.

REPLACEMENT PARTS

	LOOP ANTENNA
1093A	B.C. OSC COIL
1094-1	S.W. 1 ANT COIL
1095-1	S.W. 1 OSC COIL
1094-2	S.W. 2 ANT COIL
1095-2	S.W. 2 OSC COIL
1091A-1	2ND I.F. COIL
1091A-4	1ST I.F. COIL
2014-4	VARIABLE CONDENSER
2049-2	ELECTROLYTIC CONDENSER CAN
6022A-2	DIAL SCALE
8001-7	PILOT LAMP ASSEMBLY
9123-3	DRIVE SHAFT
7017-2	P.M. SPEAKER WITH OUTPUT TRANS.
8017-B-4	WAVE BAND SWITCH
2050	PADDER CONDENSER (BROADCAST)
8043-2	TONE CONTROL SWITCH
3013-4	VOL CONTROL & "ON-OFF" SWITCH
4093-C	CABINET
4132-1	KNOB

TUBES: 12BA6 - 12BE6 - 12AT6 - 35W4 - 50B5


MODEL E-520
P.M. SPEAKER
5085
12AT6
12BA6
12BE6
35W4
TONE SWITCH
.02 MFD.
25 MFD.
150
.003 MFD
470,000Ω
.01MFD.
470,000Ω
220 MMFD.
47 MEGΩ
120 MMFD.
2 MEG Ω VOL CONT.
TO PEAK AT 455 K.C.
2.2MEG Ω
.05MFD
B+
AVC
1500Ω 1W
40 MFD.
80 MFD.
.05
10Ω
MAZDA #47
12AT6 12BE6 12BA6 5085
BROADCAST RANGE - 525-1680 K.C.
SHORTWAVE RANGE - 2.5-8 MC 7.5-24.2 MC
MODEL E-520
TO 105-125V. 40-60~ A.C. or D.C. UNLESS OTHERWISE SPECIFIED
LOOPTENNA
B.C.
SW2
SW1
C1
C2
2-30
.05 MFD
47
22K
C7 400-750
B.C. C3 2-30
SW2 C4 2-30
SW1 C5 2-30
1850
3300
.002 MFD.
TUNING
BAND SWITCH
VOLUME
TONE
SPEAKER
BOTTOM VIEW
C1
C2
C3
C4
C5
C7
1ST I.F.
2ND I.F.
12BE6
12BA6
12AT6
35W4
5085



F-1156

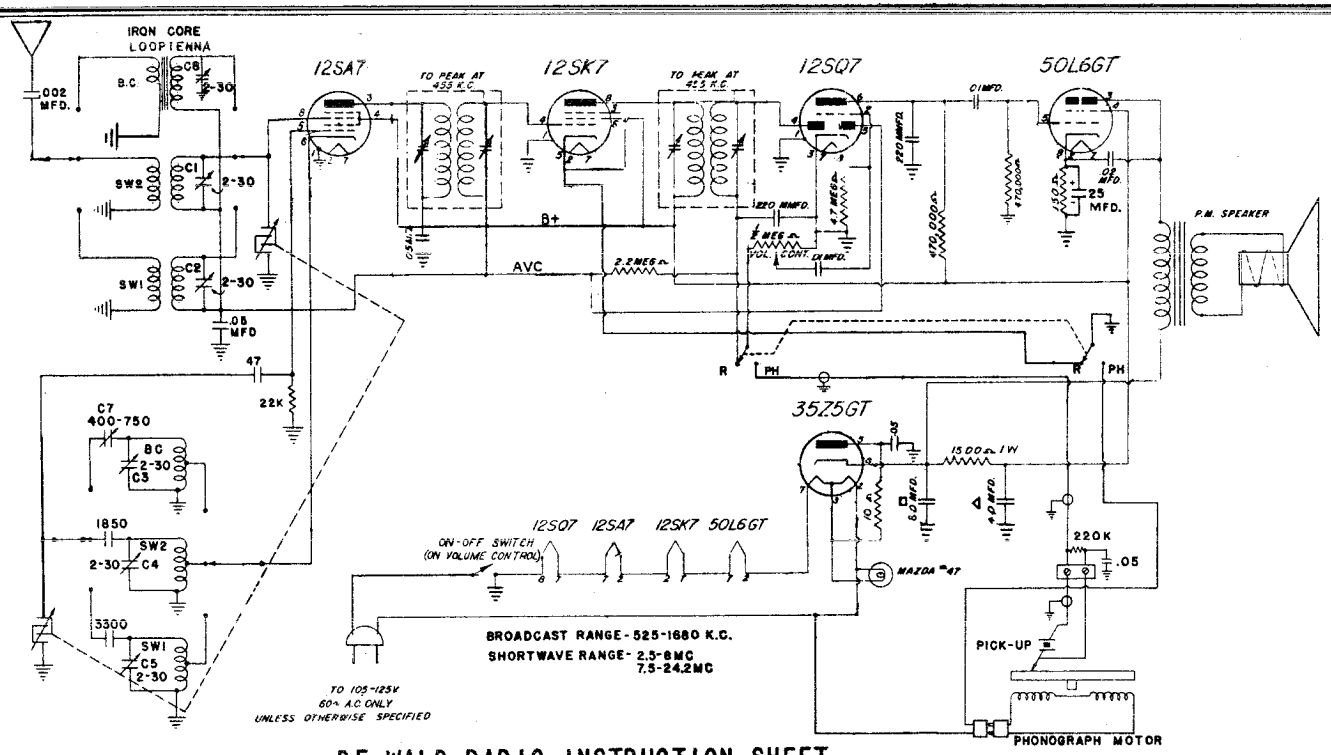
1137	ANT. LOOP		**REPLACEMENT PARTS**	7001-1	SPEAKER
1028-2	OSCILLATOR COIL	3029	1/2 W. RESISTOR	8001-2	PILOT LAMP SOCKET
1136	1ST I.F. COIL	3004	2 W. RESISTOR		AUTOMATIC RECORD CHANGER
1136	2ND DETECTOR COIL	3002-2	VOL. CONTR. AND SWITCH	9032-2	SHAFT
2000A	PAPER CONDENSER	8003-1	TONE CONTROL SWITCH	9818C	BUSHING
2012B	CERAMIC CONDENSER	8004-1	PHONO. SWITCH	9069-3	DRIVE SPRING
2005-8	COMB. ELECTROLYTIC	5000	LINE CORD		DIAL CORD
2003C	VAR. CONDENSER	6007	DIAL SCALE	#47	PILOT LAMP
				4132-3	KNOB

Range: 535-1720 Kilocycles

A. C. Volts	Cycles	Watts
105-125	60	45

TUBES

1 12SA7 - 1 12SK7 - 1 12SQ7 - 1 50L6GT - 1 35Z5GT



REPLACEMENT PARTS

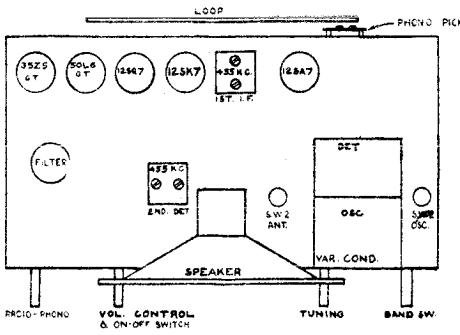
1136	1ST I.F. COIL
2014-4	VARIABLE CONDENSER
2049-2	ELECTROLYTIC CONDENSER CAN
6022A-4	DIAL SCALE
8001-7	PILOT LAMP ASSEMBLY
9032-2	DRIVE SHAFT
1137	LOOP ANTENNA
1093A	B.C. OSC COIL
1094-1	S.W. 1 ANT COIL
1095-1	S.W. 1 OSC COIL
1094-2	S.W. 2 ANT COIL
1095-2	S.W. 2 OSC COIL
1136	2ND I.F. COIL
7017-3	P.M. SPEAKER WITH OUTPUT TRANS.
8017-C-4	WAVE BAND SWITCH
2050	PADDER CONDENSER (BROADCAST)
8004-1	PHONO. SWITCH
3002-2	VOL. CONTR. AND SWITCH
#47	PILOT LAMP
4132	KNOB

F-1160 5/51

DE WALD RADIO INSTRUCTION SHEET

TUBES: 1 12SA7 - 1 12SK7 - 1 12SQ7 - 1 50L6GT - 1 35Z5GT

To calibrate receiver, connect the output of signal generator in series with a 200 MMFD fixed condenser to the flexible antenna lead attached to the loop. Connect the low side of generator through a 0.1 MFD condenser to receiver chassis. The wave band switch should be in broadcast position. Adjust the generator to 455 K.C. and adjust both I.F. transformers for maximum signal. Open the variable condenser for minimum capacity. Turn the wave band switch to short wave #1 position. Set generator at 24.2 M.C. Peak the short wave #1 oscillator trimmer screw (C5) for maximum signal. Next set generator at 23 M.C. Tune in this signal. Adjust short wave #1 R.F. trimmer screw (C2) for maximum signal. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to short wave #2 position. Rotate drive shaft until variable condenser is all the way open. Adjust generator to 8 M.C. Adjust the short wave #2 oscillator trimmer screw (C4) until maximum signal is heard. Next set generator at 7 M.C. Tune in this signal and adjust short wave #2 R.F. trimmer screw (C1) for maximum signal strength. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to broadcast position. Adjust generator to 1500 K.C. and tune in this signal. Adjust the broadcast oscillator trimmer screw (C3) and the R.F. trimmer screw (C8) for maximum signal. To adjust the low end of the dial, set the generator and receiver at 600 K.C. Peak the broadcast padder (C7) for maximum output. The variable condenser should be rocked slightly during the operation. Keep the signal generator output as low as possible when making all these adjustments. It is extremely necessary in making the short wave adjustments, that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental.



MODEL 653B,
Ch. 120136-B

MODEL 653B
Chassis 120136-B

DESCRIPTION

TYPE: Single-band superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

V-1-12SA7—pentagrid oscillator-modulator

V-2-12SK7—first i-f amplifier

V-3-12SQ7—diode detector, a-f amplifier, a.v.c.

V-4-50L6GT—beam power output

V-5-35Z5GT—half-wave rectifier

POWER SUPPLY: A.C. or D.C.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

CURRENT DRAIN: 0.24 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.

3. Model 653B has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear near the line cord. Use no ground connection.

4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

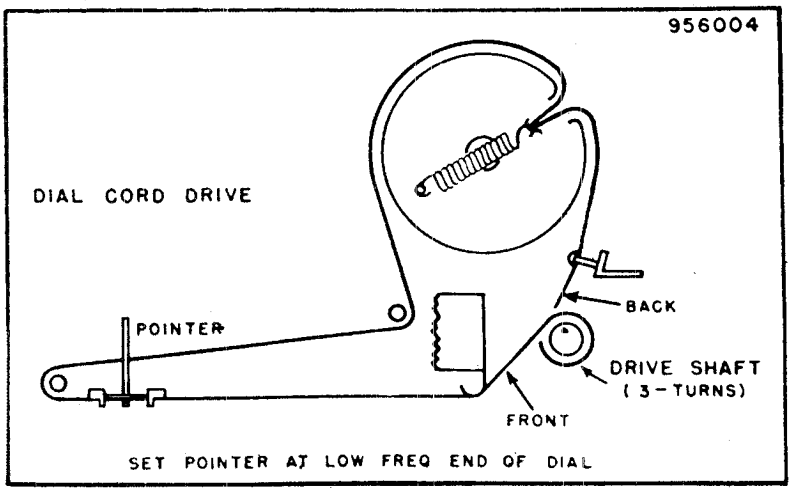


Fig. 2—Dial Cord Stringing, Model 653B

MODEL 653B,
Ch. 120136-B

ALIGNMENT

To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to stator of rear section of tuning condenser. Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1620 kc	Variable condenser fully open.	Across voice coil.	A5	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1400 kc	Tune for maximum output.	Across voice coil.	A6	Adjust for maximum output.

VOLTAGE READINGS FOR CHASSIS 120136-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V-1	12SA7	—.3 DC	24 AC	80 DC	80 DC	—6 DC	0	12 AC	—.7 DC
V-2	12SK7	—.3 DC	36 AC	0	—1 DC	0	80 DC	24 AC	80 DC
V-3	12SQ7	—.3 DC	—.7 DC	0	—.7 DC	—.5 DC	50 DC	0	12 AC
V-4	50L6GT	0	80 AC	110 DC	80 DC	0	0	36 AC	5 DC
V-5	35Z5GT	0	117 AC	110 AC	0	110 AC	0	80 AC	110 DC

RESISTANCE READINGS FOR CHASSIS 120136-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V-1	12SA7	Inf.	28	500,000	500,000	24,000	.5	14	4 meg.
V-2	12SK7	Inf.	45	0	4 meg.	0	500,000	28	500,000
V-3	12SQ7	Inf.	10 meg.	0	4 meg.	500,000	1 meg.	0	14
V-4	50L6GT	N.C.	95	500,000	500,000	500,000	0	44	150
V-5	35Z5GT	N.C.	130	120	N.C.	140	N.C.	95	500,000

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltage measured at 1,000 ohms per volt.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

MODEL 653B,
Ch. 120136-B

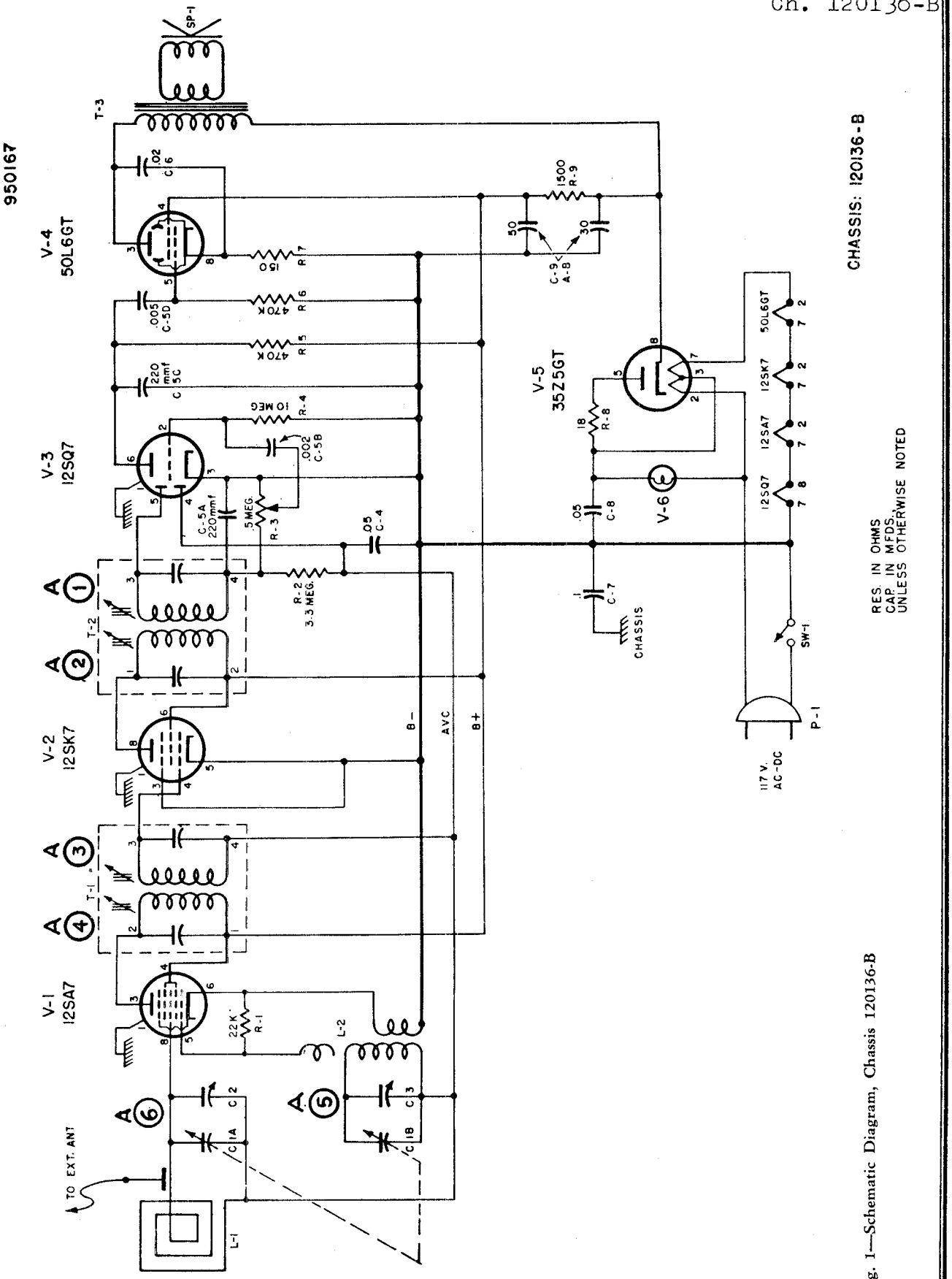


Fig. 1—Schematic Diagram, Chassis 120136-B

MODEL 653B,
Ch. 120136-B

CHASSIS PARTS LIST (Chassis 120136-B)

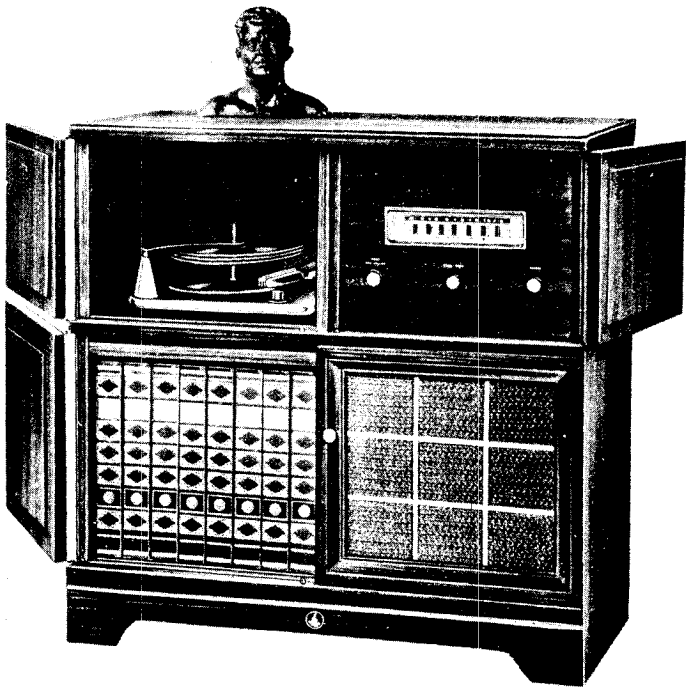
ITEM	PART NO.	DESCRIPTION
C-1A, C-1B	900071	Variable Capacitor—R.F. Section; Variable Capacitor—Osc. Section
C-2	Pt. of C-1A	Trimmer—R.F. Section
C-3	Pt. of C-1B	Trimmer—Osc. Section
C-4	920539	.05 mf. 400V
C-5A	923023	220 mmf. — Multiple Condenser
C-5B		.002 mf. — Multiple Condenser
C-5C		220 mmf. — Multiple Condenser
C-5D		.005 mf. — Multiple Condenser
C-6	920540	.02 mf. 400V
C-7	920040	.1 mf. 200V
C-8	920539	.05 mf. 400V
C-9A	925000	50 mf. Electrolytic 150V
C-9B		30 mf. Electrolytic 150V
L-1	700051	Loop Antenna & Back
L-2	716026-2	Oscillator Coil
P-1	583032	Line Cord & Plug
R-1	Pt. of L-2	22,000 ohm ½ W ±10%
R-2	351330	3.3 megohm ½ W ±20%
R-3	390145	500,000 ohm Volume Control

ITEM	PART NO.	DESCRIPTION
R-4	351450	10 megohm ½ W ±20%
R-5	351130	470,000 ohm ½ W ±20%
R-6	351130	470,000 ohm ½ W ±20%
R-7	340292	150 ohm ½ W ±10%
R-8	340072	18 ohm ½ W ±10%
R-9	380532	1,500 ohm 1W ±20%
SP-1	180045	Speaker—PM—5"
SW-1	Pt. of R-3	On-Off Switch
T-1	720525	1st I.F. Transformer
T-2	720021	2nd I.F. Transformer
T-3	734057	Output Transformer
V-1	800000	Vacuum Tube—12SA7
V-2	800020	Vacuum Tube—12SK7
V-2	800030	Vacuum Tube—12SK7GT
V-3	800040	Vacuum Tube—12SQ7
V-3	800050	Vacuum Tube—12SQ7GT
V-4	800070	Vacuum Tube—50L6GT
V-5	800090	Vacuum Tube—35Z5GT
V-6	807000	Pilot Light—.15 amp.

CABINET PARTS LIST (Model 653B)

PART NO.	DESCRIPTION
140345	Cabinet—Bakelite—Walnut
140377	Cabinet—Urea—Ivory
460162S	Knob
470608	Baffle & Grille Cloth
583032	Line Cord
531323	Drive Pulley
180045	Speaker
530002	Drive Cord (30" approx.)
410904	Dial Back Plate
525022-2	Pointer
700051	Loop Antenna & Back

MODEL 670B,
Ch. 120139-B



Model—670B
Chassis—120139-B

DESCRIPTION

TYPE: Single band (AM) superheterodyne
FREQUENCY RANGE: 540-1620 KC.

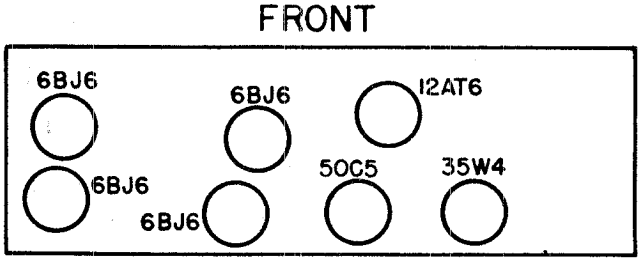
TYPES OF TUBES:

- V-1-6BJ6 converter
- V-2-6BJ6 oscillator
- V-3-6BJ6 1st i.f. amplifier
- V-4-6BJ6 2nd i.f. amplifier
- V-5-12AT6 Detector, a.v.c., a-f amplifier
- V-6-50C5 Power output
- V-7-35W4 Rectifier

POWER SUPPLY: A.c. or d.c.
VOLTAGE RATING: 115 volts
POWER CONSUMPTION: 30 watts
CURRENT DRAIN: 0.26 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.
3. The receiver has a self-contained antenna, and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear. Use no ground connection.
4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.



TUBE LOCATIONS

MODEL 670B,
Ch. 120139-B

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms unless otherwise specified.
2. A.C. and D.C. measurements are taken with a V.T.V.M.
3. Measured values are from socket pin to common negative (B—).
4. Line voltage maintained at 115V A.C. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum with no signal applied, for voltage measurements.
7. **Measurements taken with radio-phono switch in radio position.**

VOLTAGE READINGS FOR CHASSIS 120139-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	6BJ6	—1 D.C.	1 D.C.	18 A.C.	12 A.C.	90 D.C.	35 D.C.	0
V-2	6BJ6	—7.2 D.C.	0	24 A.C.	18 A.C.	90 D.C.	90 D.C.	0
V-3	6BJ6	0	1.4 D.C.	30 A.C.	36 A.C.	70 D.C.	90 D.C.	0
V-4	6BJ6	—1 D.C.	.75 D.C.	30 A.C.	24 A.C.	90 D.C.	90 D.C.	0
V-5	12AT6	—.8 D.C.	0	0	12 A.C.	0	—.3 D.C.	45 D.C.
V-6	50C5	5.8 D.C.	0	36 A.C.	80 A.C.	0	90 D.C.	105 D.C.
V-7	35W4	115 A.C.	110 D.C.	80 A.C.	115 A.C.	112 A.C.	110 A.C.	120 D.C.

RESISTANCE READINGS FOR CHASSIS 120139-B

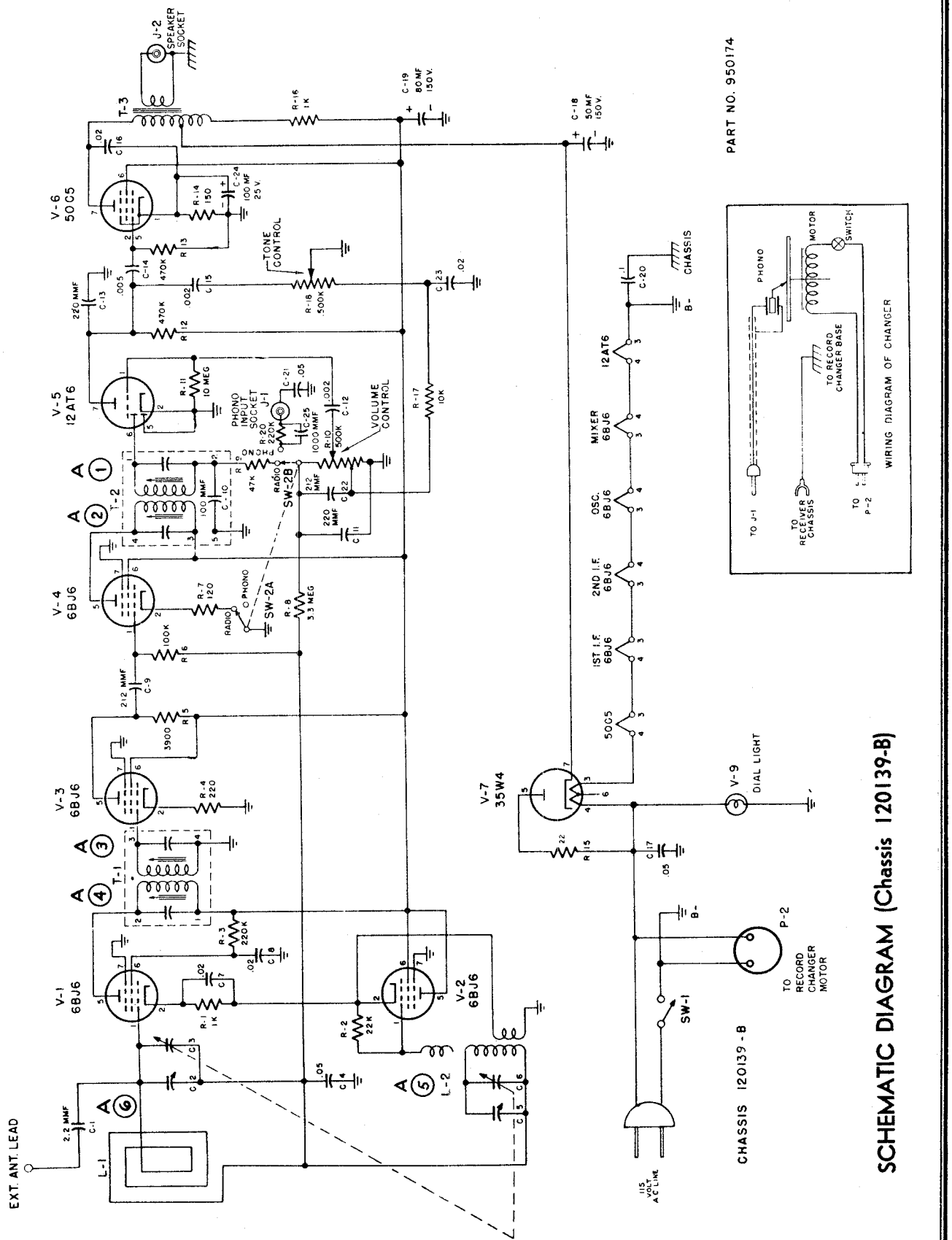
SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	6BJ6	4.2 meg.	1000	22	16	500,000	1 meg.	0
V-2	6BJ6	22,000	1	30	22	500,000	500,000	0
V-3	6BJ6	20	220	38	46	500,000	500,000	0
V-4	6BJ6	4.3 meg.	120	38	30	500,000	500,000	0
V-5	12AT6	10 meg.	0	0	16	0	550,000	1 meg.
V-6	50C5	150	500,000	46	100	500,000	500,000	500,000
V-7	35W4	135	500,000	100	135	155	130	500,000

ALIGNMENT PROCEDURE

1. To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and B minus bus.
3. Volume control should be at maximum position; output of signal generator should be not higher than necessary to obtain an output reading.
4. Use an insulated alignment screwdriver for adjusting.

STEPS	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 1 (grid) of 6BJ6 (V1). Low side to B minus Bus.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2 (2nd i-f trans. T2) A3, A4 (1st i-f trans. T1)	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to B minus Bus.	1620 kc	Variable condenser fully open.	Across voice coil.	A5 (Trimmer cond. C5).	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to B minus Bus.	1400 kc	Tune for maximum output.	Across voice coil.	A6 (Trimmer cond. C2).	Adjust for maximum output.

MODEL 670B,
Ch. 120139-B



MODEL 670B,
Ch. 120139-B

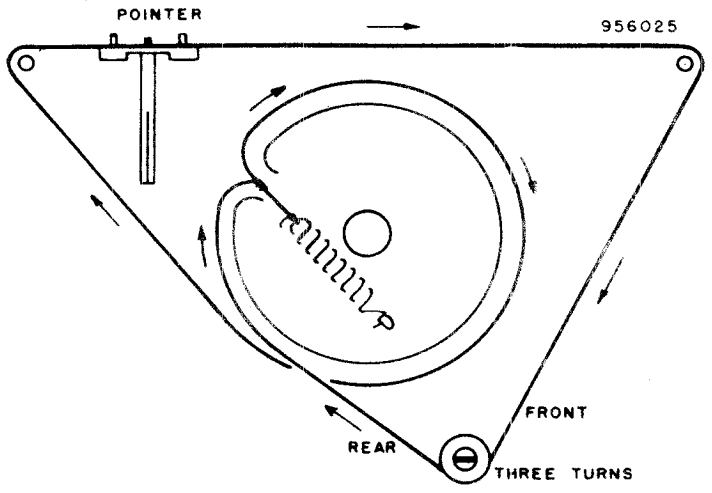
CHASSIS PARTS LIST (Chassis 120139-B)

Symbol	Part No.	Description
C-1	Pt. of L-1	2.2 mmf.
C-2	Pt. of 900079	Trimmer — r.f
C-3	Pt. of 900079	Variable capacitor — r.f. section
C-4	920030	.05 mf paper 400v
C-5	Pt. of 900079	Trimmer — osc.
C-6	Pt. of 900079	Variable capacitor — osc. section
C-7	920020	.02 mf paper 400v
C-8	920020	.02 mf paper 400v
C-9	928104	212 mmf ceramic
C-10	Pt. of T-2	100 mmf
C-11	Pt. of 470310	220 mmf }
C-12	Pt. of 470310	.002 mf }
C-13	Pt. of 470310	220 mmf } Multiple capacitor
C-14	Pt. of 470310	.005 mf }
C-15	920545	.002 mf paper 400v
C-16	920020	.02 mf paper 400v
C-17	922101	.05 mf molded 400v
C-18	Pt. of 925195	50 mf electrolytic 150v
C-19	Pt. of 925195	80 mf electrolytic 150v
C-20	920040	.1 mf paper 200v
C-21	920030	.05 mf paper 400v
C-22	928104	212 mmf ceramic
C-23	920020	.02 mf paper 400v
C-24	Pt. of 925195	100 mf electrolytic 25v
C-25	928003	1000 mmf ceramic
L-1	700054	Loop antenna
L-2	716063	Oscillator — coil
R-1	340492	1,000 ohm carbon ½W ±10%
R-2	Pt. of L-2	22,000 ohm
R-3	341050	220,000 ohm carbon ½W ±10%
R-4	340332	220 ohm carbon ½W ±10%
R-5	340632	3,900 ohm carbon ½W ±10%
R-6	350970	100,000 ohm carbon ½W ±20%
R-7	340272	120 ohm carbon ½W ±10%
R-8	351330	3.3 megohm carbon ½W ±20%
R-9	340890	47,000 ohm carbon ½W ±10%
R-10	390178	500,000 ohm volume control
R-11	351450	10 megohm carbon ½W ±20%
R-12	351130	470,000 ohm carbon ½W ±20%
R-13	351130	470,000 ohm carbon ½W ±20%
R-14	340292	150 ohm carbon ½W ±10%
R-15	370092	22 ohm carbon 1W ±10%
R-16	370490	1,000 ohm carbon 1W ±10%
R-17	340732	10,000 ohm carbon ½W ±10%
R-18	Pt. of 390178	500,000 ohm tone control
R-20	341050	220,000 ohm carbon ½W ±
J-1	Pt. of 508002	Phono input socket
J-2	Pt. of 508002	Speaker socket
SW-1	Pt. of 390178	On-off switch
SW-2A, B	510077	Phono-radio switch
T-1	720033	1st i.f. transformer
T-2	720125	2nd i.f. transformer
T-3	734063	Output transformer
P-2	585067	Phono motor plug and cable assy.
V-1	800023	Vacuum tube - 6BJ6
V-2	800023	Vacuum tube - 6BJ6
V-3	800023	Vacuum tube - 6BJ6
V-4	800023	Vacuum tube - 6BJ6
V-5	800523	Vacuum tube - 12AT6
V-6	800032	Vacuum tube - 50C5
V-7	800526	Vacuum tube - 35W4
V-9	807003	Pilot light dial

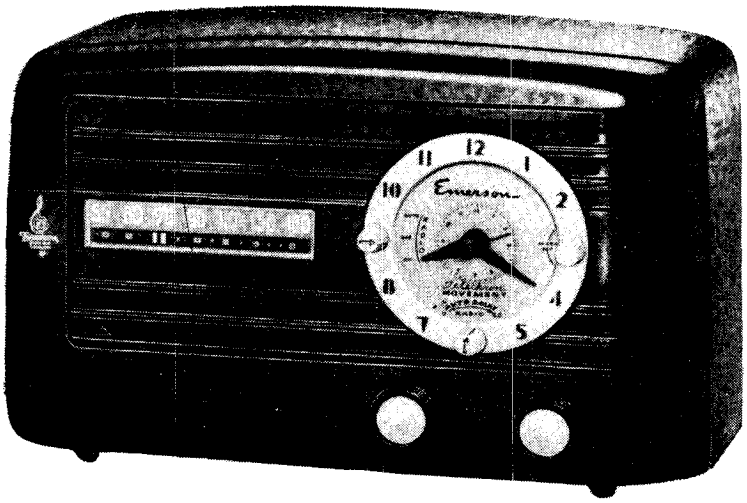
Prices subject to change without notice.

CABINET PARTS LIST (Model 670B)

Part No.	Description	Part No.	Description
140397	Cabinet	587011	Spring Insert (Knobs)
411115	Metal Grille	585067	Motor Plug and Cable Assembly
520064	Escutcheon	508002	Phono and Speaker Socket
520142	Glass Dial	510077	Phono-Radio Switch
180077	Speaker (12")	280162	Drive Shaft
505040	Speaker Plug	411022	Dial Support Bracket
819060	G.I. 3-Speed Changer	411064	Dial Back Plate
560151	45 R.P.M. Adaptor	530002	Drive Cord (50")
450068S	Knob — Tuning and Phono	700054	Loop Antenna
450089	Knob — Tone	411024	Loop Bracket
450099S	Knob — Volume	525056	Dial Pointer



MODEL 671D,
Ch. 120137-D



MODEL: 671D
CHASSIS: 120137-D

DESCRIPTION

TYPE: Single-band superheterodyne, with clock-timer and appliance outlet.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

V-1—12BE6, oscillator mixer

V-2—12BA6, first i-f amplifier

V-3—12AT6, detector, a-f amplifier

V-4—50C5, A. F. output

V-5—35W4, rectifier

POWER SUPPLY: A.C. 60 cycles only

VOLTAGE RATING: 115 volts.

POWER CONSUMTION: 32 watts.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. This model has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear. Use no ground connection.

3. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

4. Appliance outlet and radio on-off switch located in back of chassis. For information on clock applications see instructions supplied with set.

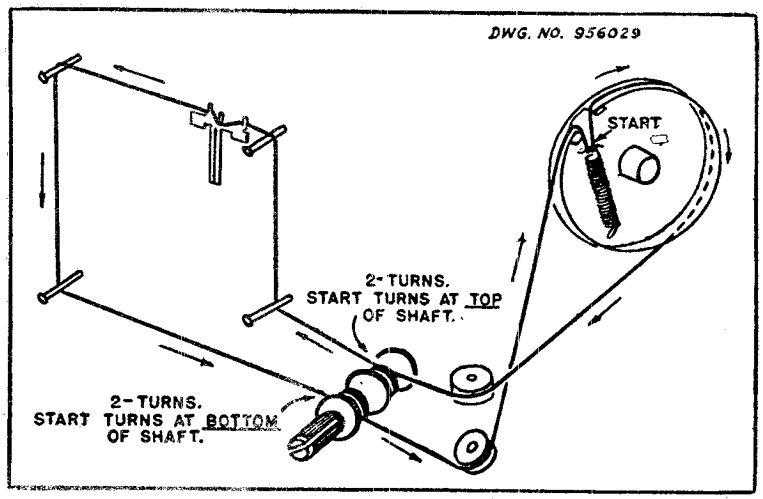


Fig. 2—Dial Cord Stringing, Model 671D

MODEL 671D,
Ch. 120137-D

ALIGNMENT

To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate. Use isolation transformer if available. It not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.001 mfd.	High side to stator of rear section of tuning condenser. Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1620 kc	Variable condenser fully open.	Across voice coil.	A5	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1400 kc	Tune for maximum output.	Across voice coil.	A6	Adjust for maximum output.

VOLTAGE READING FOR CHASSIS 120137-D

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	—6.3 DC	0	24 AC	12 AC	90 DC	90 DC	—.8 DC
V-2	12BA6	—.8 DC	0	24 AC	36 AC	90 DC	90 DC	1 DC
V-3	12AT6	—.9 DC	0	0	12 AC	—.7 DC	—.8 DC	38 DC
V-4	50C5	5.5 DC	0	80 AC	36 AC	0	90 DC	110 DC
V-5	35W4	0	0	80 AC	117 AC	115 AC	110 AC	120 DC

RESISTANCE READING FOR CHASSIS 120137-D

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	2,400	0.4	26	14	300,000	300,000	4 meg.
V-2	12BA6	4 meg.	0	26	38	300,000	300,000	120
V-3	12AT6	10 meg.	0	0	14	500,000	4 meg.	800,000
V-4	50C5	150	470,000	90	38	470,000	300,000	350,000
V-5	35W4	N.C.	N.C.	90	125	150	120	350,000

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltage measured at 1,000 ohms per volt.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts, 60 cycles for voltage readings.
5. Normal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

NOTE: The radio and clock mechanism of MODEL 671D are covered by the Emerson warranty. If is should be necessary to have the clock mechanism repaired after the warranty has expired, it should be sent to the nearest authorized Telechron service station.

TO REMOVE THE CLOCK MECHANISM FROM THE CABINET THE FOLLOWING STEPS SHOULD BE TAKEN:

1. Remove radio chassis from cabinet.
2. Unsolder 3-wires at terminal strip coming from clock.
3. Remove three nuts located on back of clock and remove clock cover.
4. Carefully remove clock from *front* of cabinet.

MODEL 671D,
Ch. 120137-D

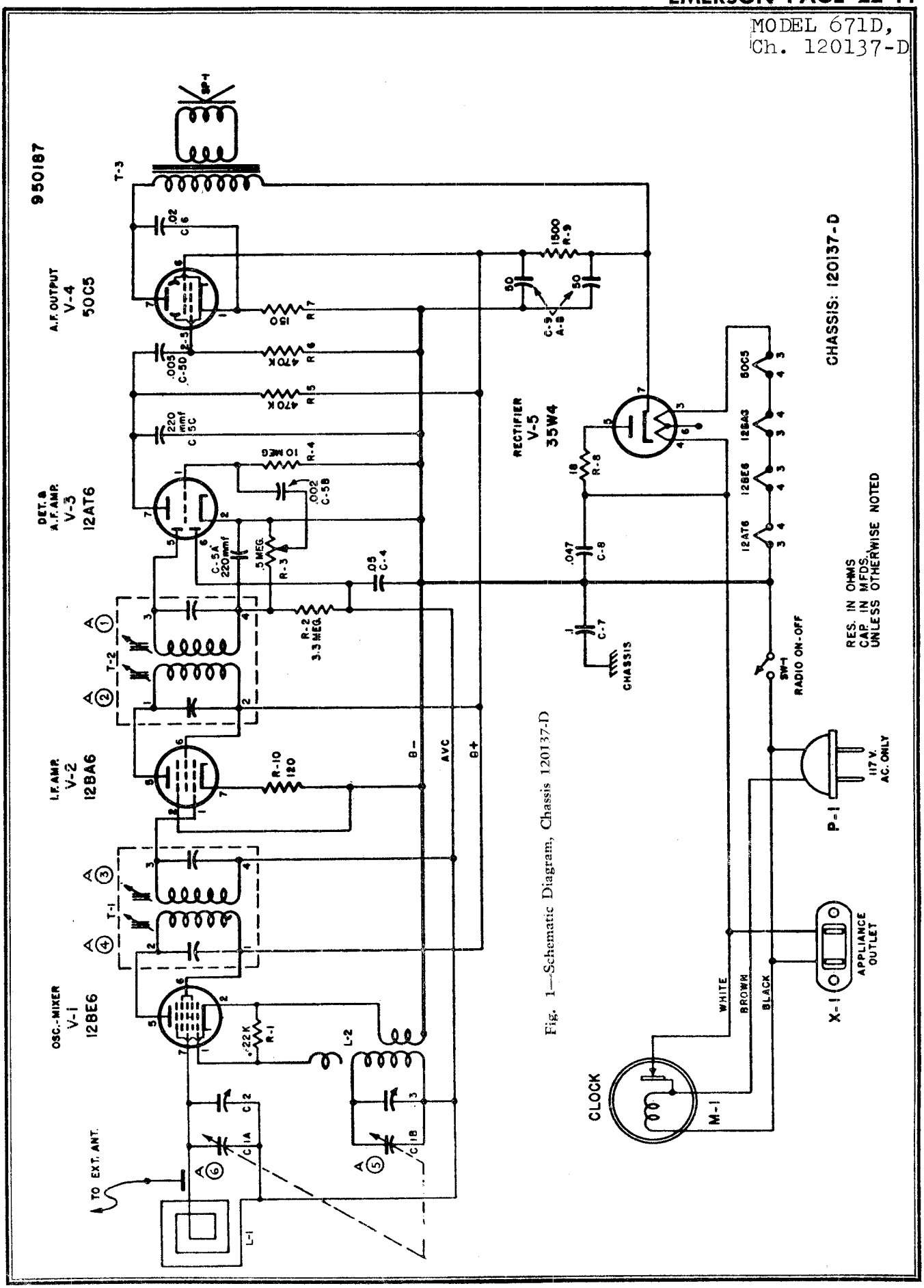


Fig. 1—Schematic Diagram, Chassis 120137-D

CHASSIS PARTS LIST (Chassis 120137-D)

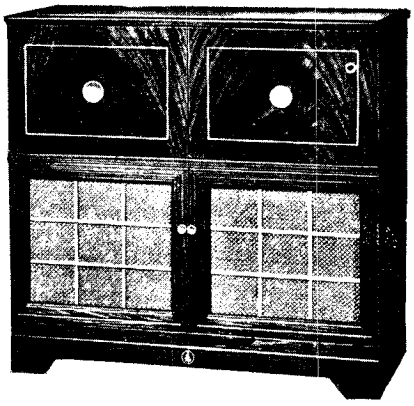
Item	Part No.	Description
C1A	900082	Variable Capacitor - r.f. Section
C1B		Variable Capacitor - osc. Section
C2	Pt. of C1A	Trimmer - r.f. Section
C3	Pt. of C1B	Trimmer - osc. Section
C4	923554	.05 mf. Paper 400V
C5A	470310	220 mmf. Multiple Condenser
C5B		.002 mf.
C5C		220 mmf.
C5D		.005 mf.
C6	923524	.02 mf. Paper 400V
C7	923315	.1 mf. Paper 200V
C8	922101	.047 mf. Paper Molded 400V
C9A	925201	50 mf. Electrolytic 150V
C9B		50 mf. Electrolytic 150V
L1	700061	Loop Antenna & Back
L2	716064	Oscillator Coil
M1	470668	Clock Movement
P1	583035	Line Cord & Plug
R1	Pt. of L2	22,000 ohm. Carbon ½W ∓10%
R2	351332	3.3 megohm. Carbon ½W ∓20%
R3	390177	500,000 ohm. Volume Control
R4	351452	10 megohm. Carbon ½W ∓20%

Item	Part No.	Description
R5	351132	470,000 ohm. Carbon ½W ∓20%
R6	351132	470,000 ohm. Carbon ½W ∓20%
R7	340292	150 ohm. Carbon ½W ∓10%
R8	340072	18 ohm. Carbon ½W ∓10%
R9	380532	1,500 ohm. Carbon 1W ∓20%
R10	340272	120 ohm. Carbon ½W ∓10%
SP1	180079	Speaker — PM — 5″
SW1	510083	On—Off Switch—Radio
T1	720033	1st I.F. Transformer
	or	
T1	720124	1st I.F. Transformer
T2	720033	2nd I.F. Transformer
	or	
T2	720124	2nd I.F. Transformer
T3	734065	Output Transformer
V1	800525	Vacuum Tube—12BE6
V2	800524	Vacuum Tube—12BA6
V3	800523	Vacuum Tube—12AT6
V4	800032	Vacuum Tube—50C5
V5	800526	Vacuum Tube—35W4
X1	500029	Appliance Outlet

CABINET PARTS LIST (Model 671D)

MODEL 671D	DESCRIPTION
140387	Cabinet (Bakelite—Walnut)
140407	Cabinet (Urea—Ivory)
470668	Clock Movement
411108	Housing—Clock
520141	Crystal—(For Radio Dial)
460162S	Knob—Radio
960170	Knob—Clock (With Indicator)
960171	Knob—Clock (Without Indicator)
960172	Knob—Clock (For Setting Hands)
960173	Crystal (For Clock Face)

MODEL 679B,
Ch. 120116-B



MODEL 679B

CHASSIS 120116-B

DESCRIPTION

TYPE: Amplitude modulation (AM) and frequency modulation (FM) superheterodyne.

FREQUENCY RANGE:
Broadcast band (AM)—540-1620 kilocycles
Frequency modulation band (FM)—88-108 megacycles

TYPE OF TUBES:
1—6BJ6 FM r-f amplifier
1—12AT7 FM converter
1—12BE6 AM converter
1—6BJ6 FM and AM i-f amplifier
1—6BJ6 2nd i-f FM amplifier
1—6BH6 FM limiter
1—19T8 FM discriminator, AM det., AVC and audio ampl.
1—50L6 power output
1—Selenium rectifier

POWER SUPPLY: 60 cycles

VOLTAGE RATING: 115v. a.c.

POWER CONSUMPTION: 75 watts

CURRENT DRAIN: 0.70 amps. at 115 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the R-F section of the circuit, the receiver should be carefully realigned.

2. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used.
Connect the outdoor antenna to the terminal strip marked (A.M.—"A") located at the back of the cabinet.

3. An internal power line antenna is provided for F.M. operation in relatively strong signal areas. For improved reception in weak signal areas, connect an external diapole antenna to the terminal strip on the back of the cabinet. Disconnect the link from screw (F.M.—"A") and connect the dipole to terminals marked (F.M.—"A" and "G").

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance reading in ohms, unless otherwise specified.
2. D.c. voltage measurements are made at 20,000 ohms-per-volt and a.c. voltages are measured at 1000 ohms-per-volt.
3. Line voltage maintained at 115 volts a.c. for voltage readings.
4. Nominal tolerance on component values makes possible a variation of ± 15% in readings.
5. Volume control at maximum, with no signal applied and bandswitch in broadcast position (unless otherwise noted), for voltage measurements.

VOLTAGE READINGS (CHASSIS 120116-B)

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	6BJ6	0	.6 V.*	35 V.AC	41 V.AC	78 V.*	78 V.*	0	—	—
V-2	12AT7	86 V.*	-2.8 V.*	0	53 V.AC	41 V.AC	80 V.*	0	1.7 V.*	N.C.
V-3	6BJ6	-.4 V	.8 V.	35 V.AC	30 V.AC	100 V.	100 V.	0	—	—
V-4	12BE6	-7.6 V	0	53 V.AC	64 V.AC	100 V.	100 V.	-.4 V	—	—
V-5	6BJ6	0	.7 V.*	30 V.AC	24 V.AC	86 V.*	86 V.*	0	—	—
V-6	6BH6	-.3 V.	0	24 V.AC	18 V.AC	50 V.*	50 V.*	0	—	—
V-7	19T8	-.5 V.*	-.6 V.*	-.1 V.*	O	18 V.AC	-.5 V.	0	-.5 V.	40 V.
V-8	50L6	N.C.	115V.AC	110 V.	105 V.	0	N.C.	64 V.AC	7.2 V.	—

N.C. Denotes "No Connection."

*Bandswitch in F.M. Position Only.

RESISTANCE READINGS (CHASSIS 120116-B)

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	6BJ6	0	68	42	50	200 K.*	200 K.*	0	—	—
V-2	12AT7	200 K.*	10 K.	0	62	50	200 K.	0	2200	N.C.
V-3	6BJ6	3.2 meg.	82	42	35	200 K.*	200 K.*	0	—	—
V-4	12BE6	22 K.	.5	62	75	200 K.	200 K.	2.7 meg.	—	—
V-5	6BJ6	.6	82	35	28	200 K.*	200 K.*	0	—	—
V-6	6BH6	100 K.	0	28	20	200 K.*	200 K.*	0	—	—
V-7	19T8	100 K.	100 K.	175 K.*	0	20	500 K.	0	4.7 meg.	500 K.
V-8	50L6	N.C.	130	200 K.	200 K.	470 K.	N.C.	75	150	—

N.C. Denotes "No Connection."

*Bandswitch in F.M. Position Only.

MODEL 679B,
Ch. 120116-B

ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BE6. Low side to chasis.	455 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A1, A2, (Trans. T4). A3, A4, (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to .001 mfd. if isolation trans. is not used
2		Loop	1620 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A5, (Trimmer cond. C6).	Form loop of several turns of wire. Radiate signal into receiver loop. Adjust for maximum output.
3		Loop	1400 KC.	Broadcast	Tune for max. outpt.	Across voice coil.	A6, (Trimmer cond. C5).	Adjust for maximum output.

FM I-F and Disc. Alignment Using AM Signal Generator and VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A7, (Trans. T5).	Adjust for maximum output.
2	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A8, A9, (Trans. T3).	Adjust for maximum output.
3	.01 mfd.	High side to Pin 7 of 12AT7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output.
4	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "B". Common to chassis.	A12, (Trans. T6).	Adjust for maximum output.
5	.01 mfd.	"	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "C". Common to chassis.	A13, (Trans. T6).	Adjust for zero output. Continue with FM r-f alignment.

FM
I-F AND DISC. ALIGNMENT USING SWEEP SIGNAL GENERATOR AND OSCILLOSCOPE. Use frequency modulated signal, with 60 cycle modulation and 450 kc sweep. Use 120 cycle sawtooth sweep voltage in oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 1st i-f (V3). Low side of chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A7, A8, A9, (Trans. T5 and T3).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
2	.01 mfd.	High side to Pin 7 of 12AT7 of conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A10, A11, (Trans. T1)	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
3	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "C". Ground to chassis.	A12, A13, (Trans. T6).	Alternately adjust A12 for maximum amplitude and A13 for maximum straightness of cross-over lines, with cross-over occurring at center of pattern as per discriminator alignment curve (page 3). Continue with FM r-f alignment.

FM R-F ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	300 ohm resistor in series with gen. lead.	High side to FM ant. term. Low side to chassis.	109.0 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open	Connect d.c. probe to point "A". Common to chassis	A14 (Iron Core)	Adjust for maximum output.
2	"	"	106.0 mc.	Frequency modulation	Tune for maximum output.	"	A15 (Iron Core)	Adjust for maximum output.

MODEL 679B,
Ch. 120116-B

CHASSIS PARTS LIST (CHASSIS 120116-B)

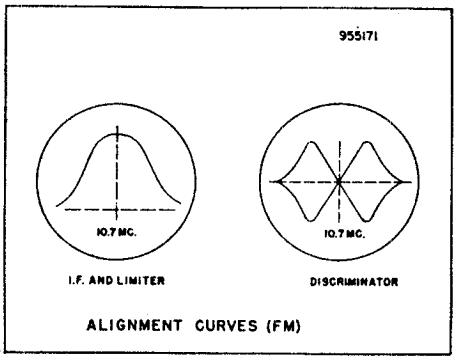
Symbol	Part No.	DESCRIPTION		
C1	928006	1,500 MMF		
C2	928006	1,500 MMF		
C3	928053	.001 MF		
C4	928027	.01 MF		
C5	915029	.5 MMF	500V	±10%
C6	928053	.001 MF		
C7	928102	50 MMF		
C8	928027	.01 MF		
C9	928027	.01 MF		
C10	928027	.01 MF		
C11	928055	.01 MF		
C12	928109	.01 MF		
C13	928110	25 MMF		
C14	928027	.01 MF		
C15	928006	1,500 MMF		
C16	928013	100 MMF		±20%
C17	928059	300 MMF		±20%
C18	Part of Loop	2.2 MMF		
C19	920060	.05 MF	200V	±25%
C20				
C21	Pt of T6	100 MMF		
C22	920180	.005 MF	400V	±25%
C23	928013	100 MMF		±20%
C24	920090	.01 MF	400V	±25%
C25	920545	.002 MF	400V	±25%
C26	920090	.01 MF	400V	±25%
C27	928104	212 MMF		
C28	920020	.02 MF	400V	±25%
C29	925191	80 MF	150V	
C30	925191	50 MF	150V	
C31	928013	100 MMF		±20%
C32	920030	.05 MF	400V	±25%
C33	928006	1,500 MMF		
C34	928006	1,500 MMF		
C35	928006	1,500 MMF		
C36	900081	AM Var. Cond. & FM Tuning Ass.		
C37	(Pt. of C36)	AM RF Trimmer		
C38	(Pt. of C36)	AM OSC. Trimmer		
C39	(Pt. of T4)			
C40	920030	.05 MF	400V	±25%
C41	920030	.05 MF	400V	±25%
R1	340212	68 Ohms	½W	±10%
R2	340332	220 Ohms	½W	±10%
R3	340572	2,200 Ohms	½W	±10%
R4	340732	10,000 Ohms	½W	±10%
R5	340332	220 Ohms	½W	±10%
R6	340212	68 Ohms	½W	±10%
R7	340232	82 Ohms	½W	±10%
R8	340492	1,000 Ohms	½W	±10%
R9	340232	82 Ohms	½W	±10%

Symbol	Part No.	DESCRIPTION		
R10	340332	220 Ohms	½W	±10%
R11	340970	100,000 Ohms	½W	±10%
R12	340770	15,000 Ohms	½W	±10%
R13	340970	100,000 Ohms	½W	±10%
R14	340970	100,000 Ohms	½W	±10%
R15	340930	68,000 Ohms	½W	±10%
R16	Pt. of L5)	22,000 Ohms		
R17	351290	2.2 Megohms	½W	±20%
R18	340332	220 Ohms	½W	±10%
R19	340890	47,000 Ohms	½W	±10%
R20	341210	1 Megohm	½W	±10%
R21	351370	4.7 Meg.	½W	±20%
R22	390153	1.0 Meg. Vol. Control		
R23	Pt. of R-22)	400,000 Ohms Tone Control		
R24	340810	22,000 Ohms	½W	±10%
R25	351130	470,000 Ohms	½W	±20%
R26	351130	470,000 Ohms	½W	±20%
R27	340292	150 Ohms	½W	±10%
R28	394042	1000 Ohms	3W	±10%
R29	394027	22 Ohms	2W	±10%
R30	340810	22,000 Ohms	½W	±10%
L1	713026	FM Ant. Coil		
L2	713027	FM R.F. Coil		
L3	716059	FM Osc. Coil		
L4	700054	AM Loop Ant.		
L5	716058	AM Osc. Coil		
L6	705002	Filament Choke		
L7	705002	Filament Choke		
J1,J2	508002	Dual Jack (Phono.-Speaker)		
P1	585081	Female Con. Cable (Phono. Motor)		
P2	505014	Interlock Plug		
SW1	(Pt. of R22)	On-Off Switch		
SW3	510078	Band Switch		
T1	720126	1st. FM I.F. Transformer		
T2	720067	2nd. FM I.F. Transformer		
T3	720077	3rd FM I.F.		
T4	708062	FM Discriminator Transformer		
T5	720075	1st. AM I.F. Transformer		
T6	720076	2nd AM I.F. Transformer		
T7	734064	Output Transformer		
V1	800023	6BJ6, FM RF Amplifier		
V2	800047	12AT7, FM Osc.-Mixer		
V3	800023	6BJ6, FM AM 1st I.F. Amplifier		
V4	800525	12BE6, AM Osc.-Mixer		
V5	800023	6BJ6, FM 2nd I.F. Amplifier		
V6	800054	6BH6, FM Limiter		
V7	800029	19T8, FM Discriminator, AM Det		
V8	800070	50L6, Power Output		
V9	817102			
	817101	Selenium Rectifier, 100 MA.		
V10	807003	Pilot Bulb, 110V., 10W. Cand. Base		

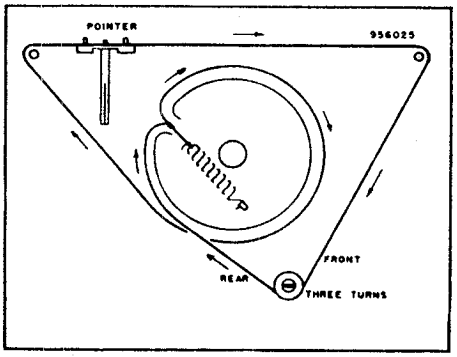
CABINET PARTS LIST (MODEL 679B)

Part No.	DESCRIPTION
140403	Cabinet
411115	Metal Grille
520064	Escutcheon
520144	Glass Dial
445032	Rubber Channel for Glass Dial
413559	Mounting Strip for Glass Dial
180077	Speaker—12"
505040	Speaker Plug
819060	G.I. 3-Speed Changer

Part No.	DESCRIPTION
560151	45 RPM Adaptor
560216	Masonite Bottom
560227	Masonite Back
583206	Line Cord
450088S	Knob—AM-FM-Phono.
450068S	Knob—Tuning
450089	Knob—Tone
450099S	Knob—Volume
587011	Spring Insert for Knobs



ALIGNMENT CURVES (FM)



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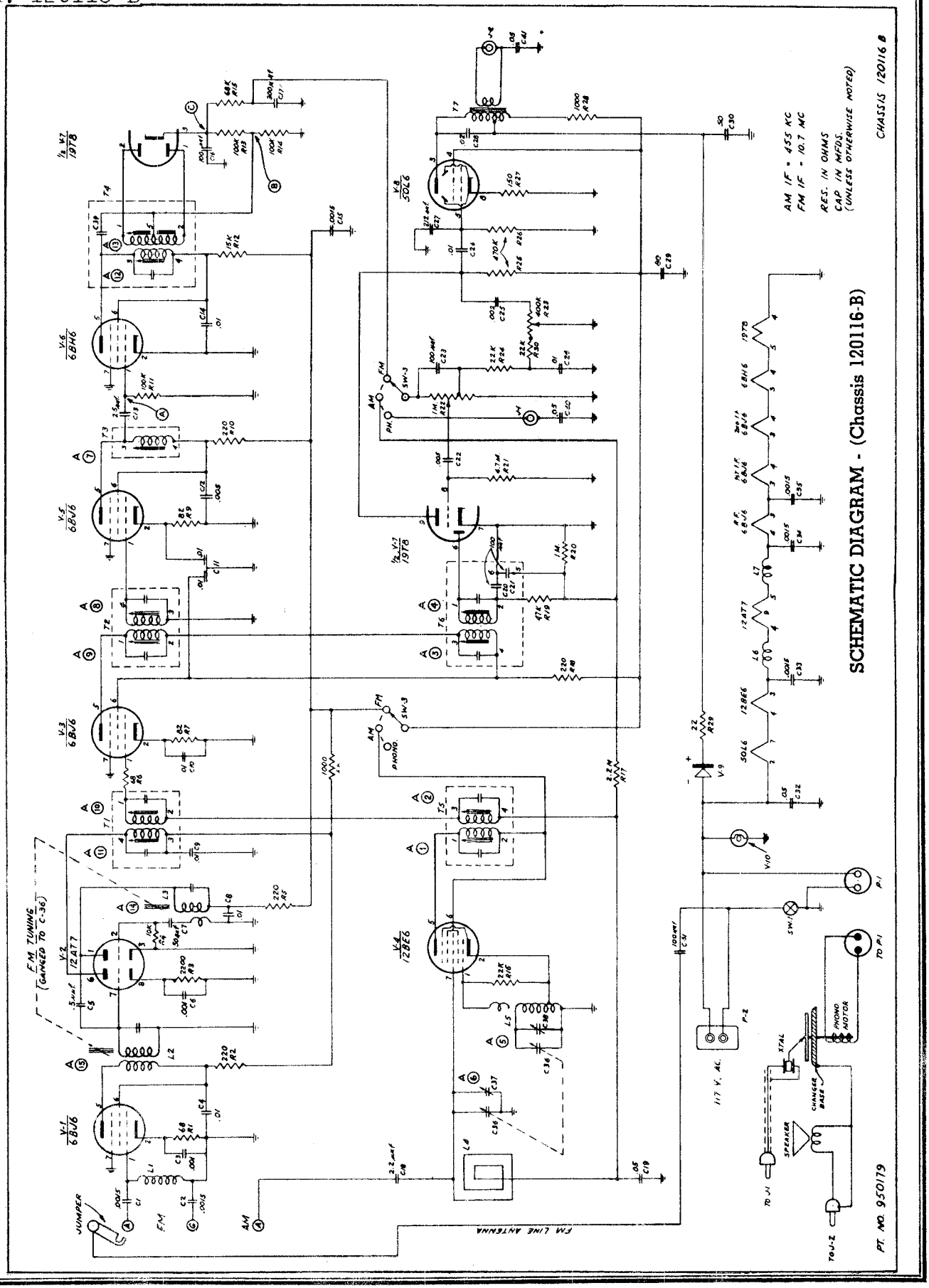
Ch. 120116-B



MODEL 691B,
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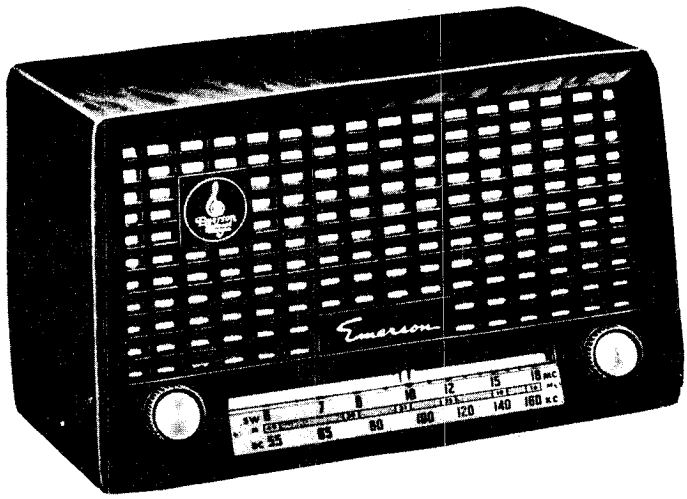


MODEL 691B
Chassis 120145-B

DESCRIPTION

TYPE: Two-band superheterodyne.

FREQUENCY RANGE: Broadcast 540-1620 kc
Short Wave 6-18 mc.

TYPE OF TUBES:

V-1--12BE6, oscillator mixer

V-2--12BA6, first i-f amplifier

V-3--12AT6, detector, a-f amplifier

V-4--50C5, A. F. output

V-5--35W4, rectifier

POWER SUPPLY: A.C. or D.C.

POWER CONSUMPTION: 30 watts.

CURRENT DRAIN: 0.26 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.

3. Model 691B has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear near the line cord. Use no ground connection.

4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

CHASSIS PARTS LIST (Chassis 120145-B)

SYMBOL	PART NO.	DESCRIPTION			
C-1	912723	.002 MF	Paper		600 V.
C-2	Pt. of L-2	1.6-18 mmf	Trimmer		
C-3	900083	Variable Capacitor - R.F. Sect.			
C-4	Pt. of C-3	Trimmer	R.F. Sect.		
C-5	Pt. of C-3	Trimmer	Osc. Sect.		
C-6	Pt. of C-3	Variable Capacitor - Osc. Sect.			
C-7	Pt. of L-2	1.6-18 mmf	Trimmer		
C-8	923515	.1 mf	Paper		400 V
C-9	900210	300-600 mmf	Padder		
C-10	915031	.0052 mf	Mica	±5%	
C-11	928010	100 mmf	Ceramic		
C-12	921554	.05 mf	Paper		400 V
C-13	921554	.05 mf	Paper		400 V
C-14	923023	220 mmf	Multiple Coupling Condenser		
C-15	Pt. of C-14	.002 mf			
C-16	Pt. of C-14	220 mmf			
C-17	Pt. of C-14	.005 mf			
C-18	921524	.02 mf	Paper		400 V
C-19	925206	50 mf	Electrolytic		150 V
C-20	Pt. of C-19	50 mf	Electrolytic		150 V
C-21	921554	.05 mf	Paper		400 V
C-22	921514	.01 mf	Paper		400 V
L-1	700058	Loop Antenna & Back			
L-2	710030	Antenna Coil - S.W.			
L-3	716065	Oscillator Coil - S.W.			
L-4	Pt. of L-3	Oscillator Coil - B.C.			
P-1	583032	Line Cord & Plug			

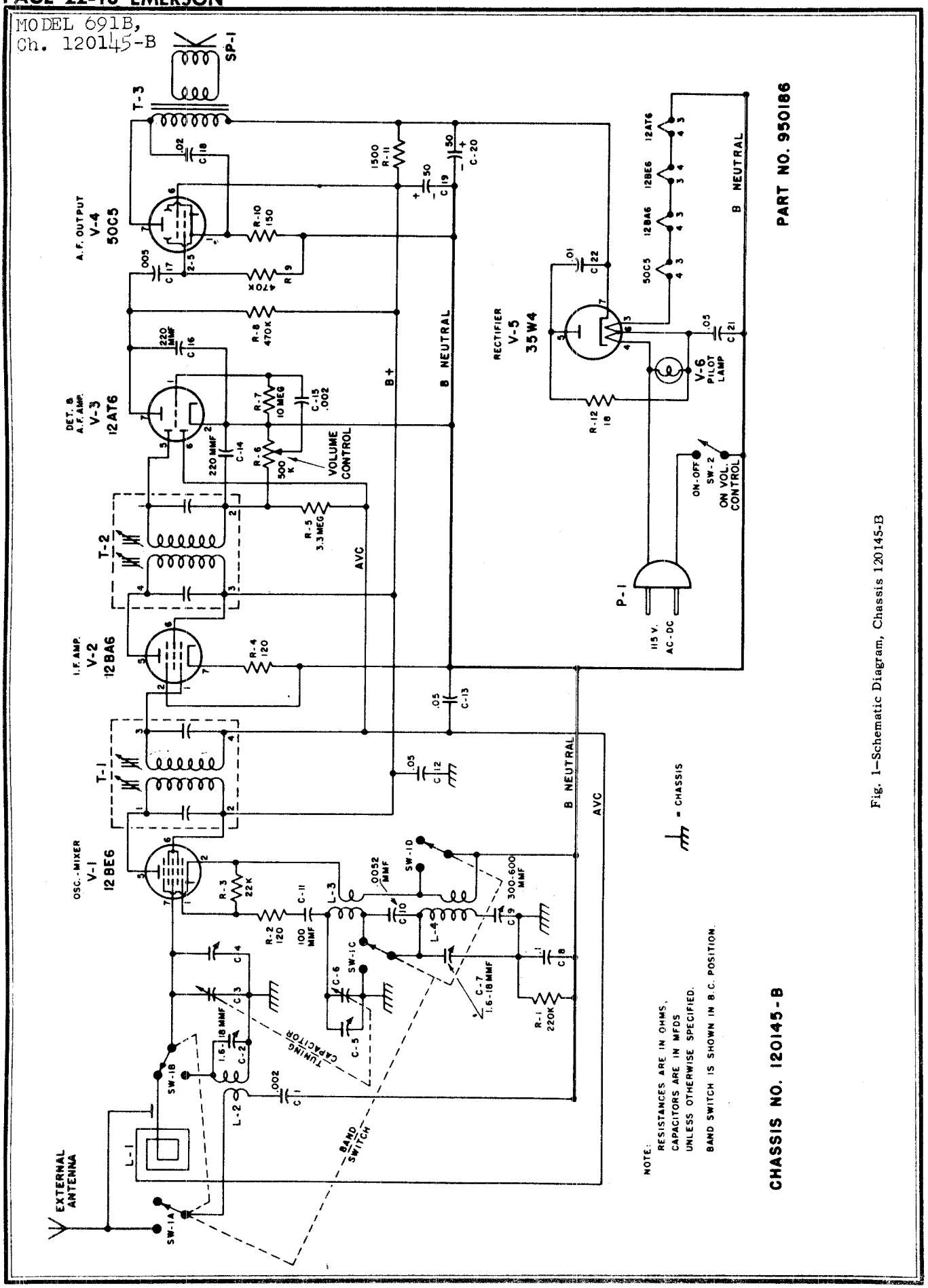


Fig. 1–Schematic Diagram, Chassis 120145-B

SYM-BOL	PART NO.	DESCRIPTION		
R-1	341052	220,000 ohm	Carbon	½W ±10%
R-2	340272	120 ohm	Carbon	½W ±10%
R-3	350812	22,000 ohm	Carbon	½W ±20%
R-4	340272	120 ohm	Carbon	½W ±10%
R-5	351332	3.3 megohm	Carbon	½W ±20%
R-6	390145	500,000 ohm	Volume Control	
R-7	351452	10 megohm	Carbon	½W ±20%
R-8	351132	470,000 ohm	Carbon	½W ±20%
R-9	351132	470,000 ohm	Carbon	½W ±20%
R-10	340292	150 ohm	Carbon	½W ±10%
R-11	380532	1,500 ohm	Carbon	1W ±20%
R-12	340072	18 ohm	Carbon	½W ±10%

SP-1	180080	Speaker - with Output Transformer
SP-1	180045	Speaker - less Output Transformer
SW-1	510082	Band- Switch
SW-2	Pt. of R-6	On-Off Switch
T-1	720525	1st I.F. Transformer
T-2	720055	2nd I.F. Transformer
T-3	734067	Output Transformer (with Pt. No. 180045
V-1	800525	Vacuum Tube - 12BE6
V-2	800524	Vacuum Tube - 12BA6
V-3	800523	Vacuum Tube - 12AT6
V-4	800032	Vacuum Tube - 50C5
V-5	800526	Vacuum Tube - 35W4
V-6	807000	Pilot Light

CABINET PARTS LIST (Model 691B)

PART NO.	DESCRIPTION
140426	Cabinet—Bakelite—Walnut
140427	Cabinet—Urea—Ivory
460162S	Knob
460162	Knob—Band Switch
411164	Dial Plate—Calibrated
411182	Dial Back Plate
583032	Line Cord
180080	Speaker with Trans. OR
180045	Speaker less Trans.
530002	Drive Cord
525022-2	Pointer
700058	Loop Antenna & Back
470608	Baffle & Grille Cloth

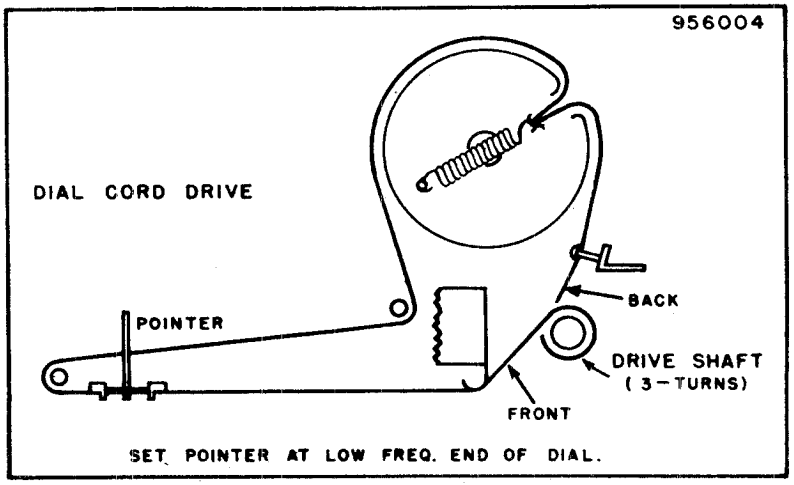


Fig. 2—Dial Cord String, Model 691

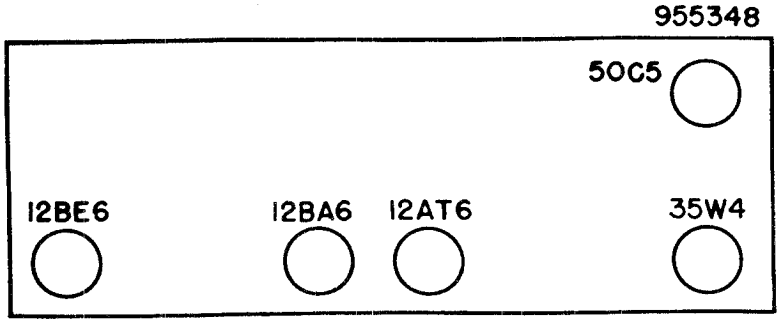


Fig. 3 Tube Location Diagram of Chassis 120145-B

MODEL 691B,
Ch. 120145-B

ALIGNMENT PROCEDURE

1. To set pointer, turn variable condenser fully closed and set pointer at mark near upper left end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and B neutral.
3. Volume control should be at maximum position; output of signal generator should be not higher than necessary to obtain an output reading.
4. Use an insulated alignment screwdriver for adjusting.

STEP	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS	SW-1
1	.1 MFD.	High side to pin #7 of V-1 (12BE6) Low side to B neutral.	455 KC 400 ~ Amplitude Modulation	Variable Condenser fully opened	Across Voice Coil	T-1, T-2 top and bottom	Adjust for maximum meter reading	Broadcast
2	400 ~	High side to external antenna lead. Low side to B neutral.	18.2 MC 400 ~ Amplitude Modulation	Variable Condenser fully opened (min. capacity)	"	C-5	Adjust for maximum meter reading	Short Wave
3	200 MMF.	High side to external antenna lead. Low side to B neutral.	1620 KC 400 ~ Amplitude Modulation	"	"	C-7	"	Broadcast
4	"	"	1420 KC 400 ~ Amplitude Modulation	Variable Condenser tuned to 1420 KC.	"	C-4	"	"
5	"	"	600 KC 400 ~ Amplitude Modulation	Variable Condenser tuned to 600 KC.	"	C-9	Rock variable slightly back & forth while adjusting C-9 for a true maximum indication. Check step #3 Repeat #4 & #5	"
6	400	Same as in Step #2	17.2 MC 400 ~ Amplitude Modulation	Variable Condenser tuned to 17.2 MC.	"	C-2	Adjust for max. signal while slightly rocking dial	Short Wave

VOLTAGE READINGS FOR CHASSIS 120145-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	-7.2	0	24 AC	12 AC	86	86	-.4
V-2	12BA6	-.5	0	24 AC	34 AC	86	86	1
V-3	12AT6	-.4	0	0	12 AC	-.4	-.4	34
V-4	50C5	5.2	0	34 AC	82 AC	0	86	110
V-5	35W4	N.C.	N.C.	82 AC	115 AC	110 AC	112 AC	112

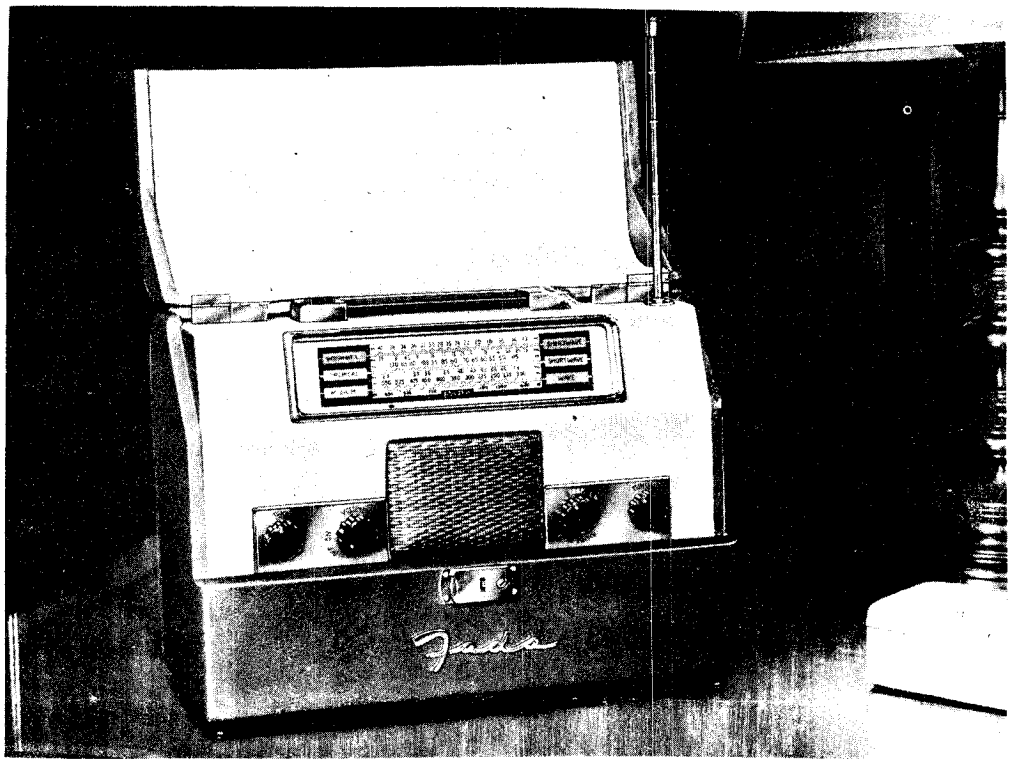
RESISTANCE READINGS FOR CHASSIS 120145-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	22K	1.3	28	14	500K	500K	3.8 MEG
V-2	12BA6	3.8 MEG	0	28	42	500K	500K	120
V-3	12AT6	10 MEG	0	0	14	500K	500K	1 MEG
V-4	50C5	150	500K	42	95	500K	500K	500K
V-5	35W4	N.C.	N.C.	95	130	150	125	500K

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

1. Line voltage maintained at 115 volts for voltage readings
2. D.C. and A.C. voltages measured with V.T.V.M.
3. Measured values are from socket pin to B neutral.
4. All measurements measured with band switch on broadcast
5. Volume control at maximum, no signal applied for voltage measurements.

MODEL P-130



Power Supply: 105-125 V. 40-60 cycles AC; Same voltage DC; and
180-220 V. 40-60 cycles AC
15 Watts Power Consumption at 117 volt line operation
30 Watts Power Consumption at 220 volt line operation

Battery Operation: 9 V.A — 90 V.B
(570-182 meters); 2.3-7.6 MC (130-39.5 meters);
and 7.4-23.5 MC (40.5-12.8 meters)

Range: 530-1650 KC

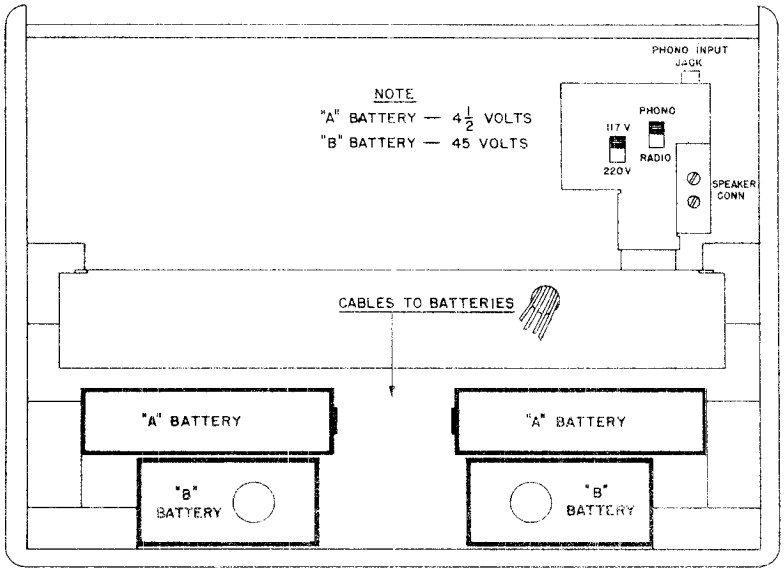
I.F. Circuits: 456 KC

Speaker: 5" P.M., 1.47 oz. Alnico V Magnet

Speaker Transformer: 10,000 ohms — 400 cycles

Speaker Voice Coil: 3.2 ohms

Tubes: 1U4 R.F. Amplifier
1R5 Osc. Converter
1U4 I.F. Amplifier
1U5 Det. AVC. A.F
3V4 Power Output
Selenium Rectifier



BATTERY LAYOUT P130

MODEL P-130

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on. Low range AC meter connected across voice coil to indicate output. Keep signal generator attenuated so as to maintain ½ scale reading on output meter. Make certain that the dial pointer is exactly on index line (top left side of dial plate) when variable condenser is fully meshed.

CAUTION:

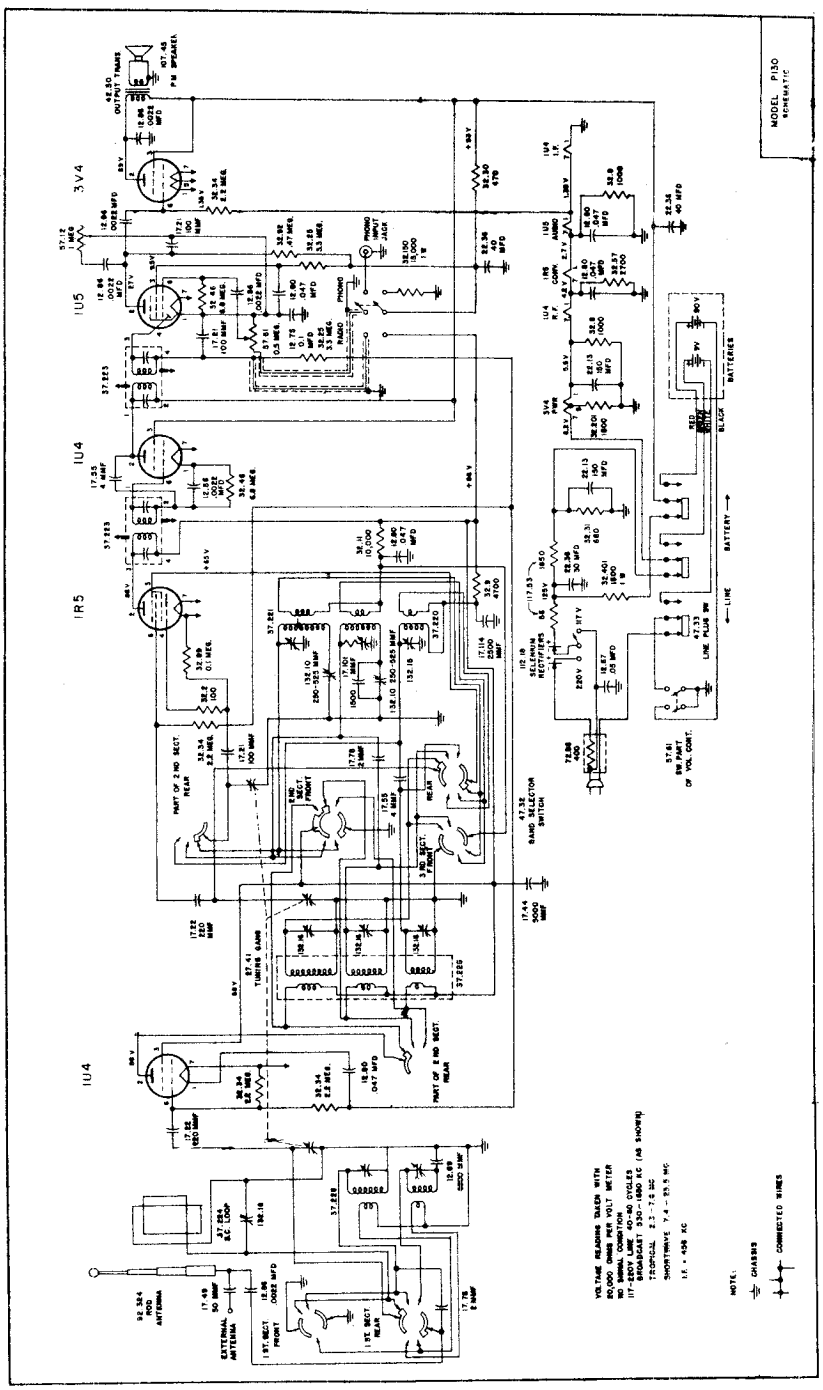
The S.W. Oscillator Trimmers can be adjusted for maximum output at two positions, namely; above and below the signal frequency.

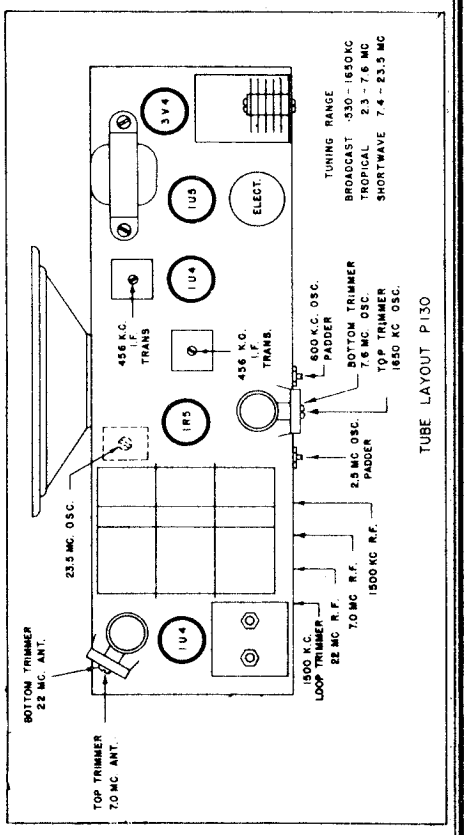
This receiver has been designed so that the oscillator frequency is always above the signal frequency.

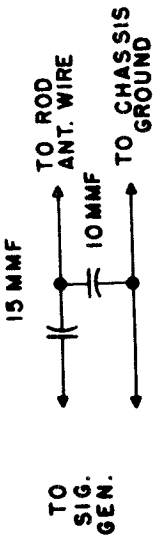
Check the oscillator frequency carefully against the signal generator calibration and tune the R.F. Trimmers to the lower signal generator frequency.

Receiver Dial At:	Signal Generator	Dummy Antenna	Connect Signal Generator Across	Refer to Chassis Layout for Location of Trimmers
1 Fully open on Medium Wave Band	456 KC (658 Meters)	0.1 Mf	1500 K.C. R.F. Trimmer	Adjust I.F. coil cores for maximum output.
2 Fully open on Medium Wave Band	1650 KC (182 Meters)	0.1 Mf	Loop Wires	Adjust 1650 KC Oscillator trimmer for maximum output.
3 600 KC (500 Meters)	600 KC (500 Meters)		Loop Wires	Adjust 600 KC Oscillator Padder for Maximum output while rocking the variable condenser.
4 Repeat step 2				
5 1500 KC (200 Meters)	1500 KC (200 Meters)	0.1 Mf	Loop Wires	Adjust 1500 KC R.F. Trimmer for maximum output.
6 Fully open on S.W. II Band	7.6 MC (39.5 Meters)	Rod dummy antenna	Rod antenna input	Adjust 7.6 Mc oscillator trimmer for maximum output.
7 2.5 Mc (120 Meters)	2.5 Mc (120 Meters)	Rod dummy antenna	Rod antenna input	Adjust 2.5 Mc oscillator padder for maximum output while rocking the variable condenser.
8 Repeat step 6				
9 7.0 Mc (42.8 Meters)	7.0 Mc (42.8 Meters)	Rod dummy antenna	Rod antenna input	Adjust 7.0 Mc R.F. and antenna trimmers for maximum output.
10 Fully open S.W.I. on Band	23.5 (12.8 Meters)	Rod dummy antenna	Rod antenna input	Adjust 23.5 Mc oscillator trimmer for maximum output.
11 22.0 Mc (13.6 Meters)	22.0 Mc (13.6 Meters)	Rod dummy antenna	Rod antenna input	Adjust 22.0 Mc R.F. and antenna trimmers for maximum output.
12 Radiate a sufficient amount of signal to readjust the respective antenna trimmers for maximum output on 7 and 22 Megacycles. This is accomplished by connecting a one foot piece of wire between the rod antenna and the rod antenna wire attached to the chassis. Connect a two foot piece of wire to the signal generator "hot" terminal. Locate the signal generator approximately five feet away and extend the rod antenna. Adjust the respective trimmers for maximum output.				

MODEL P-130







MODEL P-130

PARTS LIST

Part No.	Description
12.86	Molded Tubular Condenser .0022 Mf 400 V.
12.89	Molded Tubular Condenser .0068 Mf 400 V.
12.80	Molded Tubular Condenser .047 Mf 200 V.
12.67	Molded Tubular Condenser .047 Mf 400 V.
12.75	Molded Tubular Condenser .1 Mf 400 V.
17.78	Ceramic Condenser 2.0 Mmf
17.55	Ceramic Condenser 4.0 Mmf
17.49	Ceramic Condenser 50 Mmf ± 10%
17.22	Ceramic Condenser 220 Mmf ± 20%
17.21	Ceramic Condenser 100 Mmf ± 20%
17.44	Ceramic Condenser 5000 Mmf + 100%, — 10%
17.101	Mica Condenser 1500 Mmf ± 5%
17.114	Mica Condenser 2500 Mmf ± 5%
22.13	Electrolytic Condenser 150 Mfd. 15 W.V.
22.36	Electrolytic Condenser 30-40-40 Mfd. 150 W.V.
27.41	3 Section Variable Condenser 441 Mmf.
37.224	Loop Antenna
37.223	I.F. Transformer
37.221	B.C. — Tropical Oscillator Coil
37.220	S.W. Oscillator Coil
37.225	R.F. Coil
37.228	S.W. Antenna Coil
47.33	Battery Electric Changeover Switch
47.35	Radio-Phono Switch
47.34	117 Volt — 220 Volt Line Switch
52.61	Volume Control
57.12	Tone Control
62.272	Whip Antenna Lock
72.88	Resistance Line Cord (117-220V. A.C. line operation only)
77.185	Dial Pointer
77.186	Dial Scale (Calibrated)
92.138	Phono Plug
92.377	Battery Retainer Block
92.324	Rod Antenna Assembly
92.380	Handle Cover
92.389	Phono Jack
97.311	Cabinet
42.50	Output Transformer
107.45	5" P.M. Speaker
112.24	Selenium Rectifier
112.22	Battery Harness Assembly
117.53	56 — 1850 ohm 10 W W.W. Resistor
132.10	Padder Condenser
132.15	Oscillator Trimmer
132.16	Trimmer Assembly
142.70	Tuning or Tone Knob
142.71	Volume Knob
142.72	Band Selector Knob

MODELS 4-A-86 Rev., 4-A-95, The Westmoreland

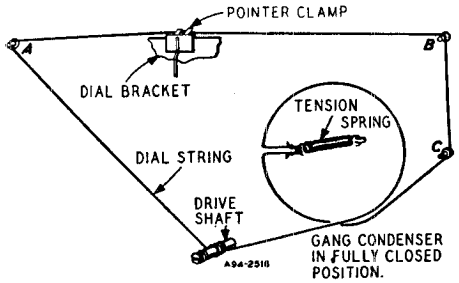
THE WESTMORELAND

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

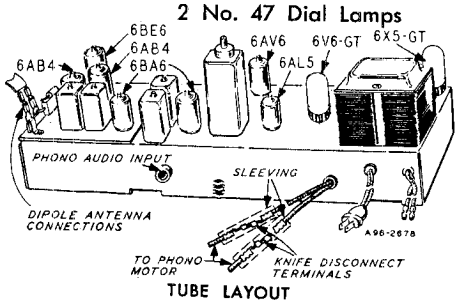
DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.

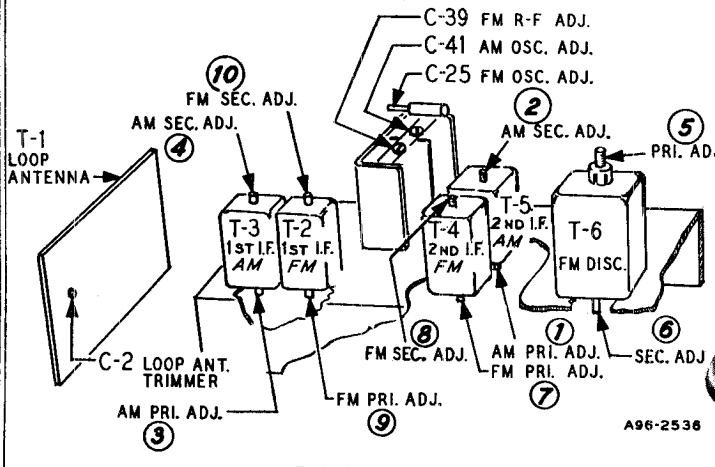


Tube and Dial Lamp Complement

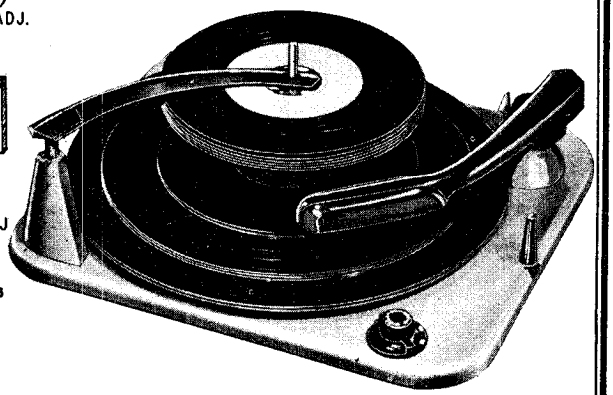
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 6AB4 R-F Amplifier
1 6AB4 Mixer
2 No. 47 Dial Lamps



TUBE LAYOUT



TRIMMER POSITIONS



VM No. 950 RECORD CHANGER

MODELS 4-A-86 Rev., 4-A-95, The Westmoreland

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

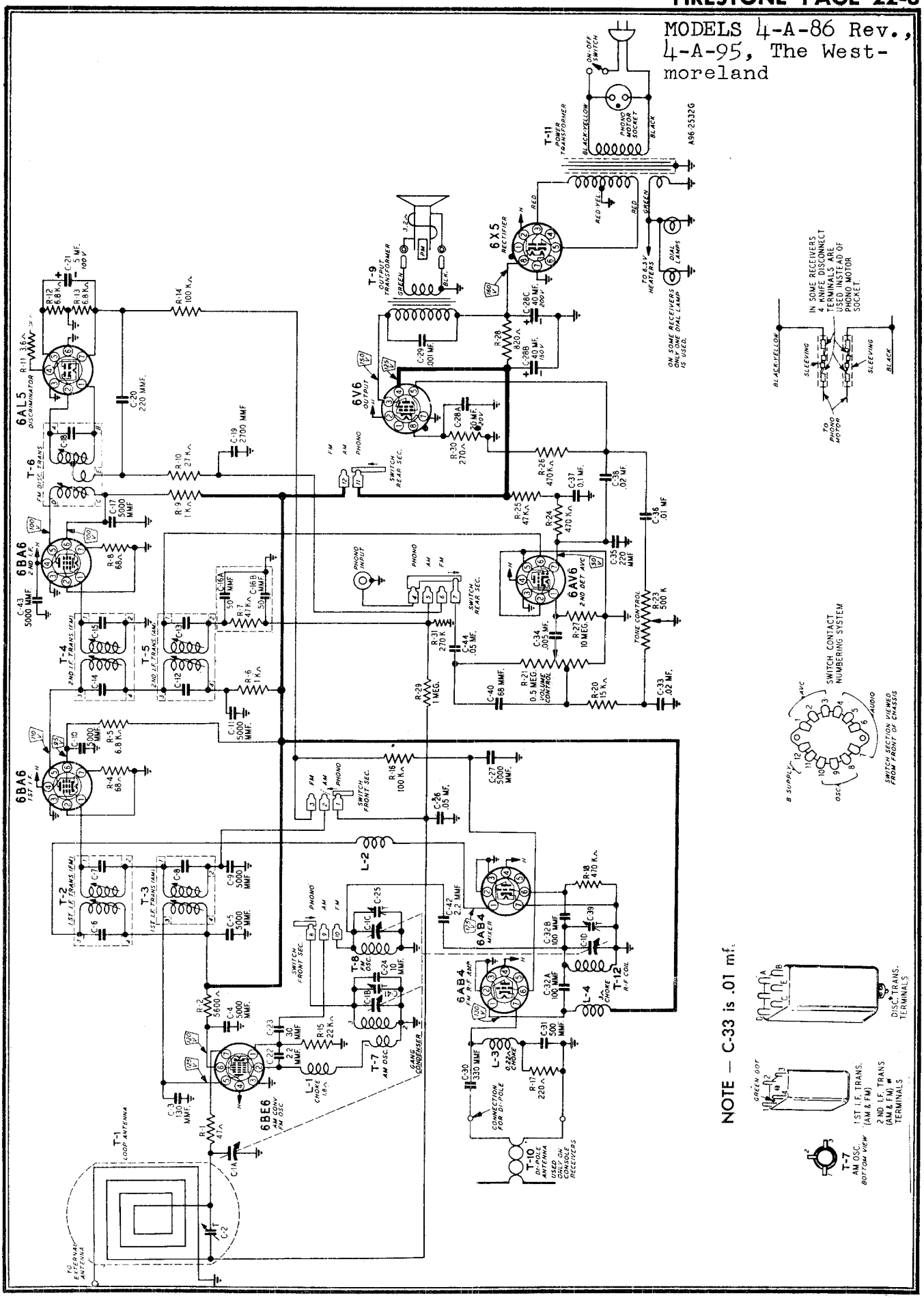
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

MODELS 4-A-86 Rev., 4-A-95, The Westmoreland



MODELS 4-A-86 Rev., 4-A-95, The Westmoreland

REPLACEMENT PARTS LIST

MISCELLANEOUS

12A480	10" P.M. Speaker	
4X1082	Escutcheon	
10A759	Knob (Mahogany)	
10A765	Knob (White Oak)	
13X546	Line Cord & Plug Assembly	
2A393	Band Change Switch	
3A435	Molded Octal Tube Socket	
3A305	Phono Socket	
3A426	Tube Socket (1st 6BA6)	
3A427	Tube Socket (6BE6)	
3A439	Tube Socket (Miniature)	

CAPACITORS

C-1	14A209	Gang Condenser Assembly		
C-2	17A256	2-24 mmf		Trimmer
C-3	47X559	130 mmf		Ceramic
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf		Ceramic
C-6, C-7	Part of T-2 (1st I-F Trans. FM)			
C-8	Part of T-3 (1st I-F Trans. AM)			
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)			
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)			
C-16A, C-16B	47X112	50-50 mmf		Dual Mica
C-18	Part of T-6 (Discriminator Trans.)			
C-19	47X492	2700 mmf		Molded Mica
C-20, C-35	47X468	220 mmf		Ceramic
C-21	45X361	5 mf	100 V	Dry Electrolytic
C-22, C-42	47X557	2.2 mmf		Ceramic
C-23	47X558	30 mmf		Ceramic
C-24	47X523	10 mmf		Ceramic
C-25	17A255	1-8 mmf		Trimmer
C-26, C-44	B66503	.05 mf	200 V	Tubular
C-28A		20 mf	20 V	
C-28B	45X360	40 mf	150 V	Dry Electrolytic
C-28C		40 mf	200 V	
C-29	H66102	.001 mf	800 V	Tubular
C-30	47X470	330 mmf		Molded Mica
C-31	47X508	500 mmf		Ceramic
C-32A, C-32B	76X4	100 mmf		Dual Ceramic
C-33, C-36	B66103	.01 mf	200 V	Tubular
C-34	D66502	.005 mf	400 V	Tubular
C-37	D66104	.1 mf	400 V	Tubular
C-38	D66203	.02 mf	400 V	Tubular
C-39, C-41	Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic

RESISTORS

		Ohms	Watts	
R-1	B85470	47	0.5	Carbon
R-2	B85562	5600	0.5	Carbon
R-4, R-8	B84680	68	0.5	Carbon
R-5, R-12, R-13	B84682	6800	0.5	Carbon
R-6, R-9	B85102	1000	0.5	Carbon
R-7, R-25	B85473	47 K	0.5	Carbon
R-10	B85273	27 K	0.5	Carbon
R-11	43X233	3.6	0.5	Wirewound
R-14, R-16	B85104	100 K	0.5	Carbon
R-15	B85223	22 K	0.5	Carbon
R-17	B84221	220	0.5	Carbon
R-18, R-24, R-26	B85474	470 K	0.5	Carbon
R-20	B85153	15 K	0.5	Carbon
R-21	36X372	.5 meg.		Volume Control
R-23	40X310	.5 meg.		Tone Control
R-27	B85106	10 meg.	0.5	Carbon
R-28	D84821	820	2.0	Carbon
R-29	B85105	1 meg.	0.5	Carbon
R-30	B84271	270	0.5	Carbon
R-31	B84274	270 K	0.5	Carbon

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke
L-2	9A2103	Parasitic Choke
L-3	35A9	Insulated Choke
L-4	35A8	Insulated Choke
T-1	9A2146	"B" Range Loop Antenna
T-2	9A2060	1st I-F Trans. (FM)
T-3	9A2062	1st I-F Trans. (AM)
T-4	9A2061	2nd I-F Trans. (FM)
T-5	9A2063	2nd I-F Trans. (AM)
T-6	9A2161	Discriminator Transformer
T-7	9A2065	Oscillator Coil (AM)
T-8	9A2067	Oscillator Coil (FM)
T-9	51X134	Output Transformer
T-10	9A2209	Dipole Antenna
T-11	53X322	Power Transformer
T-12	9A2066	Antenna Coil (FM)

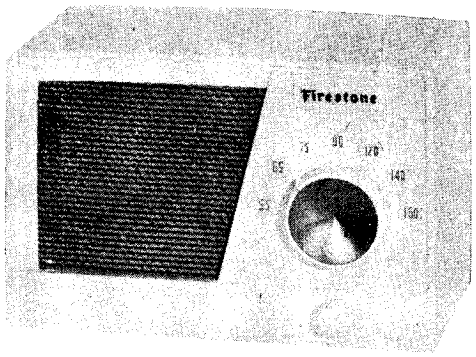
DIAL AND DRIVE ASSEMBLY

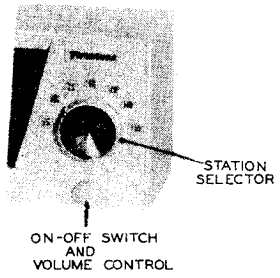
58X739	Dial Glass
15X251	Pointer
19X192	"C" Washer (Mtg. Drive Shaft)
6X66	Rubber Grommet
25X1616	Dial Bracket
28X113	Drive Cord Tension Spring
7A103	No. 47 Pilot Light
7A199	Pilot Light Socket Assembly
10X38	Drive Cord Assembly
26X486	Drive Shaft

VM No. 950 RECORD CHANGER PARTS

P-81	Crystal Cartridge with Unipoint Needle
85-35	Unipoint Needle
P-77	Crystal Cartridge with Needles
85-18	Needle, Microgroove (Red)
85-16	Needle, Regular

MODELS 4-A-90, 4-A-91





Cabinet Dimensions	-8-3/4"x4-7/16"x5-11/16"
Weight	-4lbs.
Power Supply	-110 to 120 Volt AC-DC
Tuning Range	-540 to 1600 KC
Intermediate Freq.	-455 KC
Loud Speaker	-4 Inch P.M.
Voice Coil Impedance	-3.2 Ohm at 400 Cycles

Power Output - Undistorted- 0.8 Watts
Maximum - 1.3 Watts

Tube Complement- (Code No. 297-0-3212A)

12SA7 - Converter
12SK7 - I.F. Amplifier
12SQ7 - Diode-Audio
50L6GT - Output
35Z5GT - Rectifier

Tube Complement- (Code 297-0-3212)

12BE6 - Converter
12BA6 - I.F. Amplifier
12AV6 - Diode-Audio
50C5 - Output
35W4 - Rectifier

ALIGNMENT PROCEDURE

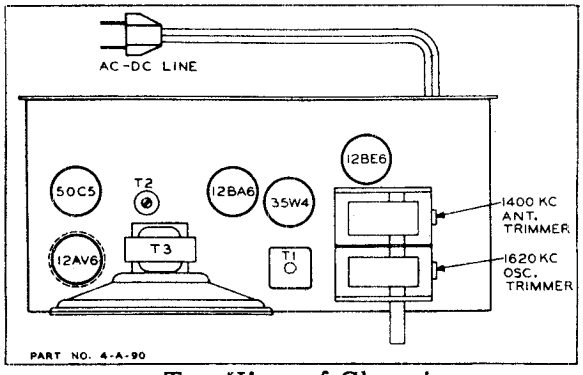
For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

Before starting alignment:

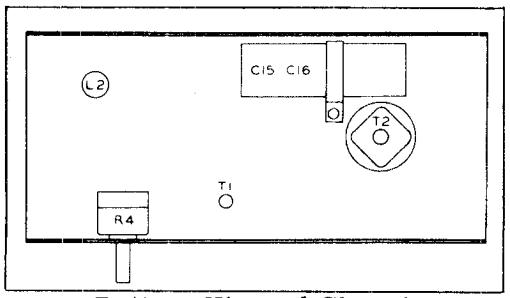
(A) Remove the chassis and loop antenna from the cabinet at the same time by removing the two screws on the rear apron of the chassis which fasten the chassis to the cabinet.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

Steps	Set Receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Attach output of test oscillator to:	DUMMY ANTENNA	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received.	EXACTLY 455 KC	High side to grid of converter Tube. Low side to common negative.	1. MFD. CONDENSER.	Adjust 2nd I.F. (T2) and then each of the slugs of the 1st I.F. (T1) for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	DUMMY ANTENNA	2 turns of Hookup wire 6" in Dia. Place Approx. a foot from & parallel to loop.)	Adjust 1620 KC oscillator trimmer for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	DUMMY ANTENNA		Adjust 1400 KC antenna trimmer for maximum output.

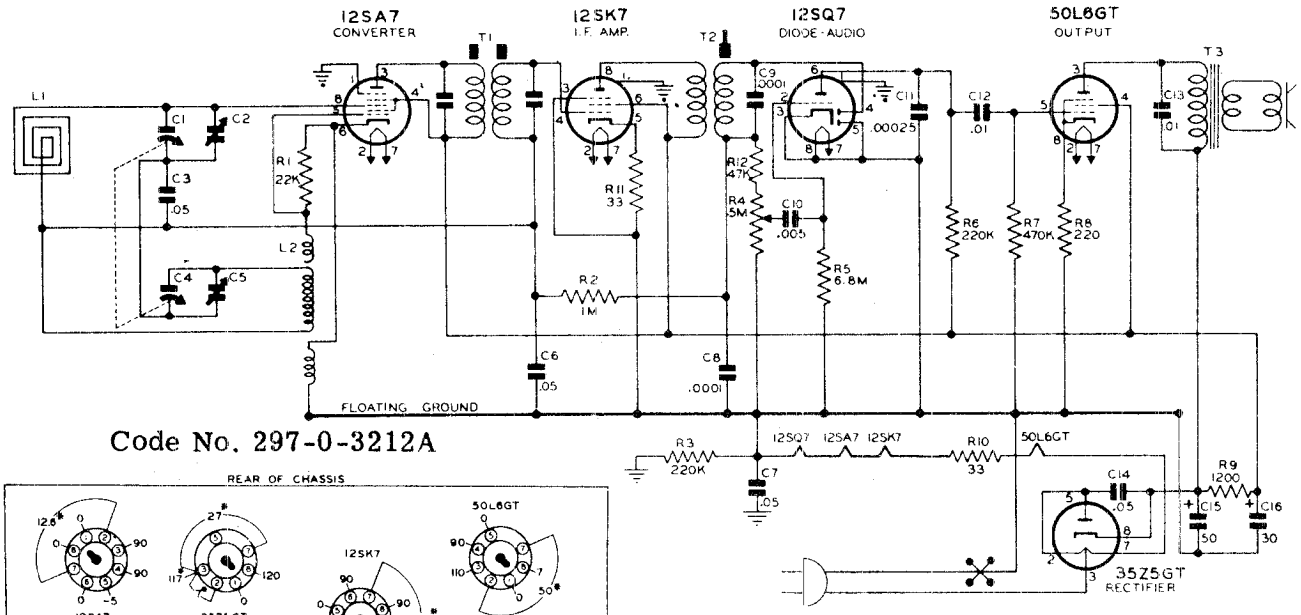


Top View of Chassis
Code No. 297-0-3212



Bottom View of Chassis
Code No. 297-0-3212

MODELS 4-A-90,
4-A-91



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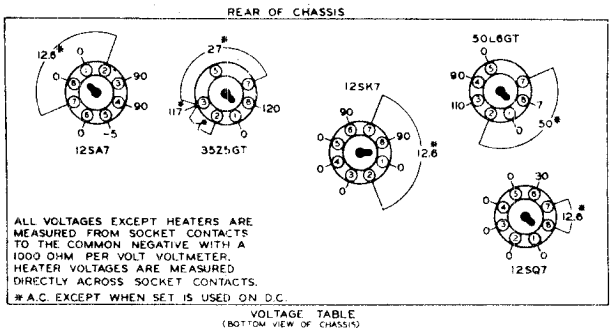
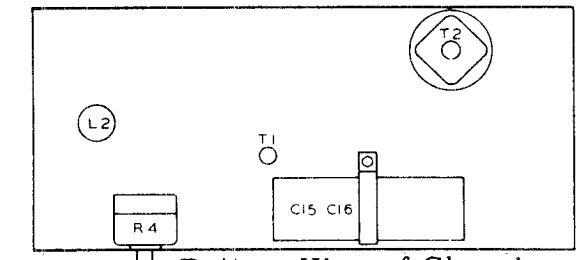
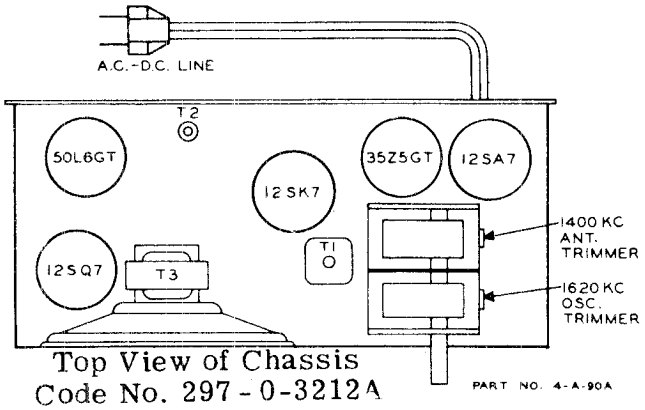


VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)



Bottom View of Chassis
Code No. 297-0-3212A



Top View of Chassis
Code No. 297-0-3212A

PART NO. 4-A-90A

PARTS LIST FOR CODE NO. 297-0-3212A

ILLUS. NO.	PART NUMBER	PART NAME	DESCRIPTION
C3,C6,C7	N-1345	Condenser	Paper .05 MFD. 200V
C8	N-6015	Condenser	Ceramic .0001 MFD. 500 V. 20%
C9	N-7549	Condenser	Ceramic .0001 MFD. 500 V. 10%
C10	N-4894	Condenser	Paper .005 MFD. 600 V.
C11	N-6438	Condenser	Ceramic .00025 MFD. 500 V. 20%
C12,C13	N-1344	Condenser	Paper .01 MFD. 400 V.
C14	N-1346	Condenser	Paper .05 MFD. 400 V.
C15) C16)	N-7889	Condenser	Electrolytic (50 MFD. 150V.) (30 MFD. 150V.)
R1	N-4025	Resistor	Carbon 22,000 Ohm 1/2W 20%
R2	N-1262	Resistor	Carbon 1.0 Megohm 1/2W 20%
R3,R6	N-4026	Resistor	Carbon 220,000 Ohm 1/2W 20%
R4	N-7890	Volume Control	500,000 Ohm with Switch
R5	N-4028	Resistor	Carbon 6.8 Megohm 1/2W 20%
R6	N-4026	Resistor	Carbon 220,000 Ohm 1/2W 20%
R7	N-4027	Resistor	Carbon 470,000 Ohm 1/2W 20%
R8	N-4024	Resistor	Carbon 220 Ohm 1/2W 10%
R9	N-4900	Resistor	Carbon 1,200 Ohm 1.0 W 10%
R10	N-4068	Resistor	Carbon 33 Ohm 1.0 W 20%
R11	N-4022	Resistor	Carbon, 33 Ohm 1/2W 20%
**R12	N-4063	Resistor	Carbon 47,000 Ohm 1/2W 20%
L1	N-8138	Coil,	Loop Antenna and Cabinet Back
L2	N-7139	Coil,	Oscillator
T1	N-7981	Coil,	1st I.F. Transformer
T2	N-7542	Coil,	2nd I.F. Transrormer
T3	(Part of N-7824 Assembly)	Transformer,	Output
	N-7824	Assembly	Speaker and Output Transformer
	N-7141	Condenser	Variable - 2 Gang
	N-8270	Assembly	Cabinet Front Panel
	#321	Cabinet	White, Plastic)
	N-8191	Knob	Tuning, White) For Stock No.
	N-8192	Knob	Volume, White) 4-A-91 Only
	#322	Cabinet	Walnut, Plastic)
	N-8140	Knob	Tuning, Walnut) For Stock No.
	N-8144	Knob	Volume, Walnut) 4-A-90 Only
	N-1090	Line Cord	6 Foot, Rubber

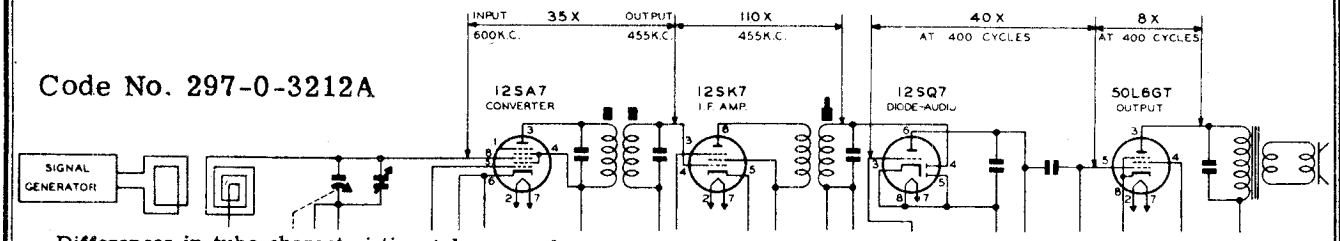
** R11 Resistor (47,000 Ohm 1/2 W. 20%) is included in R4 Volume Control is some receivers.

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel type instrument carefully tune it for maximum output at desired frequency before making measurements.

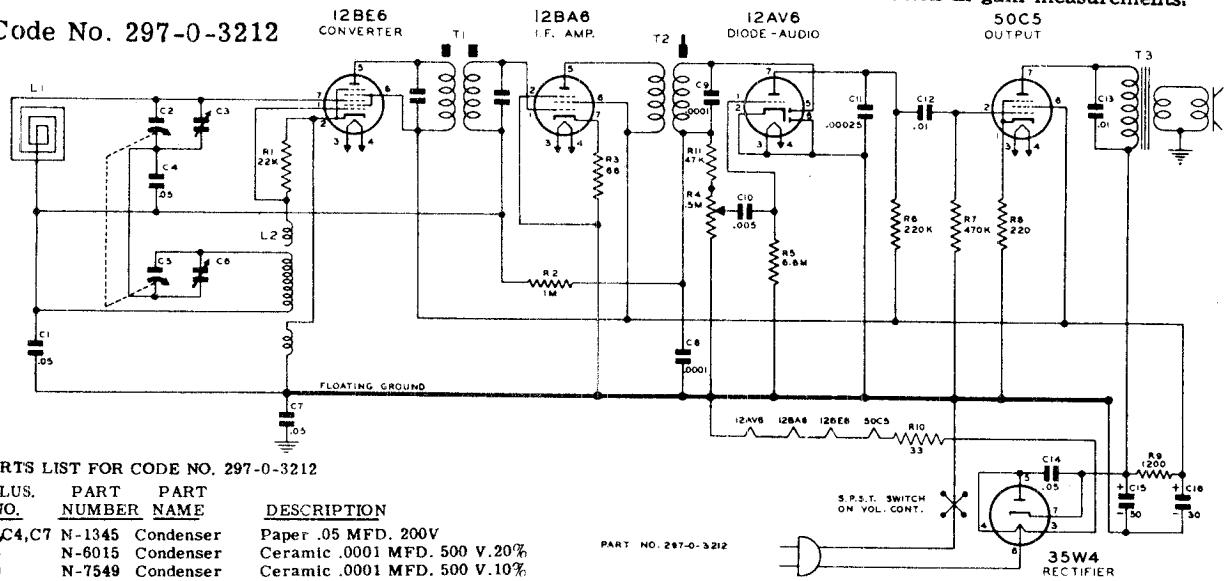
MODELS 4-A-90, -91

Code No. 297-0-3212A



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

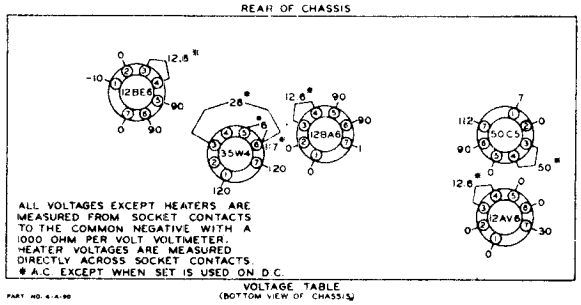
Code No. 297-0-3212



PARTS LIST FOR CODE NO. 297-0-3212

ILLUS. NO.	PART NUMBER	PART NAME	DESCRIPTION
C1,C4,C7	N-1345	Condenser	Paper .05 MFD. 200V
C8	N-6015	Condenser	Ceramic .0001 MFD. 500 V.20%
C9	N-7549	Condenser	Ceramic .0001 MFD. 500 V.10%
C10	N-4894	Condenser	Paper .005 MFD. 600 V.
C11	N-6488	Condenser	Ceramic .00025 MFD. 500 V.20%
C12,C13	N-1344	Condenser	Paper .01 MFD. 400 V.
C14	N-1346	Condenser	Paper .05 MFD. 400 V.
C15) C16)	N-7889	Condenser	Electrolytic (50 MFD. 150V.) (30 MFD. 150V.)
R1	N-4025	Resistor	Carbon 22,000 Ohm 1/2W 20%
R2	N-1262	Resistor	Carbon 1.0 Megohm 1/2W 20%
R3	N-6485	Resistor	Carbon 68 Ohm 1/2W 10%
R4	N-7890	Volume Control	500,000 Ohm with Switch
R5	N-4028	Resistor	Carbon 6.8 Megohm 1/2W 20%
R6	N-4026	Resistor	Carbon 220,000 Ohm 1/2W 20%
R7	N-4027	Resistor	Carbon 470,000 Ohm 1/2W 20%
R8	N-4024	Resistor	Carbon 220 Ohm 1/2W 10%
R9	N-4900	Resistor	Carbon 1,200 Ohm 1.0 W 10%
R10	N-4068	Resistor	Carbon 33 Ohm 1.0 W 20%
**R11	N-4063	Resistor	Carbon 47,000 Ohm 1/2W 20%
L1	N-8138	Coil,	Loop Antenna and Cabinet Back
L2	N-7139	Coil,	Oscillator
T1	N-7888	Coil,	1st I.F. Transformer
T2	N-7542	Coil,	2nd I.F. Transrormer
T3	(Part of N-7824 Assembly)	Transformer,	Output
	N-7824	Assembly	Speaker and Output Transformer
	N-7141	Condenser	Variable - 2 Gang
	N-8270	Assembly	Cabinet Front Panel

REAR OF CHASSIS



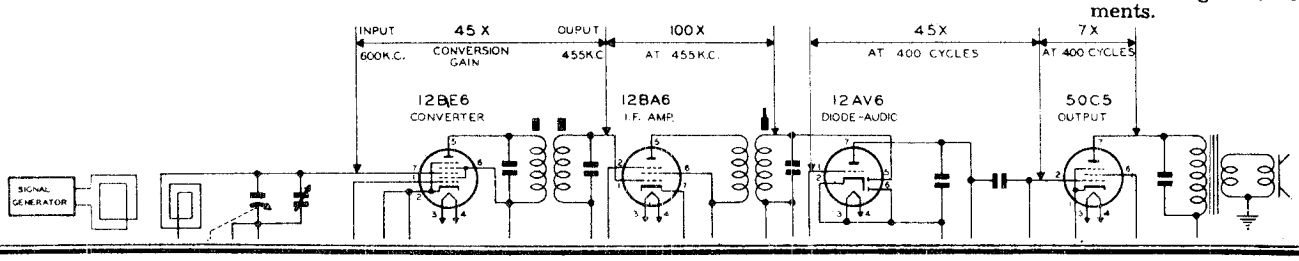
VOLTAGE TABLE (BOTTOM VIEW OF CHASSIS)

#321	Cabinet	White, Plastic	For Stock No. 4-A-91 Only
N-8191	Knob	Tuning, White	
N-8192	Knob	Volume, White	
#322	Cabinet	Walnut, Plastic	For Stock No. 4-A-90 Only
N-8140	Knob	Tuning, Walnut	
N-8144	Knob	Volume, Walnut	
N-1090	Line Cord	6 Foot, Rubber	

** R11 Resistor (47,000 Ohm 1/2 W. 20%) is included in R4 Volume Control is some receivers.

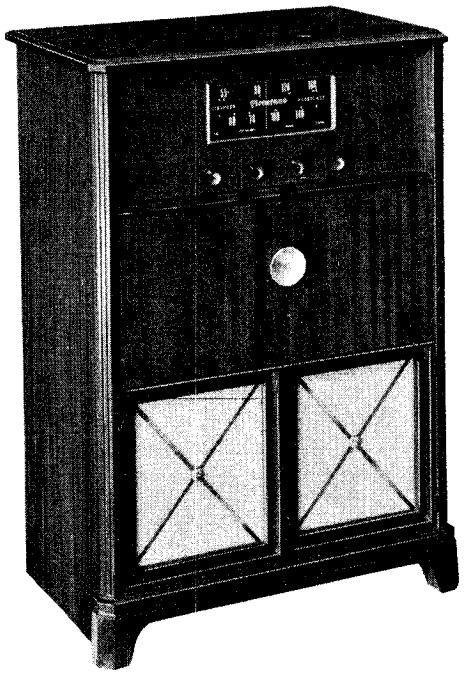
Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel type instrument carefully tune it for maximum output at desired frequency before making measurements.



MODEL 4-A-96,
The New Waverly

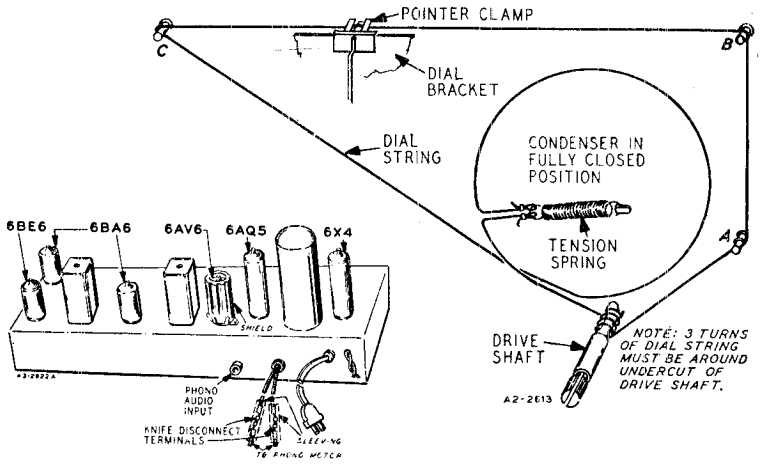
THE NEW WAVERLY

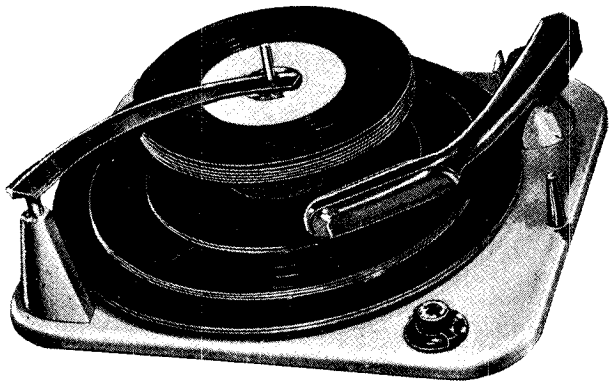


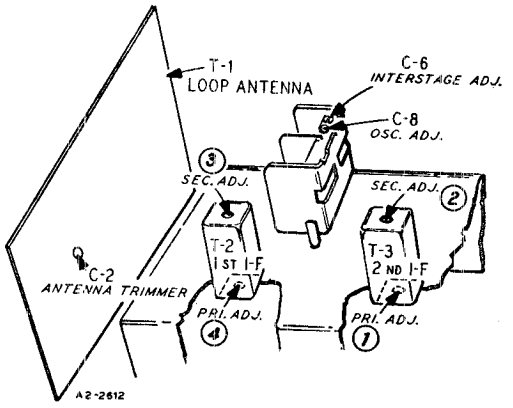
DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new S-10X77 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.





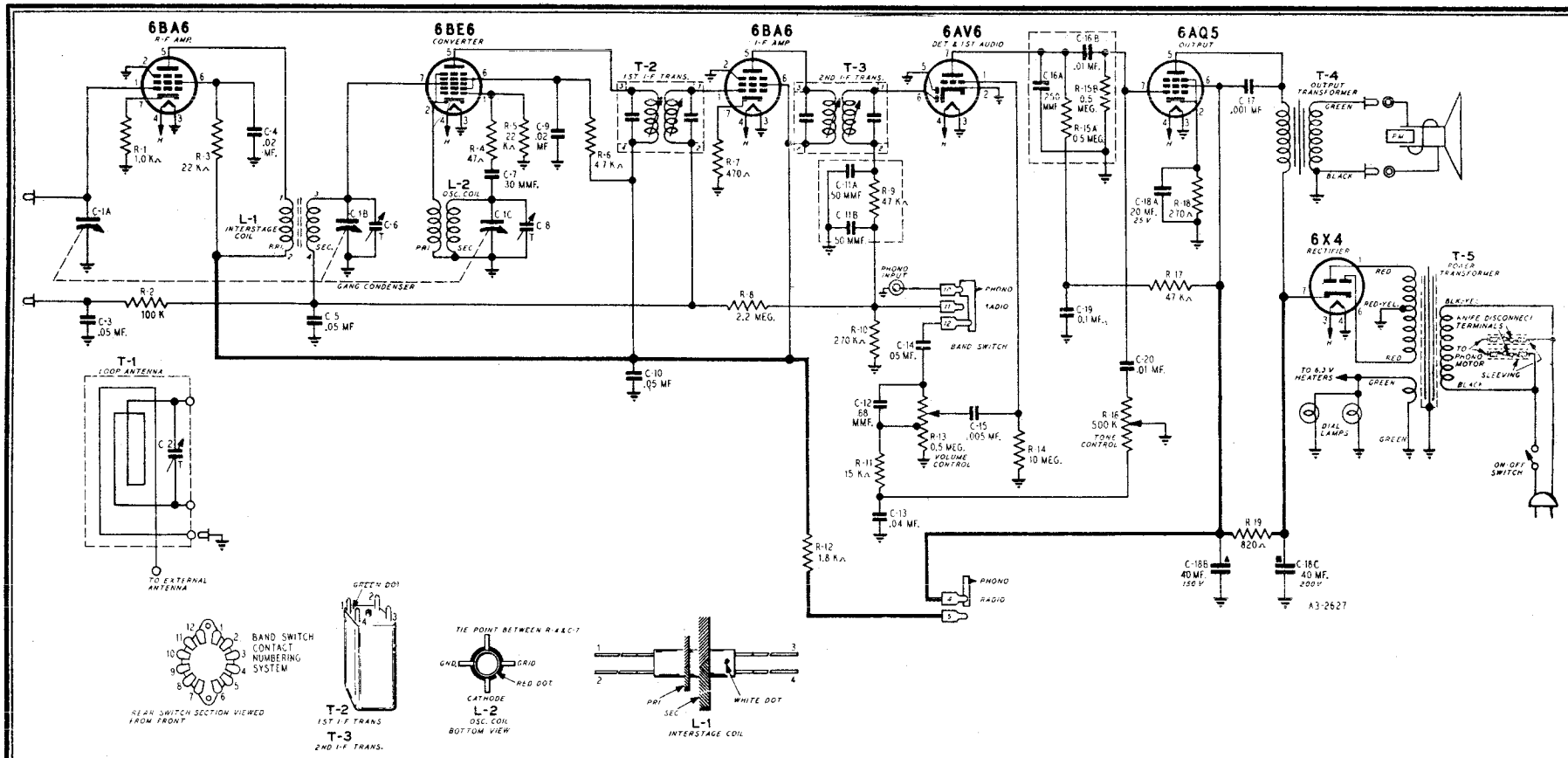


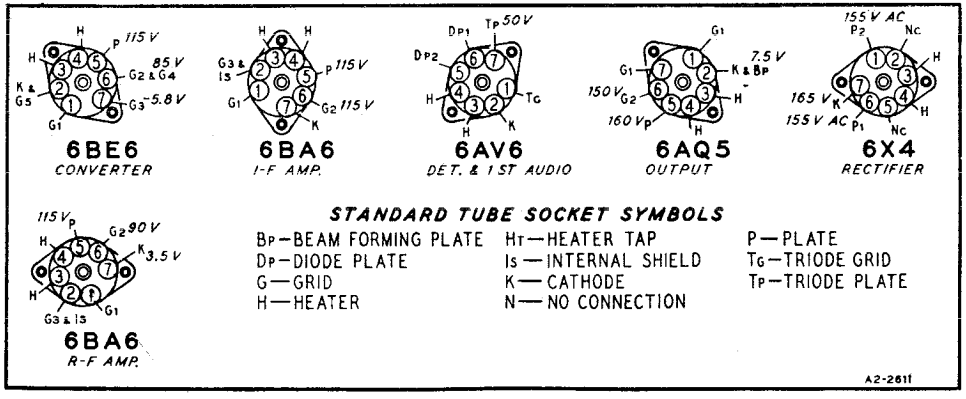
ELECTRICAL SPECIFICATIONS

6 Tube Superhetrodyne, including Rectifier Tube.
Tuning Frequency Range.....540 to 1600 KC
Power Consumption....(Radio) 35 watts (At 117 volts AC)
(Phono) 20 watts, 60 cycles only
Power Output 2.0 watt maximum, 1.1 watt (10% distortion)
Intermediate Frequency .....455 KC
Sensitivity .....10 Microvolts Average
Selectivity .....45 KC Wide at 1000 Times Signal
Speaker .....(3.2 ohm Voice Coil) 8" PM Dynamic

Tube and Dial Lamp Complement

1 6BA6 R-F Amplifier
1 6BE6 Converter
1 6BA6 I-F Amplifier
1 6AV6 Det. & 1st Audio
1 6AQ5 Output
1 6X4 Rectifier
1 No. 47 Dial Lamp





TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ± 10% is usually permissible.

MODEL 4-A-96,
The New Waverly

ALIGNMENT PROCEDURE

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas, — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid I-F 6BA6 Pin No. 1.	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. -Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (4) and Sec. (3)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-8	Maximum Output
1400 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Interstage C-6 See Note B	Maximum Output
1400 KC	External Antenna Terminal	50- mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2 See Note B	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

MISCELLANEOUS

12A477	8" P.M. Speaker
10A759	Knobs
4X1082	Escutcheon
2A405	Radio-Phono Switch
13X546	Line Cord & Plug Assembly
3A458	Tube Socket (6AV6)
3A426	Tube Socket (miniature)
30X560	Line Cord Clamp
3A305	Phono Socket
32X403	Tube Shield (6AV6)
76X1	Capacitor-Resistor Combination
76X5	Capacitor-Resistor Combination

CAPACITORS

C-1A, C-1B, C-1C	14A213	Gang Condenser Assembly		
C-2	17A235	2-24 mmf		Trimmer
C-3, C-5, C-10	B66503	.05 mf	200 V	Tubular
C-4, C-9, C-13	B66203	.02 mf	200 V	Tubular
C-6, C-8	Part of Gang Condenser Assembly			
C-7	47X558	30 mmf		Ceramic
C-11A, C-11B	Part of 76X1 Assembly (See Miscellaneous)			
C-12	47X471	68 mmf		Ceramic
C-14	B65503	.05 mf	200 V	Tubular
C-15	D66502	.005 mf	400 V	Tubular
C-16A, C-16B	Part of 76X5 Assembly (See Miscellaneous)			
C-17	F66102	.001 mf	600 V	Tubular
C-18A		20 mf	25 V	
C-18B	45X381	40 mf	150 V	Dry Electrolytic
C-18C		40 mf	200 V	
C-19	B66104	.1 mf	200 V	Tubular
C-20	B66103	.01 mf	200 V	Tubular

NOTE — C-13 is .02 mf in issue "B" receivers

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

RESISTORS

		Ohms	Watts	
R-1	B84102	1K	0.5	Carbon
R-2	B85104	100K	0.5	Carbon
R-3, R-5	B85223	22K	0.5	Carbon
R-4	B85470	47	0.5	Carbon
R-6	B84472	4.7K	0.5	Carbon
R-7	B84471	470	0.5	Carbon
R-8	B85225	2.2 meg.	0.5	Carbon
R-9	Part of 76X1 Assembly (See Miscellaneous)			
R-10	B84274	270K	0.5	Carbon
R-11	B84153	15K	0.5	Carbon
R-12	C84182	1.8K	1.0	Carbon
R-13	36X372	.5 meg.		Volume Control
R-14	B85106	10 meg.	0.5	Carbon
R-15A, R-15B	Part of 76X5 Assembly (See Miscellaneous)			
R-16	40X310	.5 meg.		Tone Control
R-17	B85473	47K	0.5	Carbon
R-18	B84271	270	0.5	Carbon
R-19	D84821	820	2.0	Carbon

TRANSFORMERS AND COILS

L-1	9A2117	Interstage Coil
L-2	9A2113	Oscillator Coil
T-1	9A2152	Loop Antenna
T-2	9A2112	1st I-F Trans.
T-3	9A2063	2nd I-F Trans.
T-4	51X134	Output Trans.
T-5	53X291	Power Trans.

DIAL AND DRIVE ASSEMBLY

S-10X77	Drive Cord Assembly
15X251	Pointer
25X1616	Dial Bracket
58X740	Dial Glass
26X515	Drive Shaft
7A199	Pilot Light Socket Assembly
28X113	Drive Cord Tension Spring
41X88	Dial Light Reflector
7A103	No. 47 Dial Light
19X192	"C" Washer (Mtg. Drive Shaft)

VM No. 950 RECORD CHANGER PARTS

P-81E	Crystal Cartridge with Unipoint Needle
85-38	Unipoint Needle for P81E Cartridge
P-77	Crystal Cartridge with Needles
85-18	Needle, Microgroove (Red)
85-16	Needle, Regular

SPECIFICATIONS

MODELS 4-A-97, 4-A-98

Frequency Range

535 to 1620 KC

Intermediate Frequency

455 KC

Power Output

1.1 watts max. .7 watts 10% distortion.

Power Supply

105 to 125 volts A. C. 60 cycle, 50 watts with record player operating.

Loud Speaker

5" PM dynamic Alnico magnet, voice coil impedance 3.2 ohms at 400 cycles.

Tube Complement

1 - 12SA7 Mixer
1 - 12SK7 I. F. Amplifier
1 - 12SQ7 Det. & A. F.
1 - 50L6 Power Amp.
1 - 35Z5 Rectifier
1 - No. 47 Dial Lamp

Record Player

3 Speed Automatic Changer (4-A-98)
3 Speed Manual Player (4-A-97)

ALIGNMENT PROCEDURE

The following equipment is required for aligning: A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

Radiation Loop: 2-turn loop, 6 inches in diameter.

Conditions for Alignment:

Tone - Treble

Volume - Maximum

Selector Switch - "Radio" position

Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

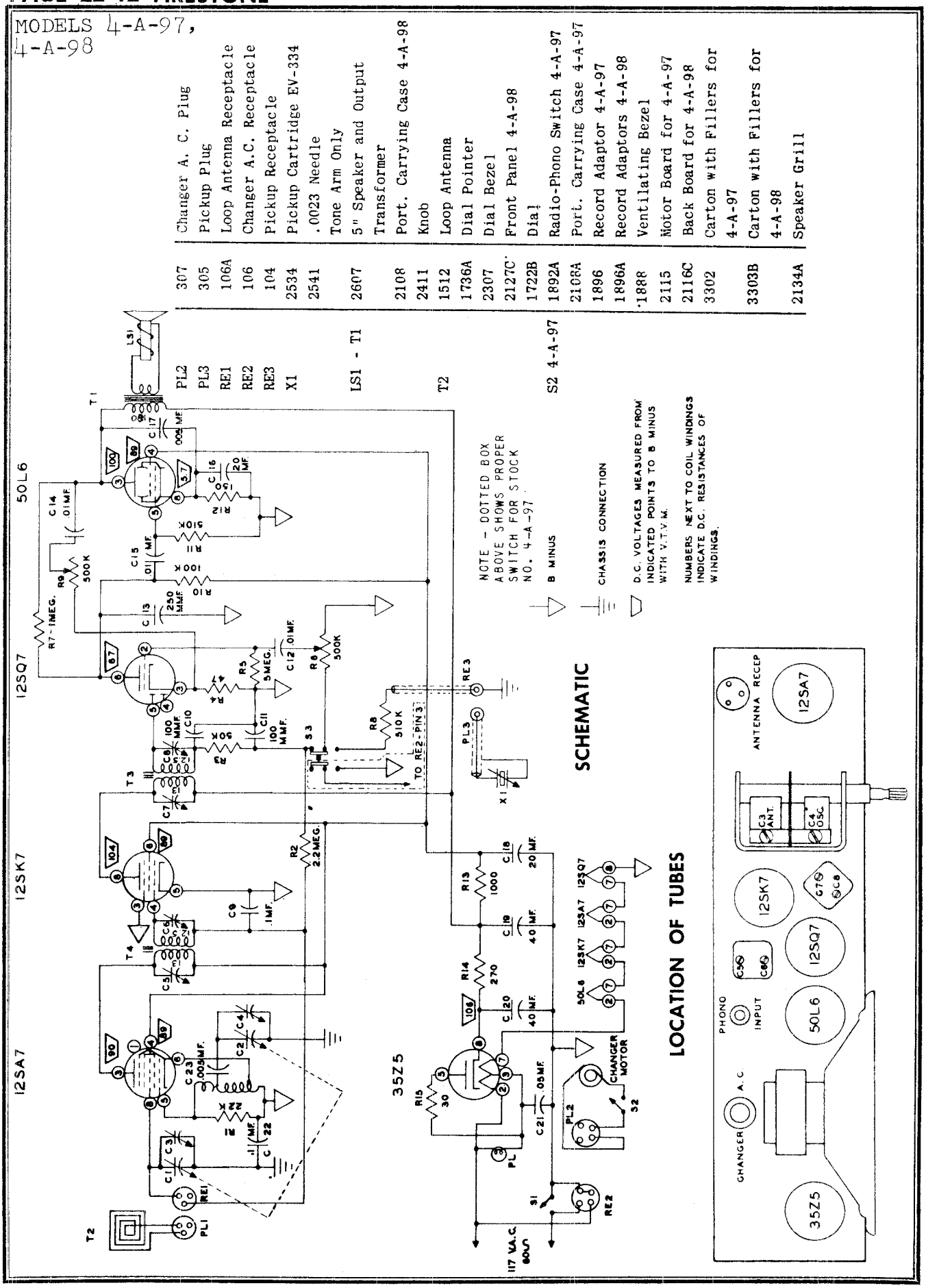
SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	C-8, C-7, C-6, C-5
LOOP	1620 KC	High End of Band		C-4
LOOP	1400 KC	1400 KC		C-3

RADIO REPLACEMENT PARTS

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
		RESISTORS
R1	517	22,000 OHM ½ Watt
R2	615	2.2 Meg OHM ½ Watt
R3		See Capristors
R4	520	47 OHM ½ Watt
R5		See Capristors
R6	401	500,000 OHM Vol. Control with Switch
R7	516	1 Meg OHM ½ Watt
R8, R11	502	510,000 OHM ½ Watt
R10		See Capristors
R12	505	150 OHM ½ Watt
R13	607	1000 OHM 1 Watt
R14	602	270 OHM 1 Watt
R15	534	30 OHM 1/2 Watt
		CAPACITORS
C1, C2	1004A	Tuning Gang and Trimmer
C3, C4		Assembly
C5, C6		Trimmer Condensors in
C7, C8		I. F. Cans
C9, C22	804	.1 MFD. 200 V.
C10, C11		See Capristors
C12		See Capristors
C13	817	250 MMF. Ceramic
C14	825	.01 MF. Ceramic
C15		See Capristors
C17	824	.005 MF. Ceramic
C18, C19	1003	40-40-20 MFD/150 Volts
C20, C16		20 MFD/25 Volts
C21	803A	.05 400 V. Tubular
		CAPRISTORS
R3, C10	811	100 MMF. 50,000 OHM 100 MMF
C11		Dual Shunt Connection
R5, C12	813	.01 MF Meg OHM
		Common Terminal Connection
R10, C15	814	.01 MF 100,000 OHM
		Common Terminal Connection
		TRANSFORMERS
T1	1201	Output Transformer
T3, T4	1402	I.F. Transformers
		MISCELLANEOUS
S1	401	On-Off Switch on Volume Control
R9	408	500,000 OHM Tone Control
S2	407	Motor Switch on Changer Assembly
S3	1892	Radio-Phono Slide Switch
PL1	307A	Loop Antenna Plug

MODELS 4-A-97, 4-A-98

	307	Changer A. C. Plug
	305	Pickup Plug
	106A	Loop Antenna Receptacle
	106	Changer A.C. Receptacle
	104	Pickup Receptacle
	2534	Pickup Cartridge EV-334
	2541	.0023 Needle
		Tone Arm Only
LS1 - T1	2607	5" Speaker and Output Transformer
	2108	Port. Carrying Case 4-A-98
	2411	Knob
T2	1512	Loop Antenna
	1736A	Dial Pointer
	2307	Dial Bezel
	2127C	Front Panel 4-A-98
	1722B	Dial
S2 4-A-97	1892A	Radio-Phono Switch 4-A-97
	2108A	Port. Carrying Case 4-A-97
	1896	Record Adaptor 4-A-97
	1896A	Record Adaptors 4-A-98
	1888	Ventilating Bezel
	2115	Motor Board for 4-A-97
	2116C	Back Board for 4-A-98
	3302	Carton with Fillers for 4-A-97
	3303B	Carton with Fillers for 4-A-98
	2134A	Speaker Grill



MODEL 4-B-56,
1949-50 Ford

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It features a novel two-piece construction and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone Top Cowl Aerial Stock No. 4-B-30. The unit is simple to install and requires no electrical adjustment after installation.

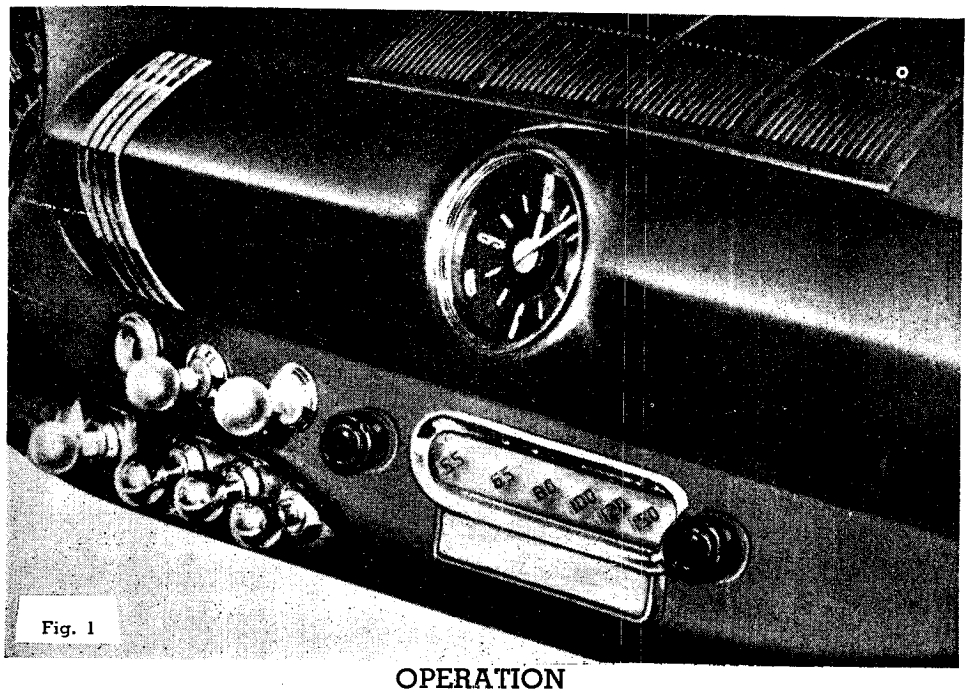


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

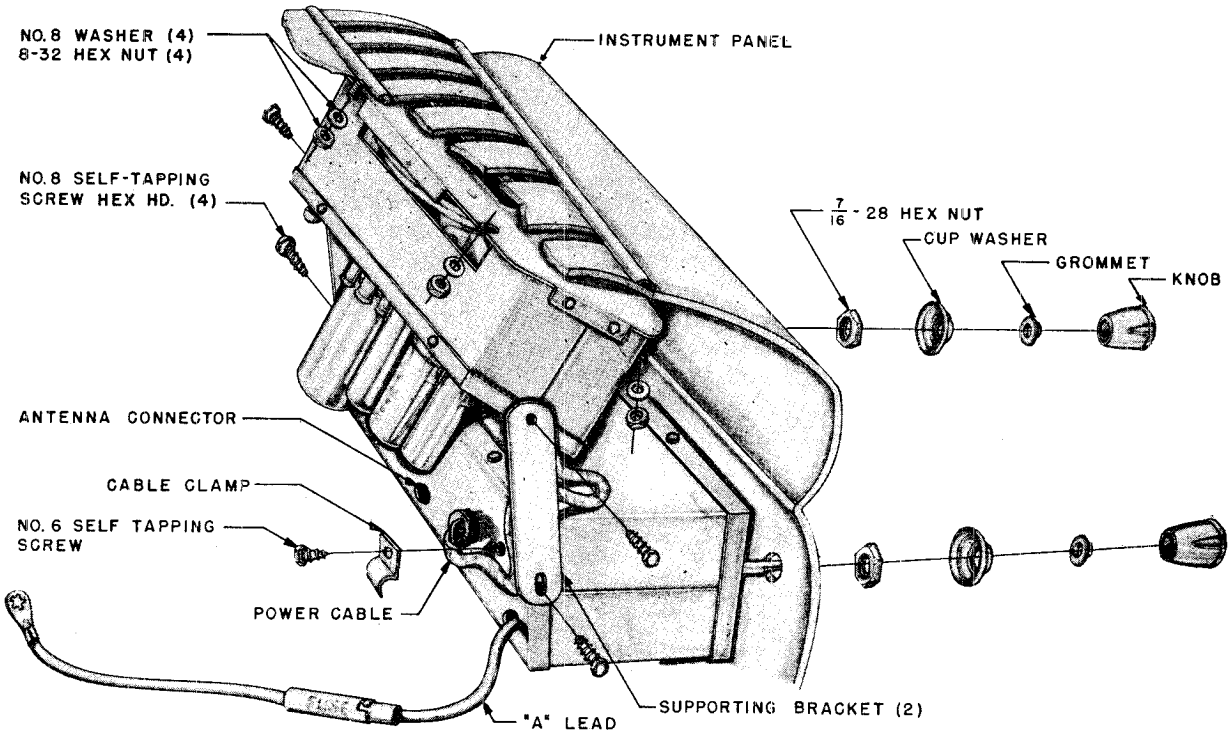
STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove two speed nuts securing radio opening cover plate to instrument panel.
2. Remove cover plate.
3. Place speaker and power pack unit over four threaded stud bolts located on the underside of the instrument panel. (Position power pack unit so that power cable is located on the left hand side.) See Fig. 2.
4. Secure power pack into position with four 8-32 nuts and washers supplied in kit of mounting hardware. Note: It may be necessary to clean threads on studs before mounting.
5. Remove knobs, grommets, cup washers and hex mounting nuts from tuning unit. *Do not remove* escutcheon.
6. Place tuning unit behind instrument panel so that mounting bushings and shafts protrude through the front panel.
7. Attach tuning unit with a hex nut on each mounting bushing.
8. Replace cup washers, grommets and knobs over shafts.
9. Secure a supporting bracket (2 supplied in kit of hardware) to each side of the power pack unit by means of two No. 8 self tapping screws. Use end of supporting bracket with round hole. If more convenient, these brackets may be attached before power pack unit is positioned in place.
10. Swing supporting brackets so that slotted holes are in line with the holes on each side of the tuning unit.
11. Secure to tuning unit with two No. 8 self tapping screws.
12. Insert power cable plug into socket on rear of tuning unit.
13. Plug antenna cable into tuning unit.
14. Secure power cable under cable clamp and tighten clamp screw.
15. Connect "A" lead to accessory terminal marked RAD. GA, on the ignition switch.

MODEL 4-B-56,
1949-50 Ford



DETAIL MOUNTING ASSEMBLY

Fig. 2

ACCESSORIES FURNISHED FOR INSTALLATION

MOUNTING PARTS KIT

The following mounting hardware parts are shipped attached to the receiver.
(See detail assembly drawing FIG. 2)

2 7/16-28 hex nuts
2 Cup washers
2 Grommets
2 Knobs
1 Cable clamp

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

2 Supporting brackets
4 No. 8 self-tapping screws
4 8-32 nuts
4 No. 8 washers

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser
1 Distributor suppressor

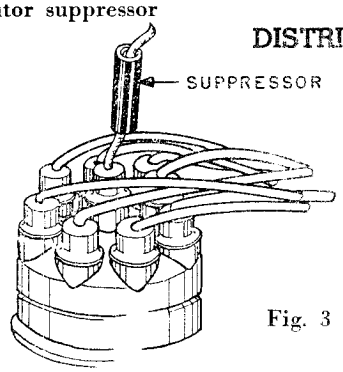


Fig. 3

DISTRIBUTOR 8 CYLINDER

DISTRIBUTOR SUPPRESSOR

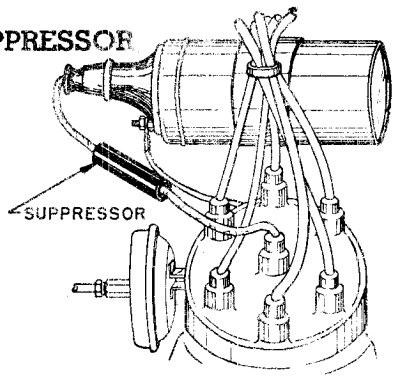


Fig. 4

DISTRIBUTOR-6 CYLINDER

Disconnect high tension wire that runs from the ignition coil to the center hole of the distributor head. Cut lead one and one-half inches back from metal tip end for 8 cylinder Ford or two and one-half inches back for 6 cylinder Ford. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor, back into distributor head.

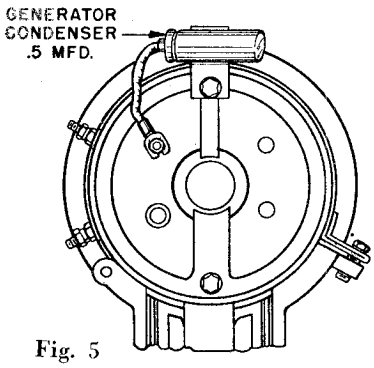


Fig. 5

GENERATOR CONDENSER

Loosen the top assembly bolt from the rear end plate of the generator. DO NOT REMOVE. Mount .5 MFD generator condenser under this bolt. Tighten bolt and connect condenser lead to the armature terminal of the generator.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 7 and 7A).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

MODEL 4-B-56,
1949-50 Ford

DIAL CORD DRIVE

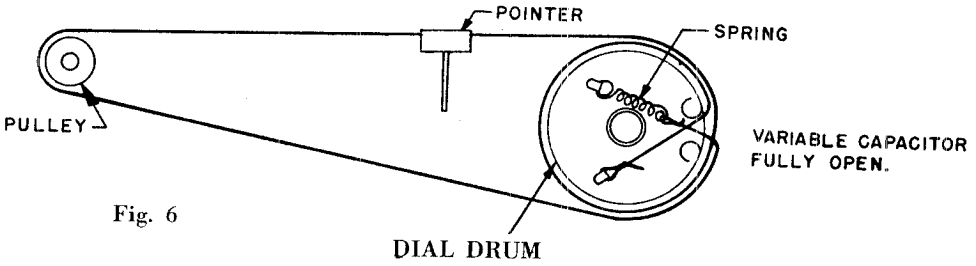


Fig. 6

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

BOTTOM VIEW OF CHASSIS

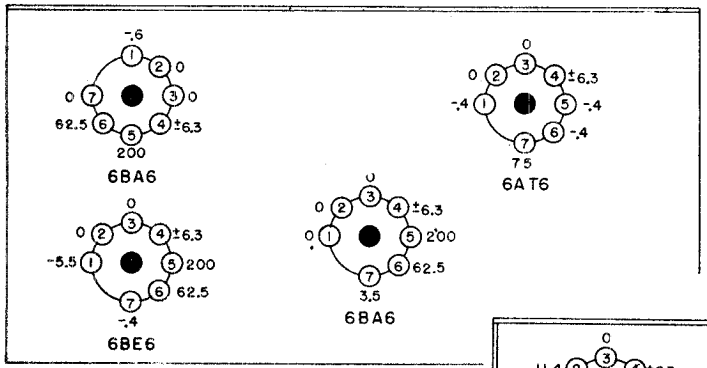


Fig. 7

FRONT OF CHASSIS

BOTTOM VIEW OF POWER PACK

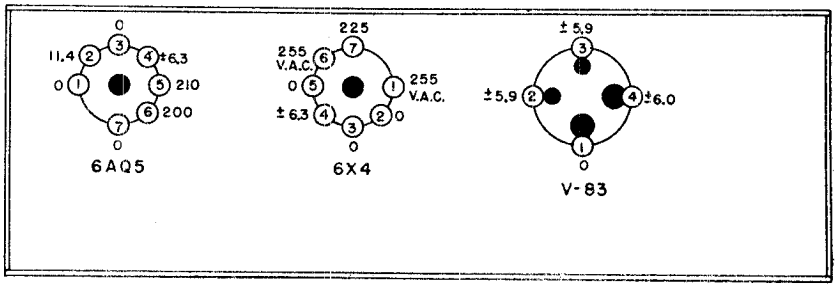


Fig. 7A

SOCKET VOLTAGES

MODEL 4-B-56,
1949-50 Ford

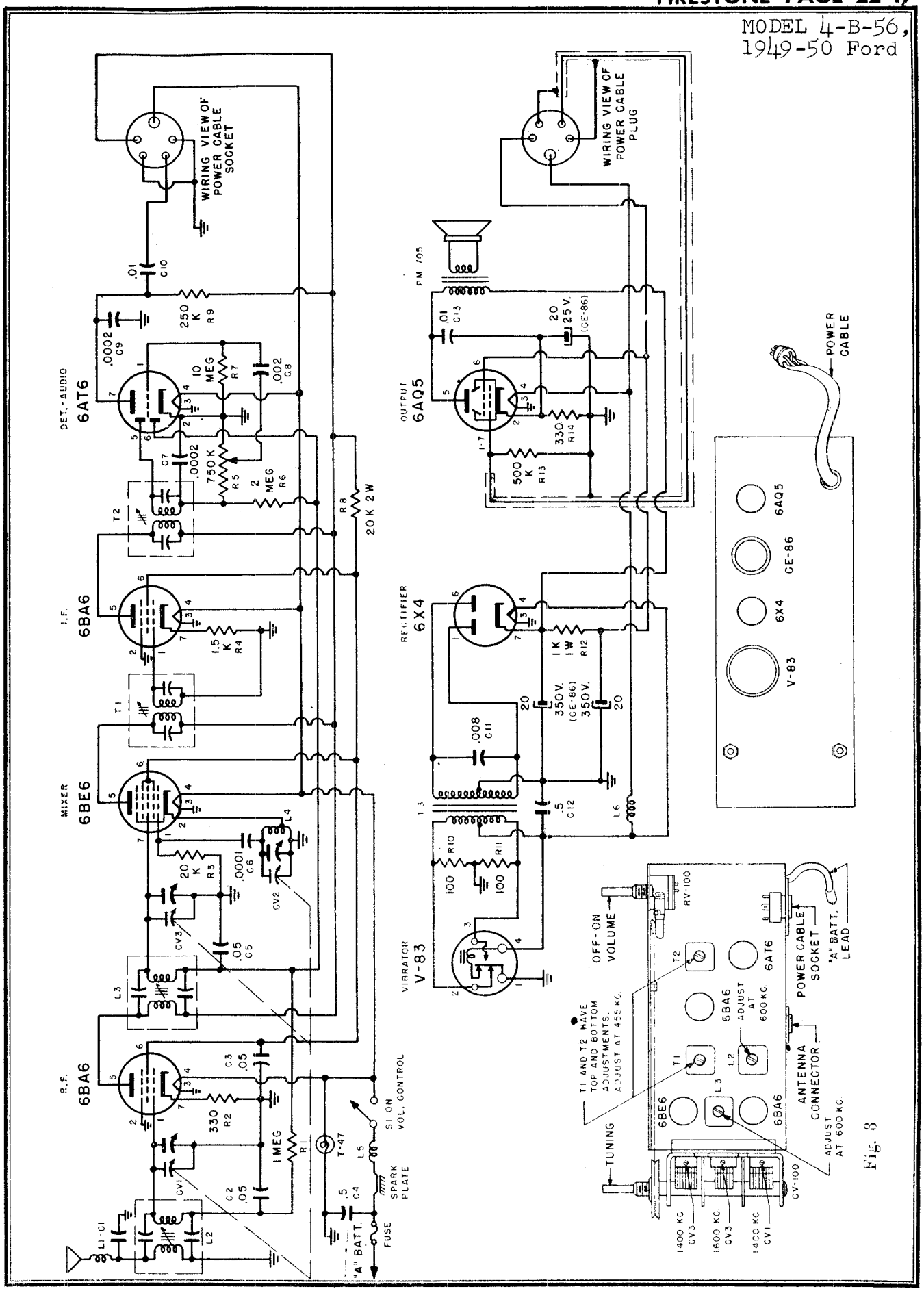


Fig. 8

MODEL 4-B-56,
1949-50 Ford

PARTS LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-100A	3 section variable

RESISTORS

R1	R309	1 megohm 1/2 watt 20% resistor
R2, R14	R303	330 ohm 1/2 watt 20% resistor
R3	R306	20K ohm 1/2 watt 20% resistor
R4	R314	1.5K ohm 1/2 watt 20% resistor
R5	RV-100	Volume control 3/4 megohm with switch
R6	R310	2 megohm 1/2 watt 20% resistor
R7	R311	10 megohm 1/2 watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm 1/2 watt 20% resistor
R10, R11	R301	100 ohm 1/2 watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
R13	R308	500K ohm 1/2 watt 20% resistor

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R. F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash
T2	14977 or 1655-16	2nd IF transformer
T1	14977 or 1655-16	1st IF transformer
T3	TV-100 or 318V-2	Vibrator transformer
T4		Output transformer (Part of speaker not furnished separately)

MISCELLANEOUS

A300	"A" lead assembly
H301	Case, less covers for Power Supply Unit
H100	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H102	Cover, power supply unit mounting (with speaker louvres)
A201	Fuse 15 Amp.
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptable, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5 1/4" PM (includes output transformer)
V-83	Vibrator
H310	Knob
H311	Cup washer
H113	7/16-28 Hex nut
C100	.5 MFD generator condenser
R100	Distributor suppressor

DIAL PARTS

D100	Dial Scale Escutcheon, Plastic
PS100	Dial Pointer
T47	Pilot Light
H114	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H115	String, dial drive

MODEL 4-B-60,
1951 Ford

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superheterodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone Top Cowl Aerial Stock No. 4-B-30. The unit is simple to install and requires no electrical adjustment after installation.

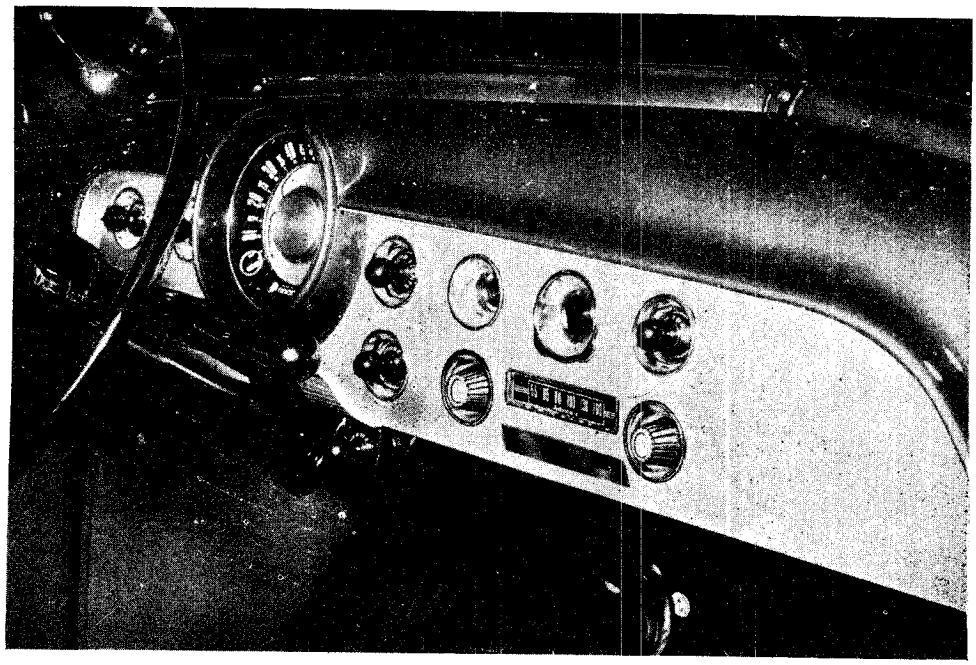


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove the radio opening cover plate by removing the speed nuts at the rear of the instrument panel.
2. Remove and discard radio bezel cups on car by removing hex nuts securing bezel cups to instrument panel.
3. Remove knobs, hex nuts, and bezel cups from tuning unit.
4. Carefully position tuning unit behind instrument panel so the mounting bushings and shafts protrude through the front panel.
5. Place bezel cups over mounting bushings.
6. Attach tuning unit and bezel cups to instrument panel with a hex nut on each mounting bushing.
7. Replace knobs.
8. Position mounting bracket over mounting stud located behind instrument panel and secure with a ¼" lockwasher and a ¼ - 20 nut.
9. Secure mounting bracket to side of tuning unit with hex head No. 8 self tapping screw, as shown in Fig. 2
10. Place speaker and power pack unit over three threaded stud bolts behind the instrument panel. (Position power pack unit so that power cable is located near the tuning unit.) See Fig. 2.
11. Secure power pack into position with the wing nuts supplied in the kit of mounting hardware.

MODEL 4-B-60,
1951 Ford

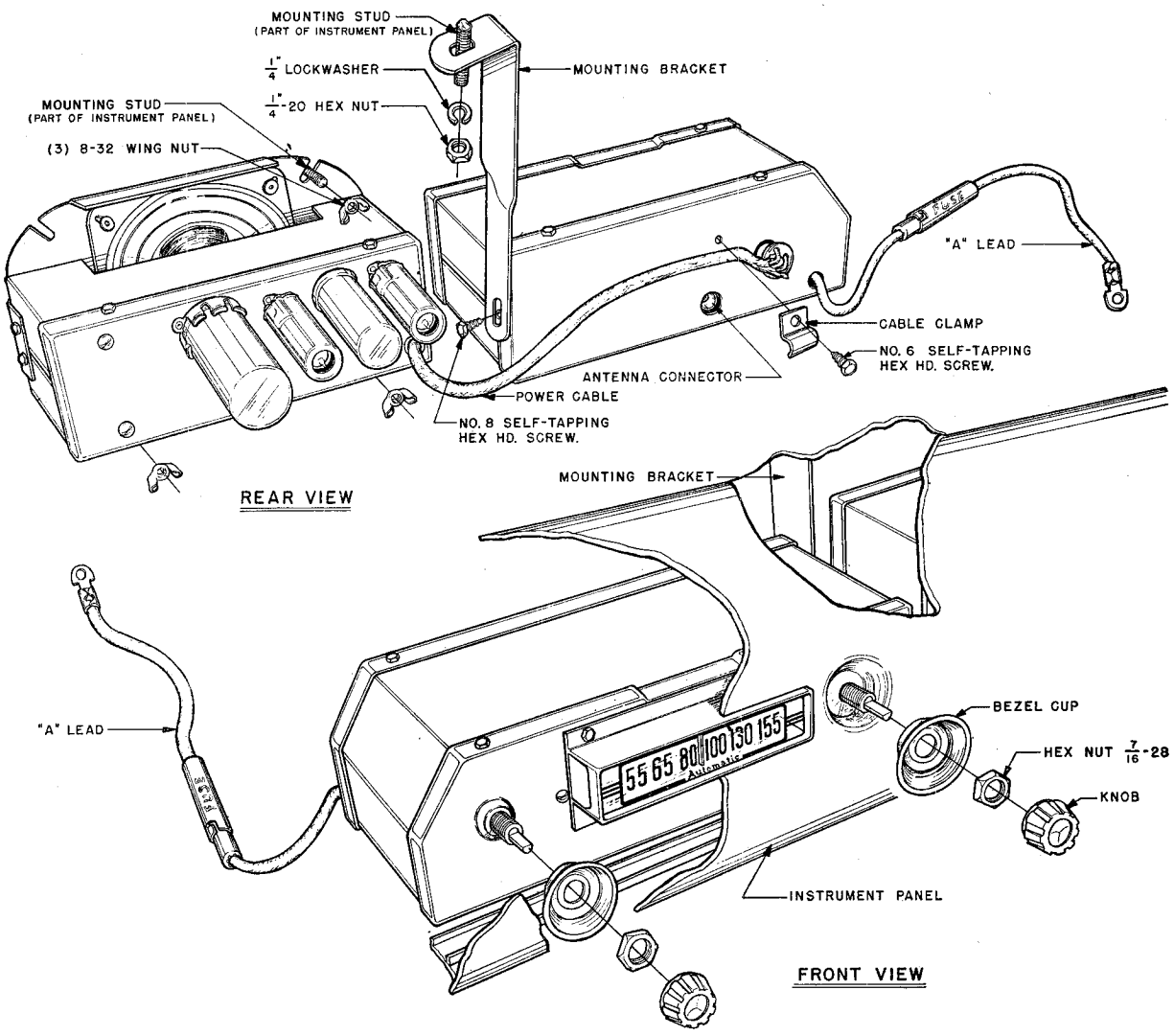


Fig. 2 DETAIL ASSEMBLY

INSTALLATION (Continued)

12. Insert power cable plug into socket on rear of tuning unit.
13. Secure power cable under cable clamp, and tighten clamp screw.
14. Plug antenna cable into tuning unit.
15. Connect "A" lead to terminal on ignition switch.

ACCESSORIES FURNISHED FOR INSTALLATION

MOUNTING PARTS KIT

The following mounting hardware parts are shipped attached to the receiver.

(See detail assembly drawing FIG. 2)

- 2 Bezel cups
- 2 7/16 — 28 hex nuts
- 2 Knobs
- 1 Cable clamp

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

- 1 Supporting bracket
- 1 No. 8 self-tapping screw
- 1 1/4" lockwasher
- 1 1/4 — 20 nut
- 3 No. 8 — 32 wing nuts

MOTOR NOISE ELIMINATION

MODEL 4-B-60, 1951 Ford

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:
1 Generator Condenser
1 Distributor suppressor

DISTRIBUTOR SUPPRESSOR

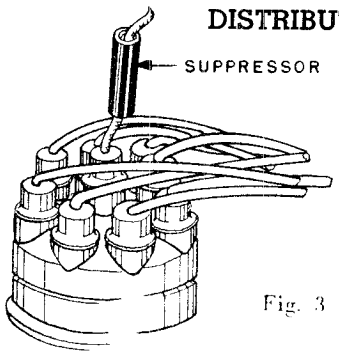


Fig. 3

DISTRIBUTOR 8 CYLINDER

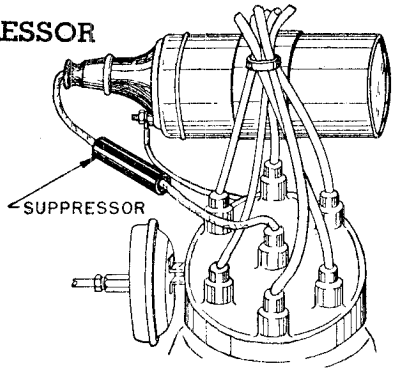


Fig. 4

DISTRIBUTOR-6 CYLINDER

Disconnect high tension wire that runs from the ignition coil to the center hole of the distributor head. Cut lead one and one-half inches back from metal tip end for 8 cylinder Ford or two and one-half inches back for 6 cylinder Ford. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor, back into distributor head.

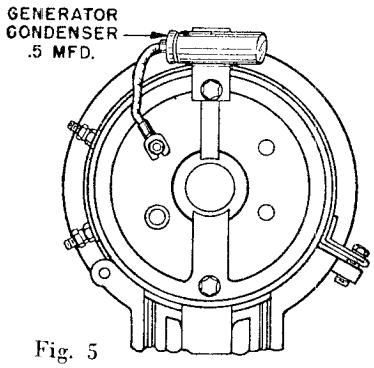


Fig. 5

GENERATOR CONDENSER

Loosen the top assembly bolt from the rear end plate of the generator. DO NOT REMOVE. Mount .5 MFD generator condenser under this bolt. Tighten bolt and connect condenser lead to the armature terminal of the generator.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models)

MODEL 4-B-60,
1951 Ford
SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart. (Fig. 7 and 7A).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

DIAL CORD DRIVE

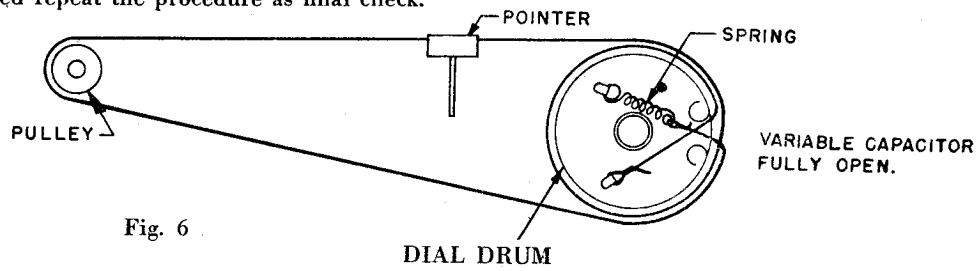


Fig. 6

REPLACEMENT PARTS LIST

SCHEMATIC DIAGRAM REF. NO.	PART NO.	DESCRIPTION
CONDENSERS		
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-100A	3 section variable
RESISTORS		
R1	R309	1 megohm ½ watt 20% resistor
R2, R14	R303	330 ohm ½ watt 20% resistor
R3	R306	20K ohm ½ watt 20% resistor
R4	R314	1.5K ohm ½ watt 20% resistor
R5	RV-100	Volume control ¾ megohm with switch
R6	R310	2 megohm ½ watt 20% resistor
R7	R311	10 megohm ½ watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm ½ watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
R13	R308	500K ohm ½ watt 20% resistor
COILS AND TRANSFORMERS		
L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash
T2	14977 or 1655-16	2nd IF transformer
T1	14977 or 1655-16	1st IF transformer
T3	TV-100 or 318V-2	Vibrator transformer
T4		Output transformer (Part of speaker not furnished separately)
DIAL PARTS		
D151		Dial Scale
H151		Dial Scale Holder
PS151		Dial Pointer
T47		Pilot Light
H114		Pilot Light Socket
H203		Pulley, idler
H204		Spring, Dial drive String Tension
H115		String, dial drive
MISCELLANEOUS		
A300		"A" lead assembly
H152		Bezel Cup
H153		Case, less covers for Power Supply Unit
H154		Case, complete with covers for R.F. tuning unit
H207		Clip, Anti-rattle
H208		Clip, coil mounting
H102		Cover, power supply unit mounting (with speaker louvres)
A201		Fuse 15 Amp.
H155		Knob
H156		Mounting Bracket
504PC-300		Power Cable Assembly (complete with plug)
H212		Receptacle, Antenna cable
504-FC		Socket, power cable
PM-705		Speaker, 5¼" PM (includes output transformer)
V-83		Vibrator
H311		Cup washer
H113		7/16—28 Hex nut
C100		.5 MFD generator condenser
R100		Distributor suppressor

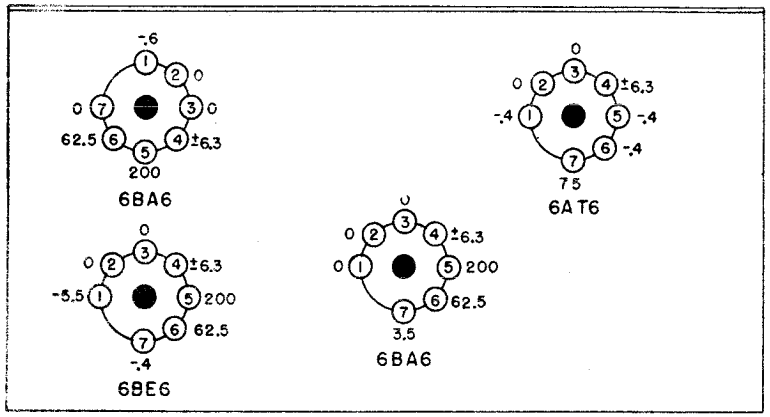
ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

BOTTOM VIEW OF CHASSIS



FRONT OF CHASSIS

Fig. 7

BOTTOM VIEW OF POWER PACK

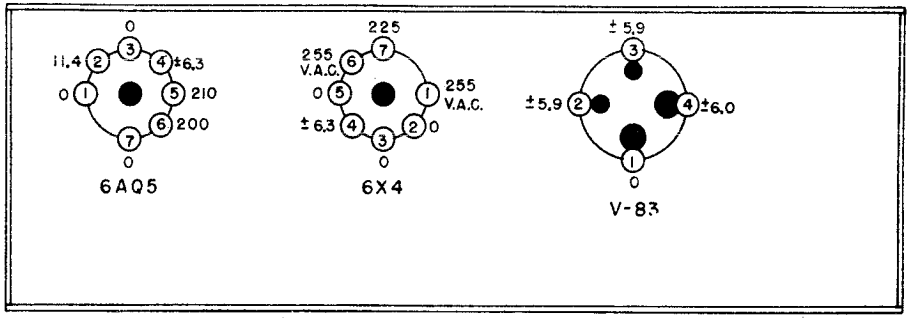


Fig. 7A

SOCKET VOLTAGES

MODEL 4-B-60,
1951
Ford

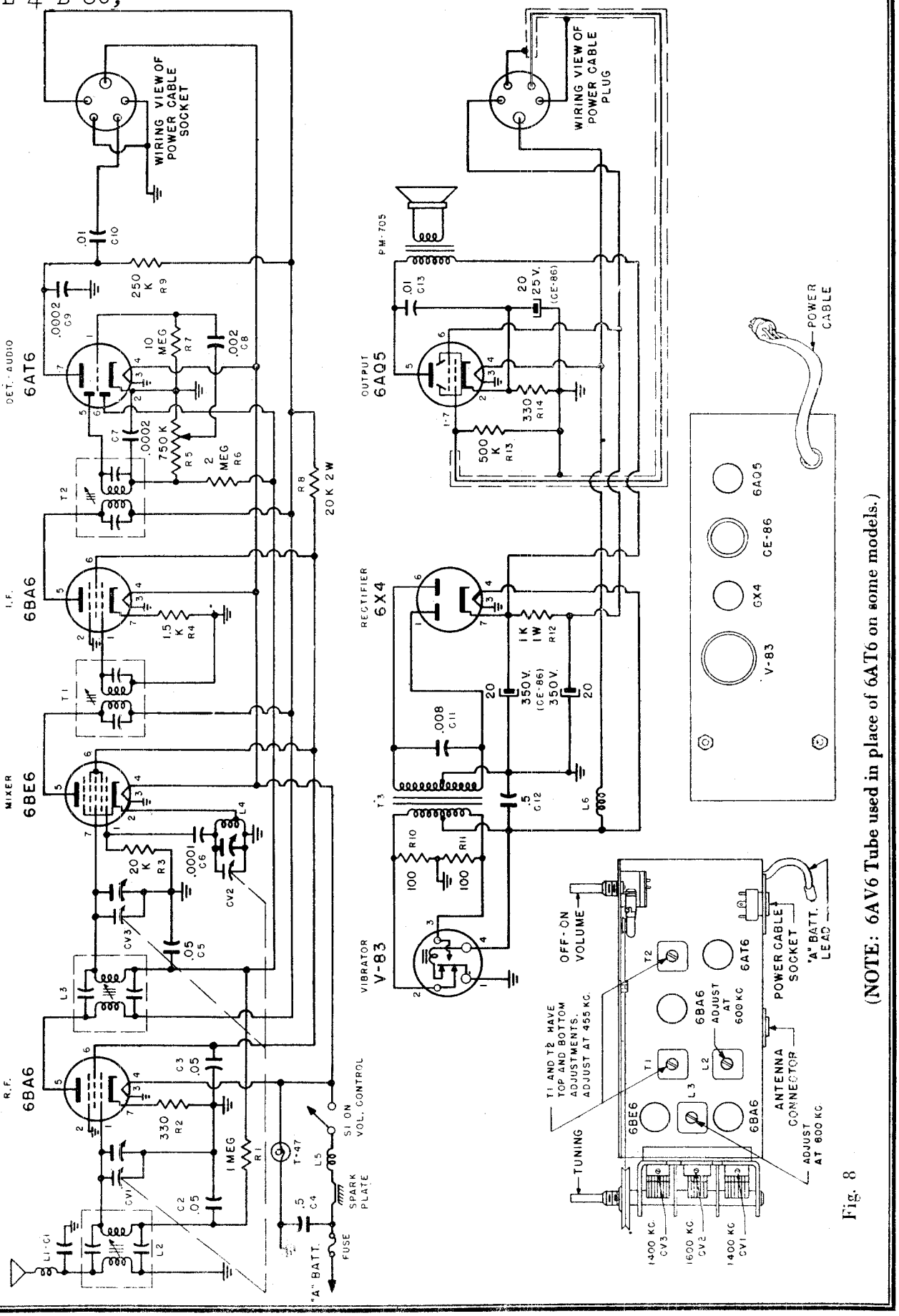
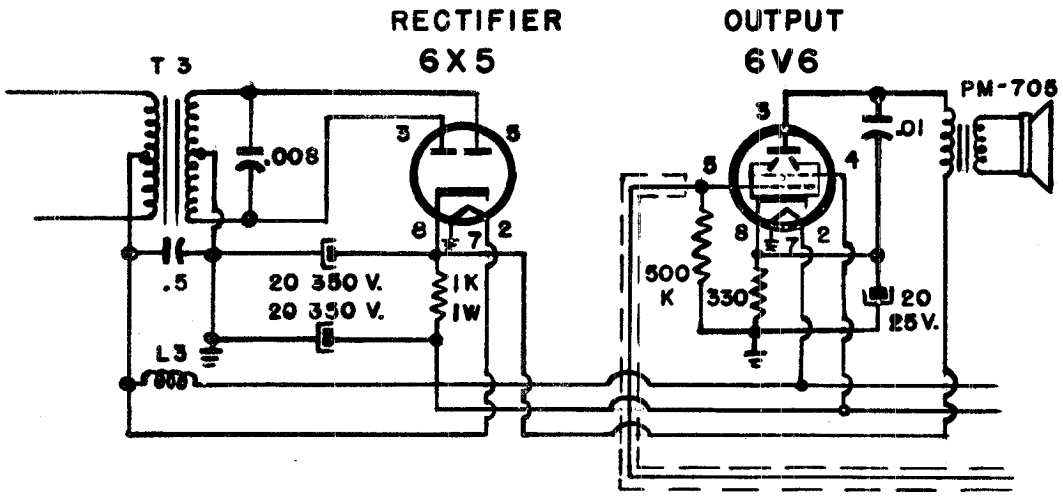


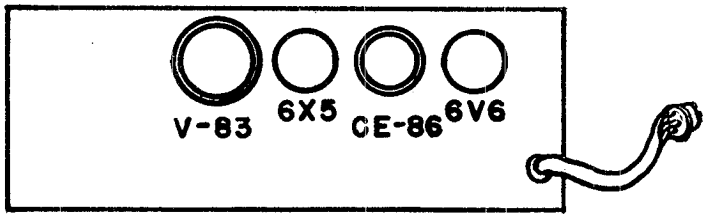
Fig. 8

(NOTE: 6AV6 Tube used in place of 6AT6 on some models.)

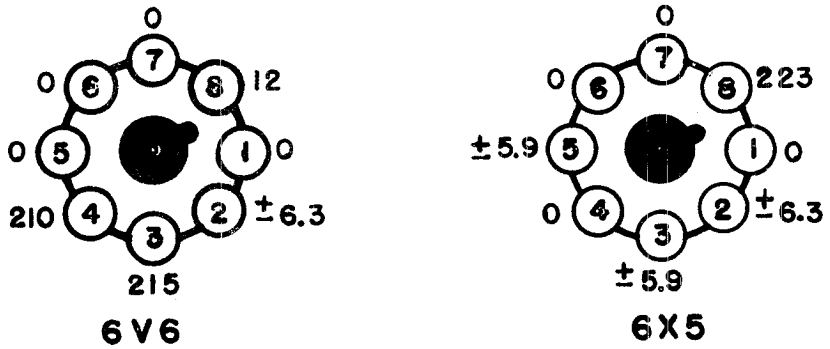
MODEL 4-B-60,
1951 Ford

SUBSTITUTION OF 6X5 TUBE IN PLACE OF 6X4 AND 6V6 TUBE IN PLACE OF 6AQ5.





TUBE LOCATION CHART



SOCKET VOLTAGES CHART

MODEL 4-B-61,
1951 Chevrolet

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone disappearing fender-well aerial stock No. 4-B-21. The unit is simple to install and requires no electrical adjustment after installation.

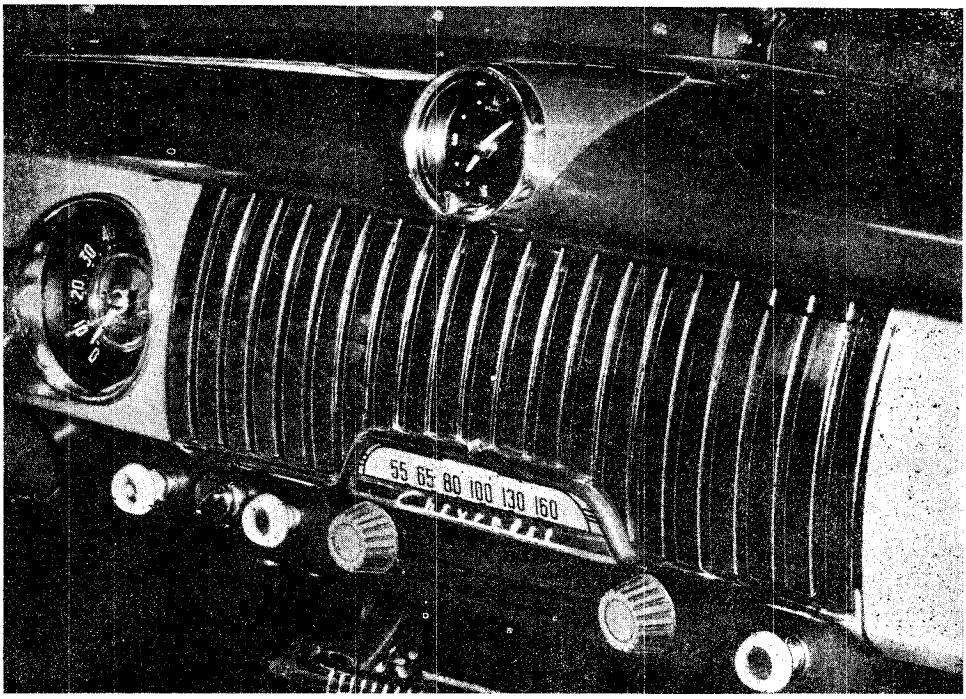


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove two speed nuts securing dummy control cover plate. Discard dummy plate and speed nuts.
2. Remove 12-24 hex nuts securing dummy radio opening cover plate. Save hex nuts but discard dummy plate.
3. Referring to Fig. 2 (rear view), place mounting brackets over 12-24 stud bolts and attach with #12 lockwashers, contained in kit of mounting hardware, and 12-24 hex nuts previously removed.
4. Remove knobs, cup washers, hex nuts, washers and control cover plate from control shafts and mounting bushings.
5. Referring to Fig. 2 (front view), position the receiver behind the instrument panel so that the shafts and mounting bushings protrude through the instrument panel and the stud bolts on the sides of the receiver slide into the slotted ends of the mounting brackets.
6. Secure the mounting brackets to receiver with ¼" lockwashers and ¼-20 hex nuts.

MODEL 4-B-61,
1951 Chevrolet

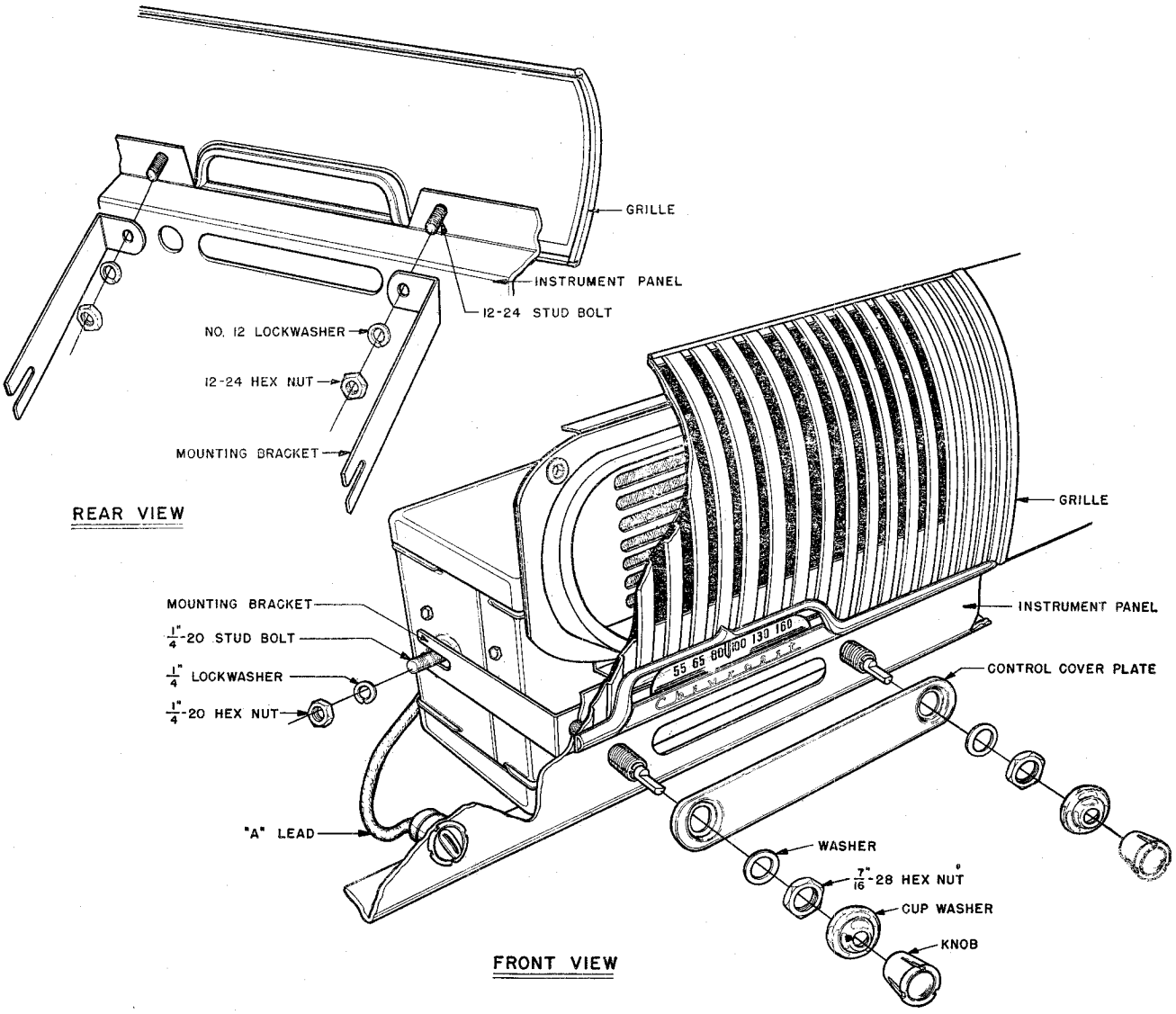


Fig. 2 DETAIL ASSEMBLY

INSTALLATION (Continued)

7. Place control cover plate over mounting bushings.
8. Replace washers and hex nuts on mounting bushings.
9. Replace cup washers and knobs on control shafts.
10. Connect the "A" lead to ignition switch.
11. Plug antenna cable into receptacle located on the back of the receiver.

ACCESSORIES FURNISHED FOR INSTALLATION

The following mounting hardware parts are shipped attached to the receiver. (See Detail Assembly drawing Fig. 2.)

- 2 Knobs
- 2 Cup washers
- 2 7/16-28 Hex nuts
- 2 Washers
- 1 Control Cover Plate
- 2 1/4" Lockwashers
- 2 1/4-20 Hex Nuts

An envelope containing additional mounting hardware is supplied with this receiver. In contains the following parts:

- 2 No. 12 Lockwashers
- 2 Mounting Brackets

MODEL 4-B-61, 1951 Chevrolet MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:
1 Generator Condenser.
1 Distributor Suppressor.

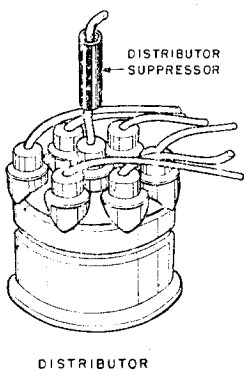
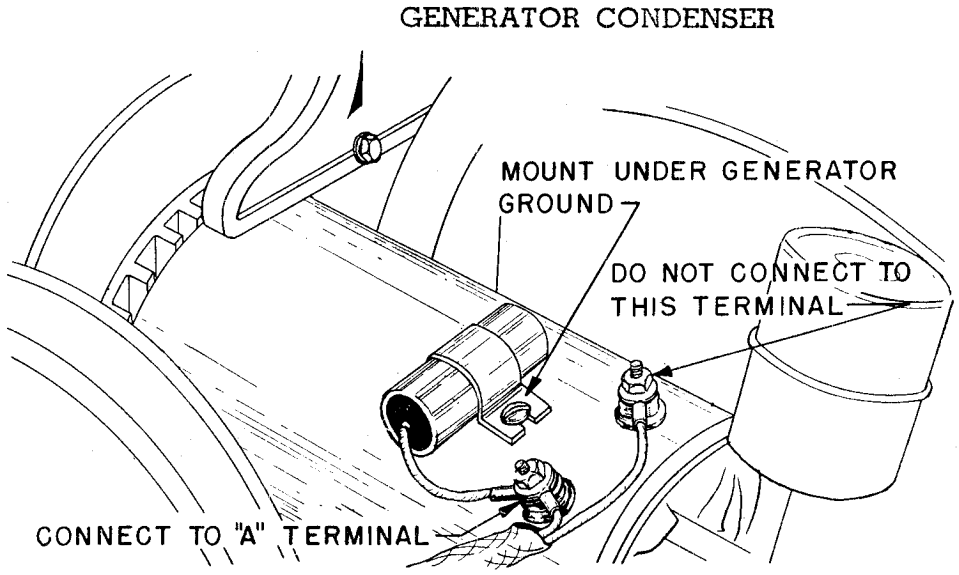


Fig. 3



DISTRIBUTOR SUPPRESSOR

Disconnect the center lead in the distributor head of the motor. Cut lead approximately 2 inches back from metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead, with attached suppressor, back into distributor head.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models.)

MODEL 4-B-61,
1951 Chevrolet

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 4).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure". After realignment has been completed repeat the procedure as final check.

INSTRUCTIONS FOR SERVICING RECEIVER COMPONENTS

The novel design of this receiver permits servicing all components without removing the chassis from the case. The top cover can be removed by removing the four (4) screws securing it to the case. This exposes all tube sockets, connections, resistors and condensers for observation and service.
Removing the bottom cover makes it possible to service tubes, vibrator, and volume control.

PARTS LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description	Part No.
C2, C3, C4	C207	.05 MFD 200 volt condenser	A351
C5	CC200	100 MMFD ceramic condenser	H352
C6, C13, C14	CC201	200 MMFD ceramic condenser	H353
C7	C203	.002 MFD 400 volt condenser	H207
C8, C9	C206	.01 MFD 600 volt condenser	H208
C10, C11	C209	.5 MFD 100 volt condenser	H209
C12	C205	.008 MFD 1600 volt condenser	H354
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser	H355 H311 A201 H211 H310
CV-200	CV-200	3 section variable tuning condenser	H212
			PM-250

RESISTORS

R1	R309	1 megohm ½ watt 20% resistor	V-83 or V-94
R2	R306	20K ohm ½ watt 20% resistor	H113
R3	R314	1.5K ohm ½ watt 20% resistor	C100
R4	R310	2 megohm ½ watt 20% resistor	R100
R5	R311	10 megohm ½ watt 20% resistor	
R6	R307	250K ohm ½ watt 20% resistor	
R7	R308	500K ohm ½ watt 20% resistor	
R8, R13	R303	330 ohm ½ watt 20% resistor	D351
R9	R313	20K ohm 2 watt 20% resistor	PS351
R10, R11	R301	100 ohm ½ watt 20% resistor	DS200
R12	R312	1K ohm 1 watt 20% resistor	H201
RV-200	RV-200	Volume control ¾ megohm with switch	T51
			H202

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit	H203
L2	57FB-3	Antenna Coil	H204
L3	57FB-4	RF coil	H205
L4	L201	RF Oscillator coil	
L5	L202	Choke, vibrator hash	
L6	L203	Choke, "A" line	
T1	1655-16	1st IF transformer	
T2	1655-16	2nd IF transformer	
T3		Output transformer (Part of speaker not furnished separately)	
T4	TV-100 or TV-86A	Vibrator transformer	

MISCELLANEOUS

"A" lead assembly	
Bracket, mounting	
Case, (less covers)	
Clip, anti-rattle	
Clip, coil mounting	
Cover, bottom case	
Control Cover Plate	
Cover, top case	
Cup washers, shaft	
Fuse, 15 amp	
Grommet, rubber, gang mounting	
Knob	
Receptacle, antenna cable	
Speaker, 5¼" PM includes output transformer	
Vibrator	
7/16-28 Hex nut	
.5 MFD Generator condenser	
Distributor suppressor	

DIAL PARTS

Dial Scale	
Dial Pointer	
Drive shaft assembly	
Grommet, rubber drive	
Pilot light	
Pilot light socket	
Pulley, idler	
Spring, Dial Drive String Tension	
String, Dial Drive	

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

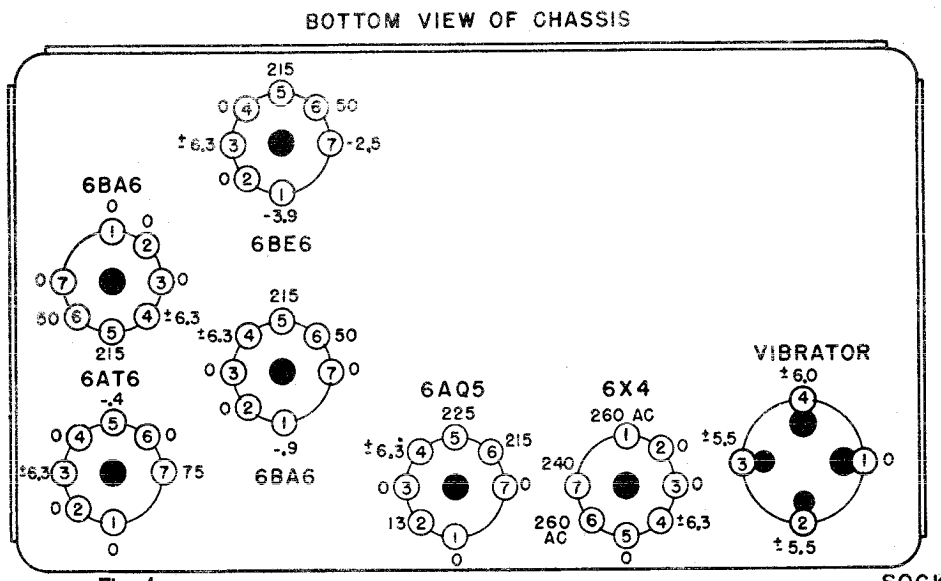


Fig. 4

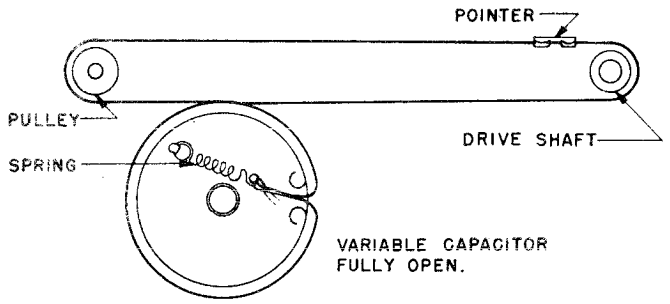


Fig. 5

MODEL 4-B-61,
1951 Chevrolet

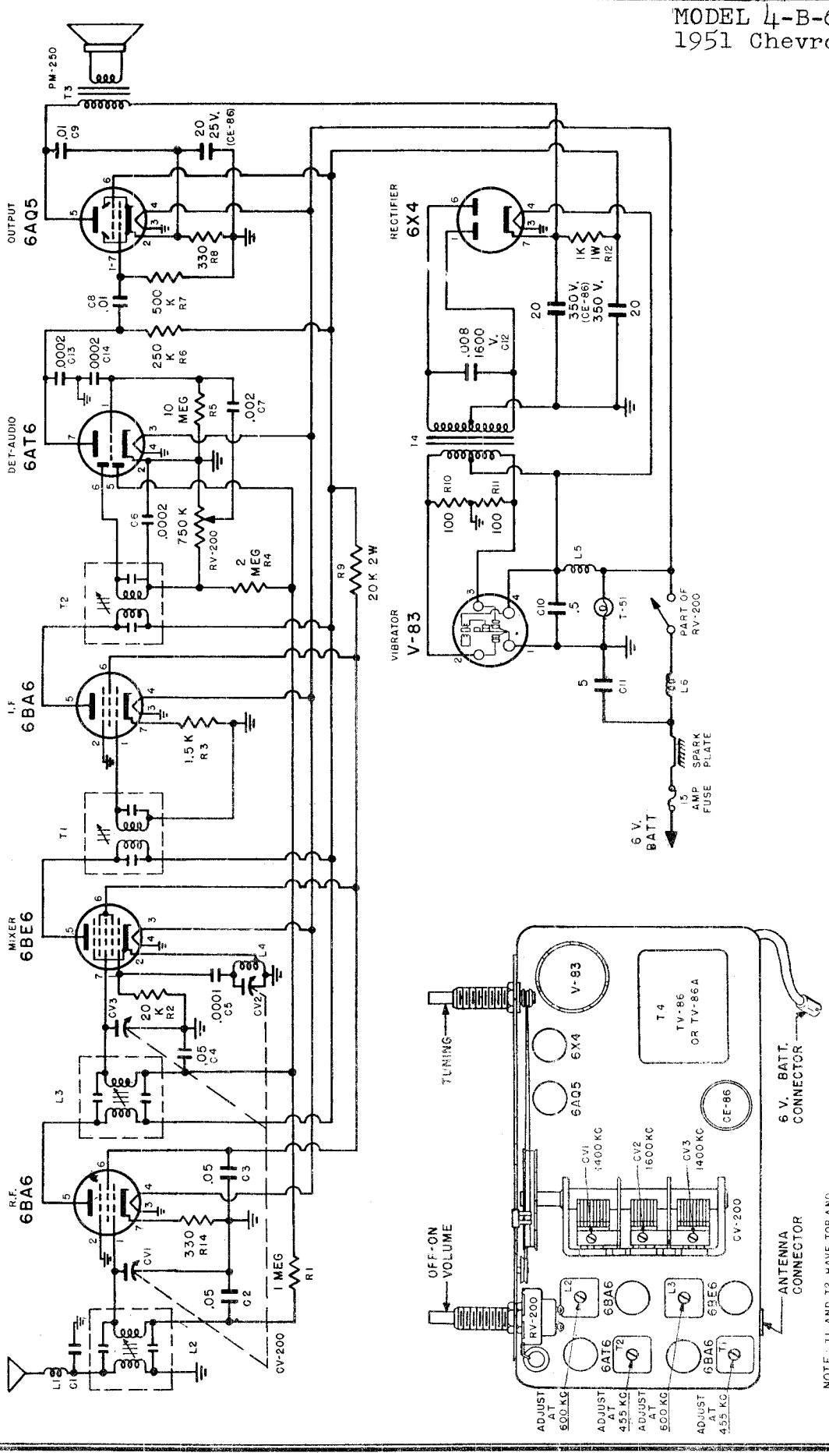


Fig. 6 Note: 6AV6 used in place of 6AT6 on some models.

MODEL 4-B-62,
1950-1951
Studebaker

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone Top Cowl Aerial Stock No. 4-B-30. The unit is simple to install and requires no electrical adjustment after installation.

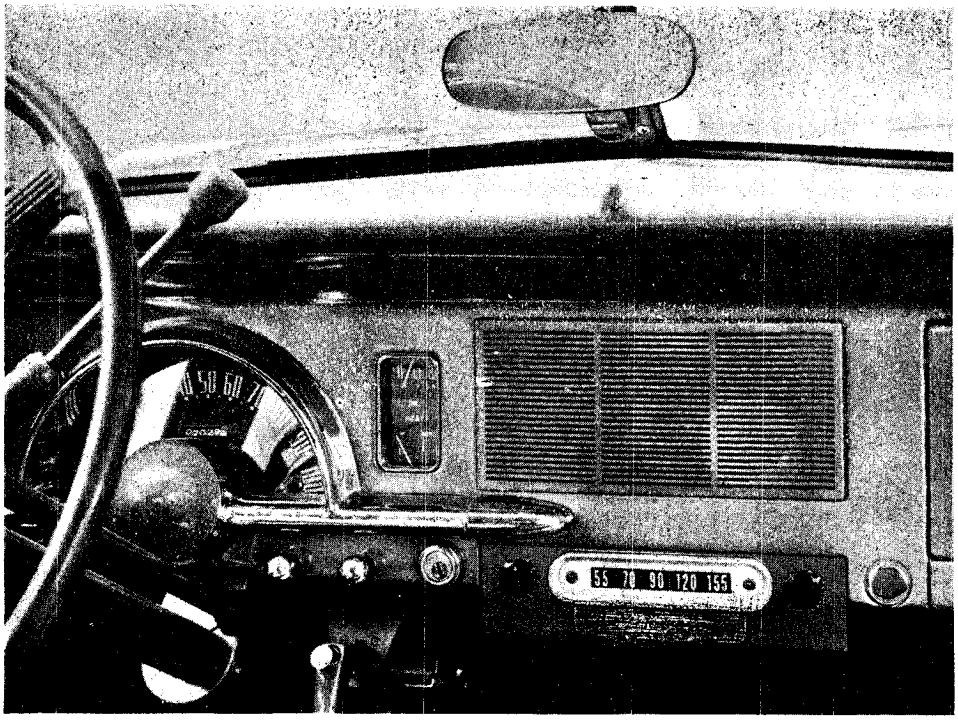


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to the desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION (See Fig. 2)

1. Attach rubber gasket baffle assembly to speaker grille on radio with 4 snap fasteners supplied in kit of mounting hardware.
2. Remove two screws securing radio opening cover plate to instrument panel.
3. Discard cover plate.
4. *Important:* Some car models have a cover over the speaker opening at the back of the instrument panel. Remove and discard this cover.
5. Lift hood of car and locate the two 5/16" holes which are in the Fire Wall just below the windshield wiper motor. Insert hook bolt through the right hand hole on the engine side.
6. Place a 1/4-20 hex nut approximately one inch up on threaded end of hook bolt.

MODEL 4-B-62,
1950-51,
Studebaker

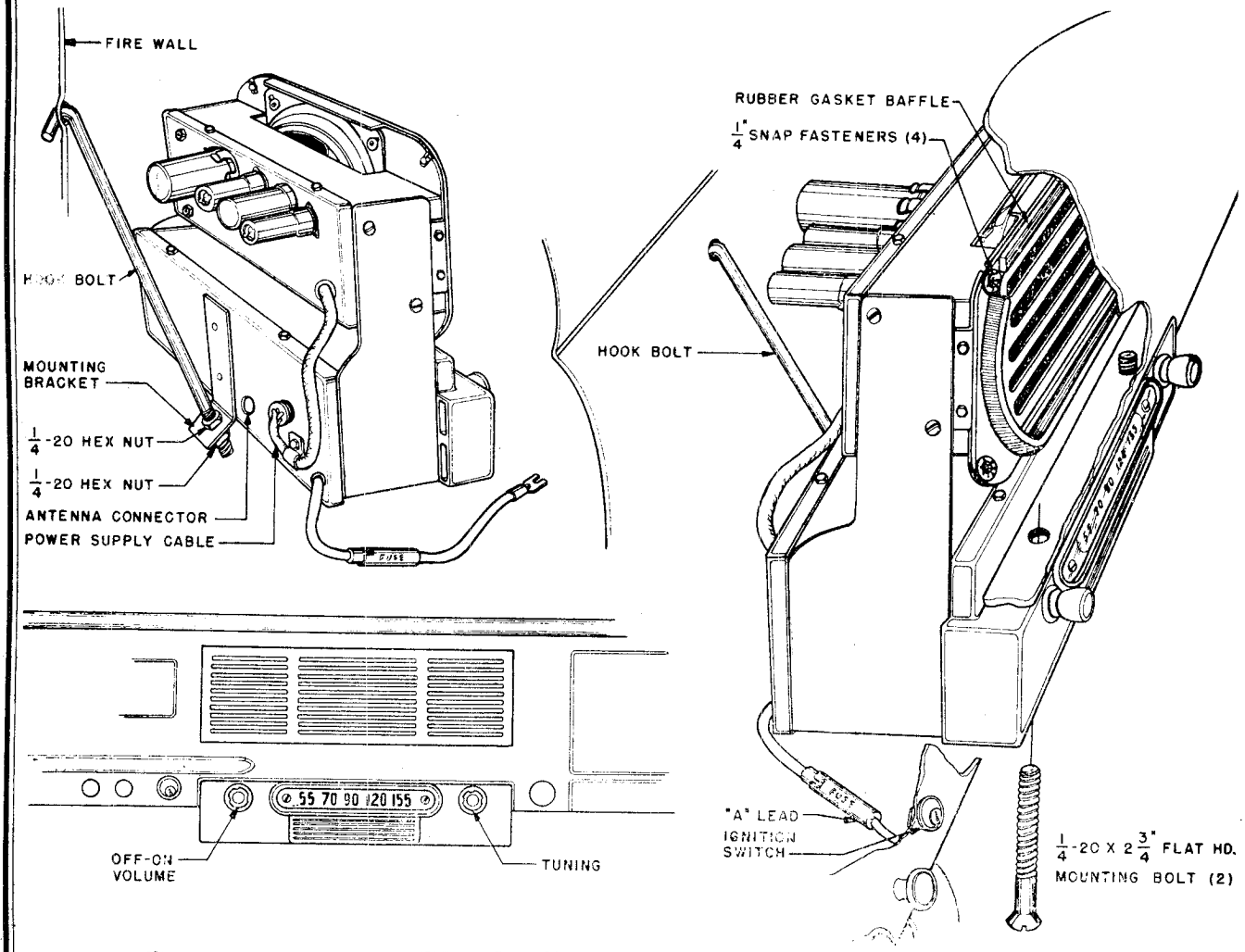


Fig. 2 DETAIL MOUNTING ASSEMBLY

INSTALLATION (Continued)

7. Position radio with attached rubber gasket baffle behind instrument panel and insert threaded end of hook bolt through hole on bracket attached to back of radio.
8. Screw ¼-20 hex nut on hook bolt. Adjust position of the two ¼-20 hex nuts so that the radio is mounted parallel to instrument panel. Tighten bottom hex nut.
9. Insert two ¼-20 Flat head bolts supplied in mounting kit through bottom edge of radio and screw into edge of instrument panel.
10. Connect "A" lead to terminal on ignition switch.
11. Plug antenna cable into receiver.

Mounting Parts Kit

ACCESSORIES FURNISHED FOR INSTALLATION

1 Rubber Gasket baffle assembly
4 ¼" snap fasteners
1 Hook bolt
2 ¼-20 hex nuts
2 ¼-20 x 2¾" flat head mounting bolts

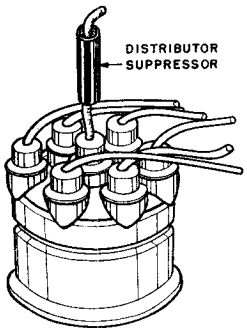
MODEL 4-B-62,
1950-1951
Studebaker

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser.
1 Distributor suppressor.



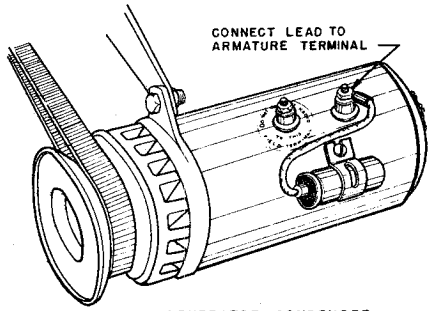
DISTRIBUTOR
Fig. 3

DISTRIBUTOR SUPPRESSOR

Disconnect the high tension wire that runs from the ignition coil to the center hole of the distributor cap. Cut lead one inch back from the metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor back into distributor cap.

GENERATOR CONDENSER

Loosen screw on top surface of generator near terminals. Insert slotted generator condenser bracket under screw head and tighten screw. Connect generator condenser lead to armature terminal. *Do not connect to field terminal.*



GENERATOR CONDENSER
Fig. 4

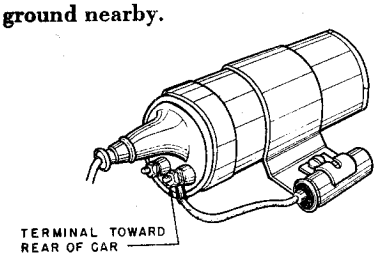
The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise in most cases. If the motor noise persists the following steps should be taken. Check operation of radio as each step is made.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

AMMETER CONDENSER

A .5 MFD by-pass condenser should be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.



IGNITION COIL CONDENSER
Fig. 5

IGNITION COIL CONDENSER

In some cases it may be necessary to connect a .5 MFD by-pass condenser from the rear terminal of the ignition coil to ground.

ELECTRICAL ACCESSORIES

It may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models)

MODEL 4-B-62,
1950-1951
Studebaker

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 7 and 7A).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

DIAL CORD DRIVE

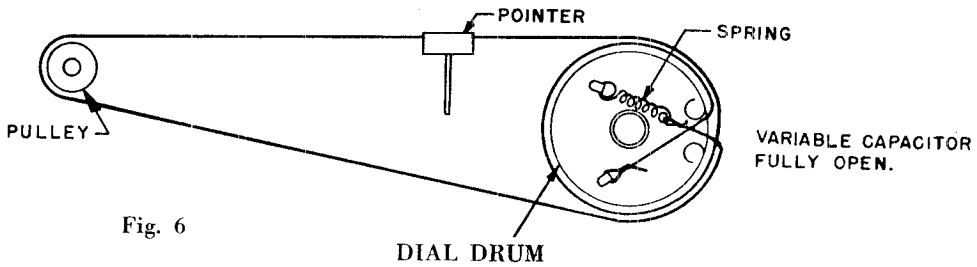


Fig. 6

PARTS LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-400	3 section variable

RESISTORS

R1	R309	1 megohm ½ watt 20% resistor
R2, R14	R303	330 ohm ½ watt 20% resistor
R3	R306	20K ohm ½ watt 20% resistor
R4	R314	1.5 K ohm ½ watt 20% resistor
R5	RV-570	Volume control ¾ megohm with switch
R6	R310	2 megohm ½ watt 20% resistor
R7	R311	10 megohm ½ watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm ½ watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor •
R13	R308	500K ohm ½ watt 20% resistor

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash
T2	14977 or 1655-16	2nd IF transformer
T1	14977 or 1655-16	1st IF transformer
T3	TV-100 or 318V-2	Vibrator transformer
T4		Output transformer (Part of speaker not furnished separately)

MISCELLANEOUS

A300	"A" lead assembly
H521	Case, less covers for Power Supply Unit
H520	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H102	Cover, power supply unit mounting (with speaker louvres)
H522	Cover, RF tuning unit, front (complete with plastic escutcheon)
A201	Fuse 15 Amp.
H524	Hook bolt
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptable, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5¼" PM (includes output transformer)
V-83	Vibrator
H310	Knob
H311	Cup washer
C100	.5 MFD generator condenser
R100	Distributor suppressor

DIAL PARTS

H523	Dial Scale Escutcheon, Plastic
PS100	Dial Pointer
T47	Pilot Light
H114	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H115	String, dial drive

ALIGNMENT PROCEDURE

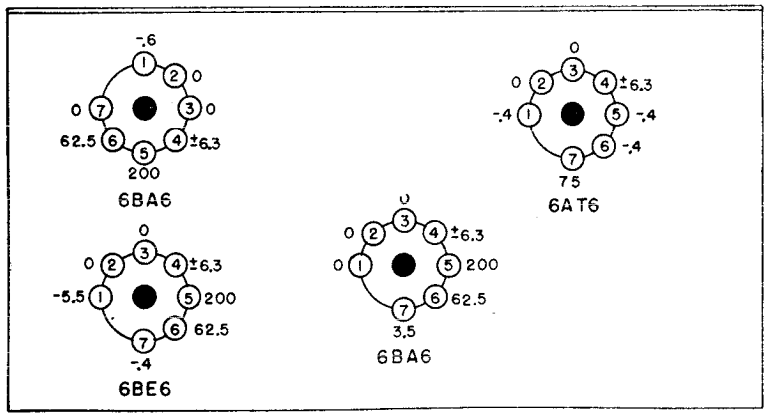
Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna

8) Repeat steps 4 and 5

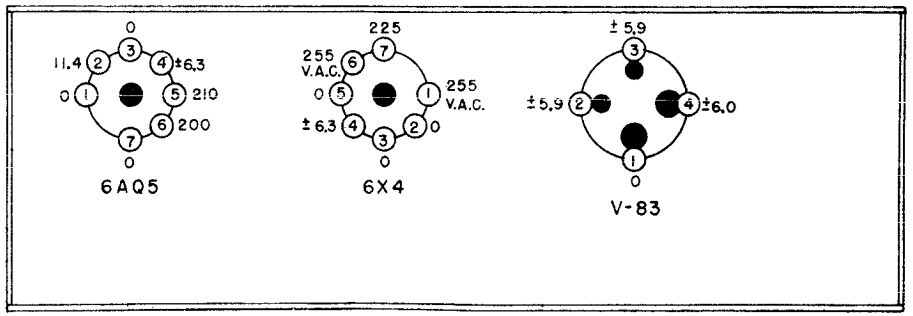
BOTTOM VIEW OF CHASSIS



FRONT OF CHASSIS

Fig. 7

BOTTOM VIEW OF POWER PACK



SOCKET VOLTAGES

Fig. 7A

MODEL 4-B-62,
1950-1951
Studebaker

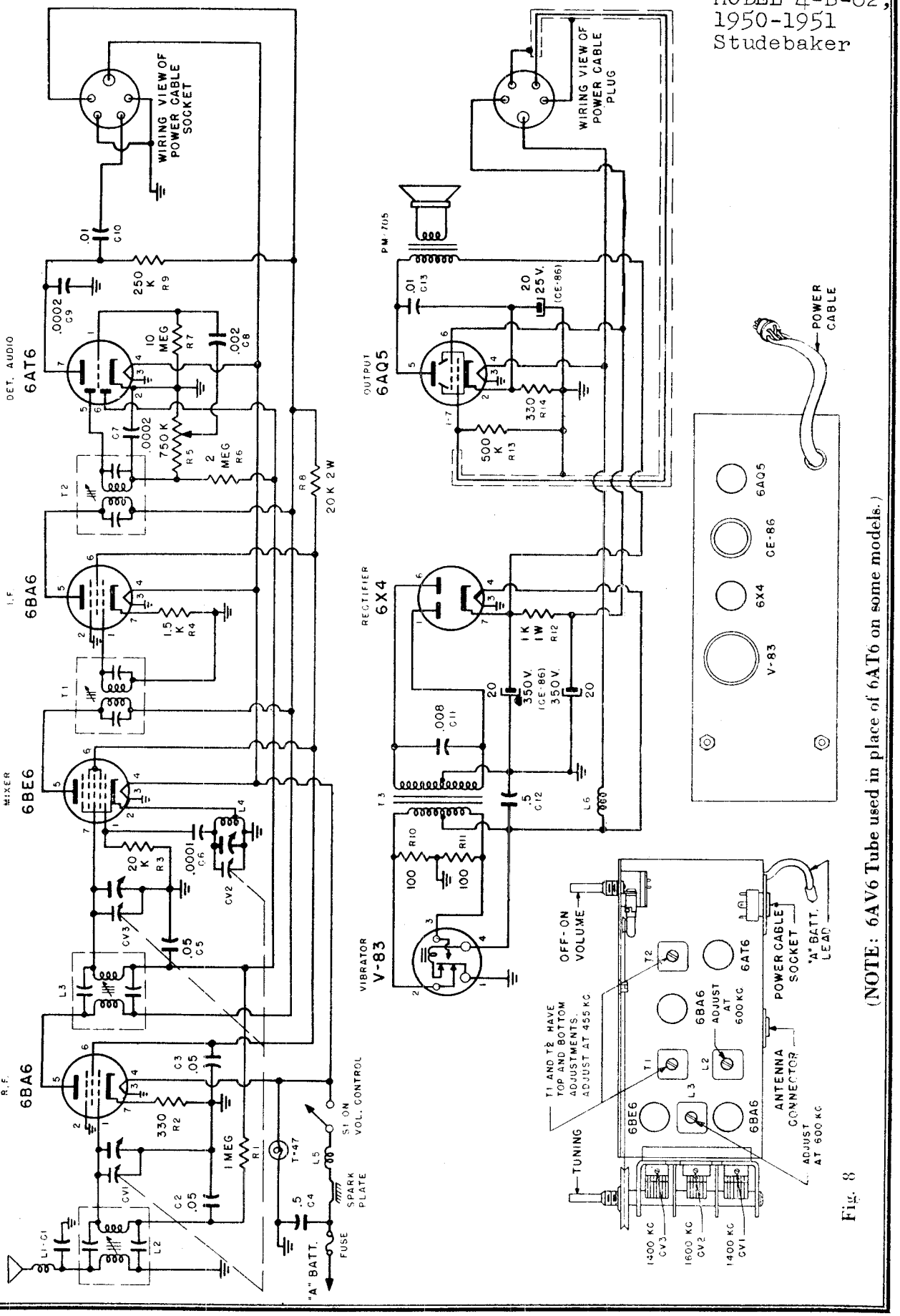
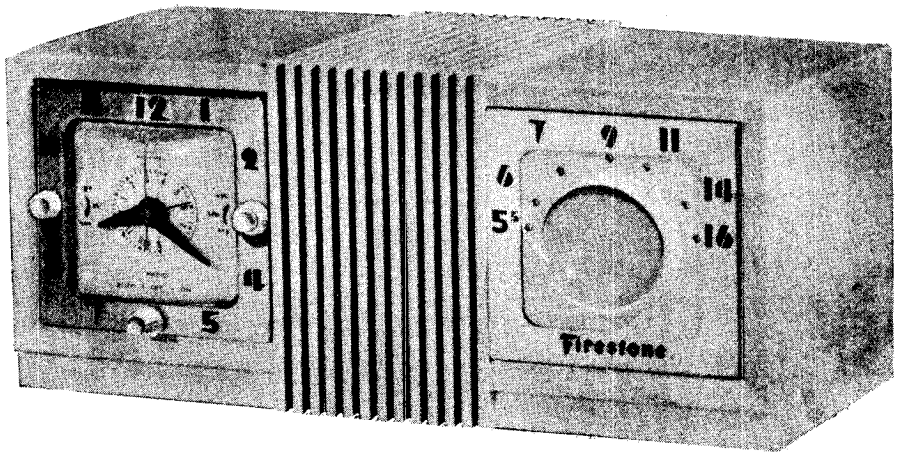


Fig. 8

(NOTE: 6AV6 Tube used in place of 6AT6 on some models.)

MODEL 4-A-92,
The New Slumbertone



SPECIFICATIONS

Cabinet Dimensions	- 11-1/8" x 5-1/16" x 5-1/8	Power Output -	
Weight	- 6-1/4 Lbs.	Undistorted	- 0.8 Watt
Power Supply	- 110 to 120 Volt 60 Cycle AC only.	Maximum	- 1.3 Watts
Tuning Range	- 540 to 1600 KC	Tube Complement -	
Intermediate Freq.	- 455 KC	12SA7	--Converter
Loud Speaker	- 3-1/2" P.M.	12SK7	- I.F. Amplifier
Voice Coil Impedance	- 3.2 Ohm at 400 Cycles	12SQ7	- Diode-Audio
		50L6GT	- Output
		35Z5GT	- Rectifier

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

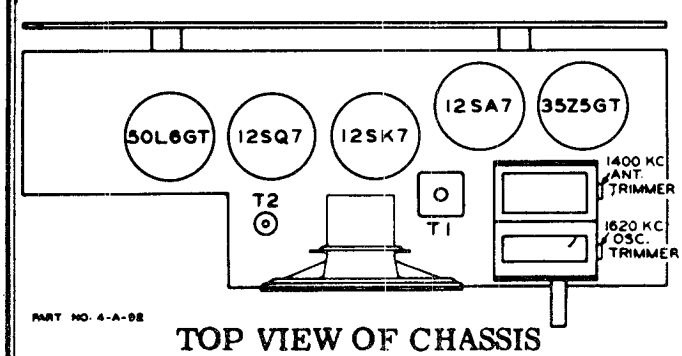
Before starting alignment:

(A) Remove the chassis and loop antenna from the cabinet at the same time by removing the two screws on the rear apron of the chassis which fasten the chassis to the cabinet.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

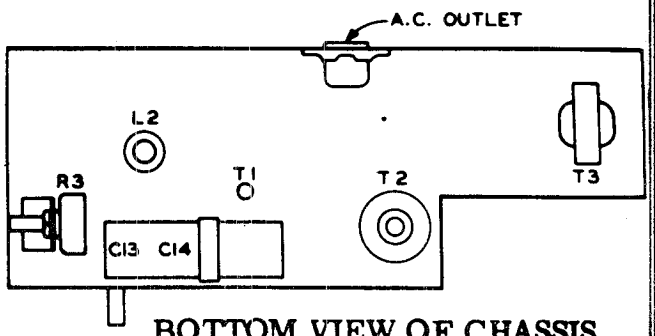
Steps	Set Receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Attach output of test oscillator to:	DUMMY ANTENNA	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received.	EXACTLY 455 KC	High side to grid of converter Tube. Low side to common negative.	1. MFD CONDENSER	Adjust 2nd I.F. (T2) and then each of the slugs of the 1st I.F. (T1) for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	DUMMY ANTENNA	2 turns of Hookup Wire 6"in Diam. (Place approx. one foot from & parallel to loop.)	Adjust 1620 KC oscillator trimmer for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	DUMMY ANTENNA		Adjust 1400 KC antenna trimmer for maximum output.

MODEL 4-A-92, The New Slumbertone

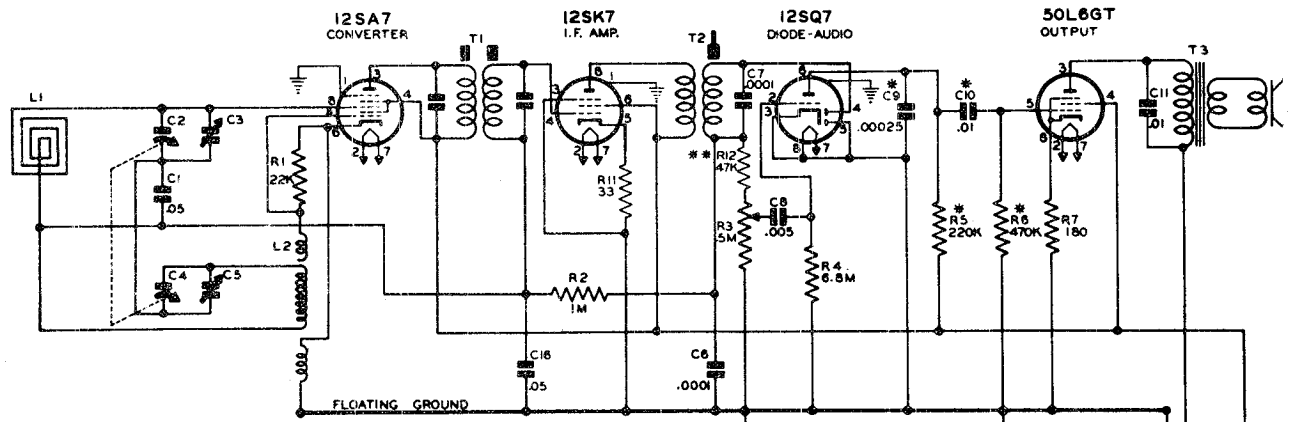


PART NO. 4-A-92

TOP VIEW OF CHASSIS

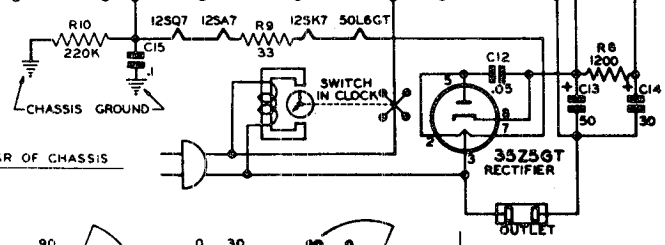


BOTTOM VIEW OF CHASSIS



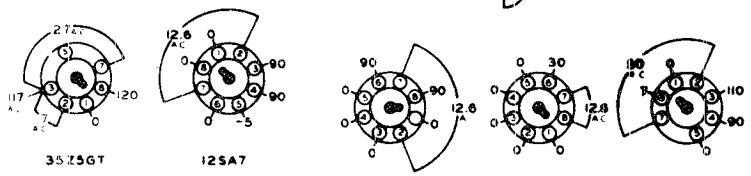
* THESE COMPONENTS REPLACED BY COUPLATE ASSEMBLY N-8215 IN SOME CHASSIS.

** THIS RESISTOR IS INCORPORATED IN THE VOLUME CONTROL ON SOME SETS.



4-A-92

REAR OF CHASSIS



ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO THE COMMON NEGATIVE WITH A 1000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

ILLUS. NO.	PART NUMBER	PART NAME	DESCRIPTION
C1, C16	N-1345	Condenser,	Paper .05 Mfd. 200 V.
C6	N-6015	Condenser,	Ceramic 100 Mmfd. 500 V. 20%
C7	N-7549	Condenser,	Ceramic 100 Mmfd. 500 V 10%
C8	N-4894	Condenser,	Paper .005 Mfd. 600 V.
*C9	N-6488	Condenser,	Ceramic 250 Mmfd. 500 V. 20%
*C10,C11	N-1344	Condenser,	Paper .01 Mfd 400 V
C12	N-1346	Condenser,	Paper .05 Mfd. 400 V.
C13) C14)	N-7888	Condenser	Electrolytic (50 Mfd. 150 V.) (30 Mfd. 150 V.)
C15	N-1351	Condenser	Paper .1 Mfd. 200 V.
R1	N-4025	Resistor	Carbon 22,000 Ohm 1/2W. 20%
R2	N-1262	Resistor	Carbon 1.0 Megohm 1/2W. 20%
**R3	N-8250	Volume Control 500,000 Ohm	
R4	N-4028	Resistor	Carbon 6.8 Megohm 1/2W 20%
*R5,R10	N-4026	Resistor	Carbon 220,000 Ohm 1/2W. 20%
R6	N-4027	Resistor	Carbon 470,000 Ohm 1/2W. 20%
R7	N-4057	Resistor	Carbon 180 Ohm 1/2W. 10%
R8	N-4900	Resistor	Carbon 1,200 Ohm 1.0W. 10%
R9	N-4068	Resistor	Carbon 33 Ohm 1.0W. 20%
R11	N-4022	Resistor	Carbon . 33 Ohm 1/2W 20%
**R12	N-4063	Resistor	Carbon 47,000 Ohm 1/2W. 20%
L1	N-8246	Coil,	Loop Antenna & Cabinet Back
L2	N-7139	Coil,	Oscillator
T1	N-7981	Transformer	1st. I.F.
T2	N-7677	Transformer	2nd. I.F.
T3	N-7281	Transformer	Output
	N-8247	Speaker	3-½" P.M.
	N-7141	Condenser	Variable - 2 Gang
	N-8253	Escutcheon	Dial
	#327	Cabinet	White - (In Carton)
	N-8254	Knob	Tuning - White
	N-8251	Knob	Volume - White
	N-8257	Power Cord	

NOTES -

* In some receivers, the following components (C9,C10,R5 and R6) are replaced by the assembly listed below:

* N-8215 . Assembly Audio Coupling Plate

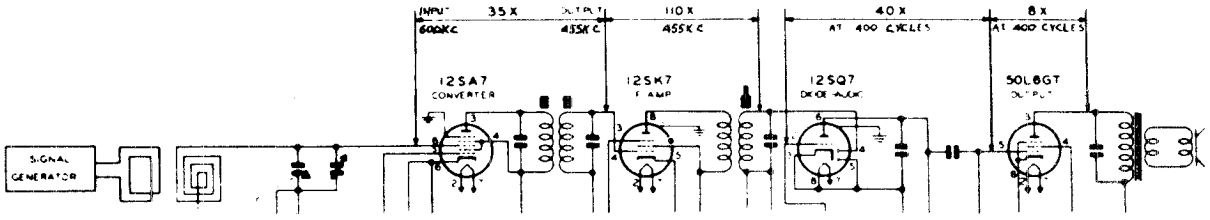
** R12 (Carbon Resistor 47,000 Ohm 1/2W. 20%) is included in the volume control of some receivers.

*** Excise Tax Included.

MODEL 4-A-92, The New Slumbertone

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R. F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R. F. Amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel type instrument" carefully tune it for maximum output at desired frequency before making measurements.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

ORDERING PARTS

Order parts from your nearest Firestone Tire and Auto Supply Warehouse. When ordering parts, it is important that the correct code number and stock number, be given with the correct part name and part number as shown in the parts list. You will find the stock number and code number marked on the radio. The stock and code number also appears on the front cover of this booklet.

IMPORTANT:-

This receiver is equipped with a special heavy duty power cord because of the added wattage rating of the appliance outlet.

When replacing power cord be sure to use one of adequate rating.

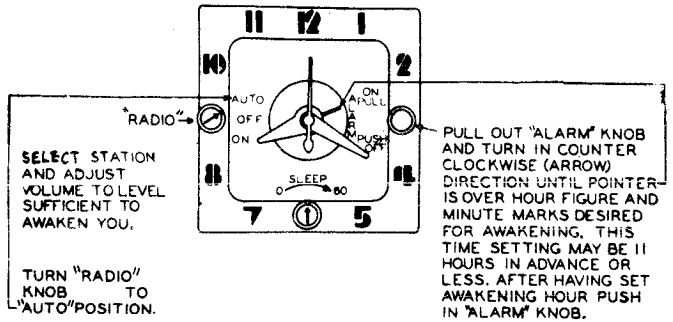
RETURNING DEFECTIVE PARTS

All parts on adjustments must be returned to your District Office Service Department with claim form completely filled out. This radio is so constructed that it can be repaired locally by an experienced repairman.

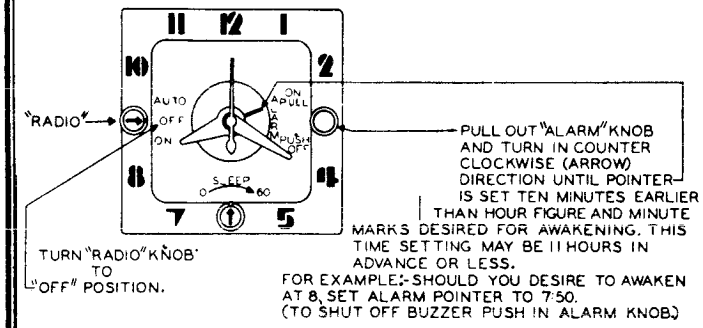
INSTRUCTIONS FOR USE OF CLOCK WITH RADIO OR EXTERNAL APPLIANCE

By carefully following the instructions illustrated below, the clock may be used to perform anv of the following functions:

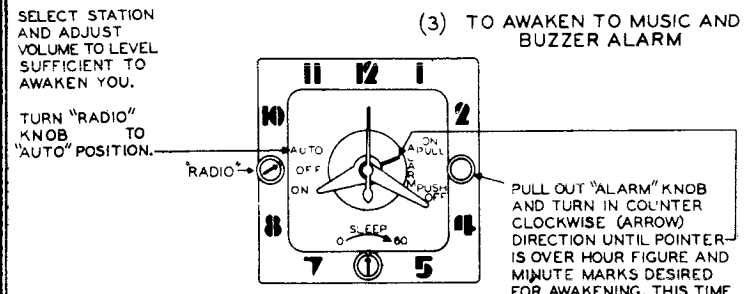
(1) TO AWAKEN TO MUSIC



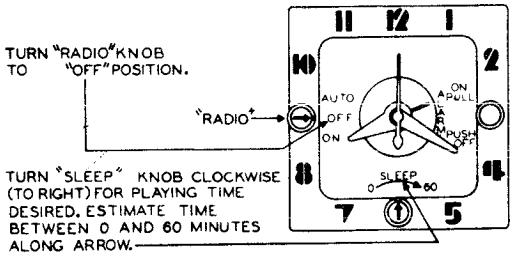
(2) TO AWAKEN TO BUZZER ALARM



(3) TO AWAKEN TO MUSIC AND BUZZER ALARM



(4) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING



To use this feature, simply plug in the appliance, turn the AUTO-OFF-ON SWITCH KNOB to the "OFF" position rotate the "Sleep" knob in a clockwise direction for the length of time required.

Precise time setting with this "Sleep" control will require practice.

(5) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING AND AWAKEN TO MUSIC. Set controls as in Illustration 1 and set "Sleep" knob as in Illustration 4.

(6) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING AND AWAKEN TO BUZZER ALARM. Set controls as in Illustration 2 and set "Sleep" knob as in Illustration 4.

(7) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING, AWAKEN TO MUSIC AND BUZZER ALARM. Set controls as in Illustration 3 and set "Sleep" knob as in Illustration 4.

(8) TO AUTOMATICALLY TURN ON RADIO AND EXTERNAL ELECTRICAL APPLIANCE. Insert plug of appliance into the electrical outlet provided at rear of receiver and set clock controls as in Illustration 1.

This feature may be used with any electrical appliance which operates on a 110-120 volt, 60 cycle power supply and which DOES NOT EXCEED THE WATTAGE RATING FOR THE OUTLET SHOWN ON THE CABINET BACK.

Current is available at this outlet whenever the radio is turned on.

(9) TO TURN RADIO AND APPLIANCE OFF AUTOMATICALLY. The controls may be set to turn off the radio and appliance at any time up to 60 minutes after the original starting time

MODEL 4-A-92, The New Slumbertone

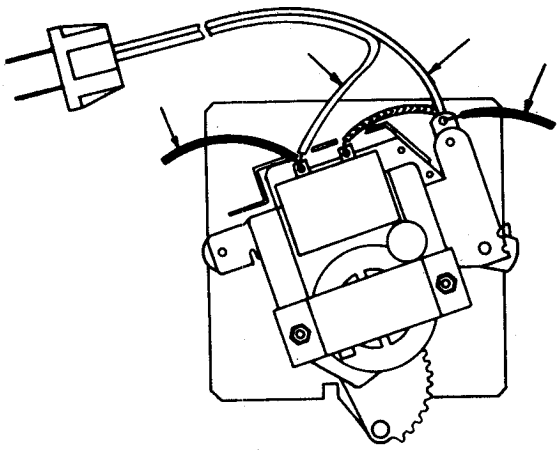


FIGURE "A"

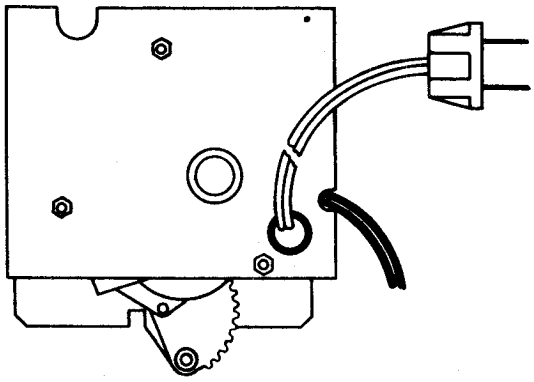


FIGURE "B"

REMOVAL OF CLOCK FROM CABINET

The clock movement may be removed from the cabinet by following the procedure listed below:

1. Remove plug of power cord from wall outlet.
2. Remove tuning and volume control knobs.
3. Remove two chassis retaining screws at rear of receiver, and slide chassis from cabinet to permit access to rear of clock.
4. Remove 3 nuts holding clock retaining bracket illustrated in figure "B" above.
5. After shield is removed, unsolder the power cord and the two wires leading from the clock to the chassis. (These wires are indicated by arrows in figure "A" above.
6. Rotate "Sleep" knob to the 60 minute position and remove clock by sliding straight forward.

SHIPPING OF CLOCK FOR REPAIR

When it is necessary to ship the clock to a Telechon Service Station for repair make certain that it is suitably packed to withstand transportation. Particular care must be given to the glass crystal so that it is not subject to strain during shipment.

MODEL 05RA4-43-9876B

Model 05RA4-43-9876B is the same as Model 05RA4-43-9876A except for the Battery/AC/DC change-over system and the substitution of 1L4 tubes for 1U4's. The hand-operated switch is replaced by a type which is operated by plugging the power cord into a chassis socket. This socket is near the back edge of the chassis. There is a slot for only one prong of the power cord plug; the other prong hangs over the back apron. The detachable power cord and the socket for it on the chassis are replaced by a conventional power cord.

The Replacement Parts List for Model 05RA4-43-9876B is the same as the List for Model 05RA4-43-9876A except for the following changes:

REMOVE:

	84-77	Cord, power, AC/DC.....
	52-196	Knob, AC/DC/battery switch
	45-121	Plug, AC/DC.....
R8	60-676	Resistor, 30,000 ohm, ½ w...
R19	60-726	Resistor, 2.2 megohm, ½ w..
	69-173	Switch, AC/DC/battery.....

ADD:

	23-151	Cord, power, AC/DC.....
R8	60-745	Resistor, 27,000 ohm, ½ w.....
R19	60-799	Resistor, 820,000 ohm, ½ w.....
R20	60-744	Resistor, 22,000 ohm, ½ w. 10%
C23	16-157	Capacitor, .1 mfd. 200 volt.....
	69-196	Switch, AC/DC/battery.....

NOTE: For additional data, See Model 05RA4-43-9876A, Pgs. 21-22 through 21-24.

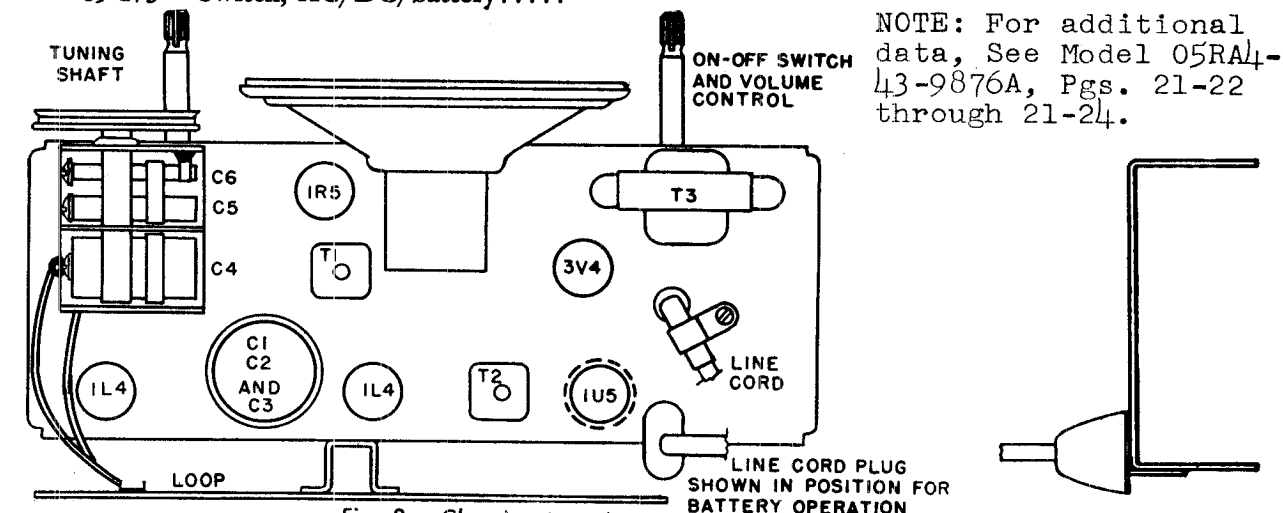


Fig. 2. Chassis—top view

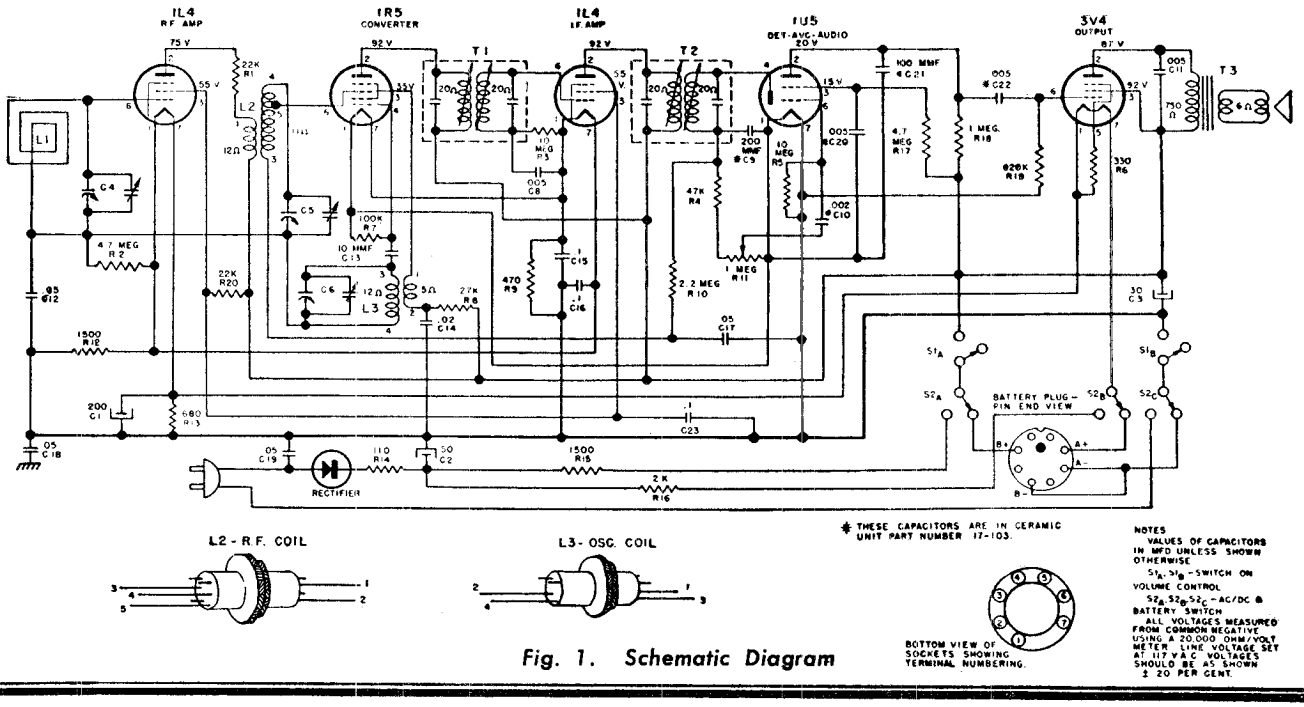
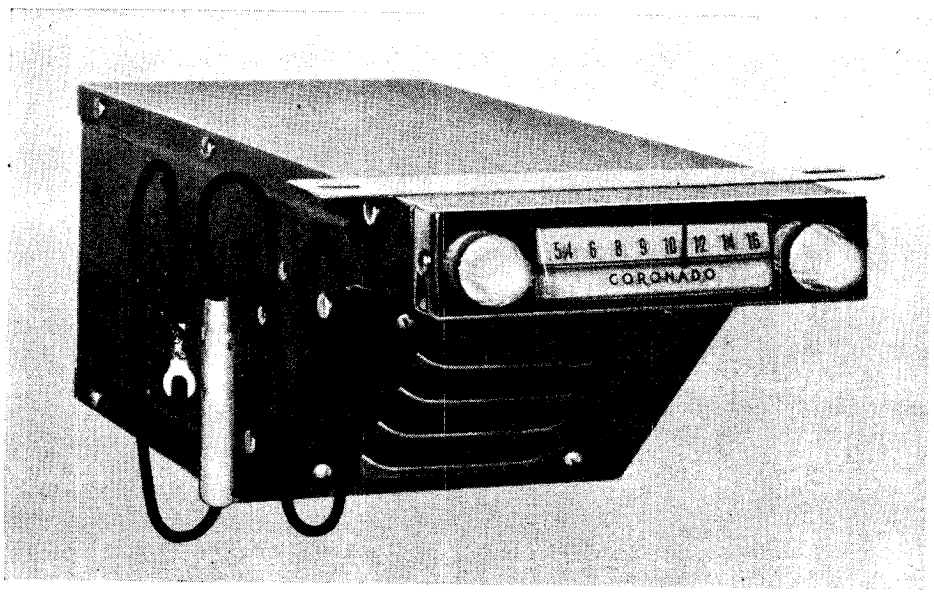


Fig. 1. Schematic Diagram

MODEL 05RA33-43-5016A



SPECIFICATIONS

Power Supply	6.3 volts DC
Frequency Range	540 KC to 1600 KC
Intermediate Frequency	257.5 KC
Antenna	Whip type
Tuning	Permeability
Speaker	4", P.M. voice coil impedance 3.2 ohms
Power Output	2.5 watts undistorted, 3.5 watts maximum
Sensitivity	1 uv for 500 milliwatts output
Selectivity	40 KC broad at 1000 times, signal at 1000 KC
Signal to Noise Ratio	10 to 1

Tubes used are as follows:

6BA6 R.F. Amplifier
6BE6 Oscillator-Converter
6BA6 I.F. Amplifier
6AV6 A.V.C., Detector, and Audio Amplifier
6AQ5 Power Output
6X4 Power Rectifier

UNPACK CAREFULLY, YOU WILL FIND:

Radio
1 Mounting bracket
1 Bag mounting parts:
Hardware, generator condenser, and distributor resistor.

MODEL 05RA33-43-5016A

MOUNTING

The chassis contains the complete radio, power supply, and speaker. This unit may be mounted to, and directly below, the instrument panel at any convenient location. Two holes must be drilled in the stiffening lip of the instrument panel about 3/4 inch back from the front of the panel and spaced approximately 6 inches apart. These holes must be large enough to pass the two No. 8 machine screws provided in the bag of mounting parts for fastening the radio in place. After the holes are drilled, insert the mounting screws through the holes in the mounting plate of the radio and in the instrument panel lip, and place lock washers and nuts on screws. These nuts must be securely fastened. It is also very important that the paint be removed from the instrument panel lip directly under the nut so that a good ground connection is made.

Drill a hole to pass a No. 10 machine screw in the fire wall or some other convenient place, and bolt one end of the metal strap with series of holes to this place. Insert the 1/4-20 stud in tapped hole in the back of the radio, and fasten the mounting strap to the back of the radio by means of this stud, lock washer, and nut. This is the back support for the radio, and good ground connections must also be considered in this assembly.

CONNECTIONS

Connect the fused power lead from the radio to the ammeter or circuit breaker of the vehicle. A 10 ampere fuse is provided in this lead; never replace this fuse with one of another value.

The antenna lead is plugged into the antenna jack.

If a second, or external, speaker is desired, a speaker socket is provided. Just connect the proper plug onto this second speaker, and insert plug in the external speaker socket.

After installation, tune in a weak station near 1600 KC, and adjust antenna trimmer, TC1, for maximum volume. If, for any reason, the set is out of alignment, these adjustments must be made by a competent service man and with the use of a good signal generator.

ALIGNMENT PROCEDURE

The following is for use only by competent service men having the proper equipment:

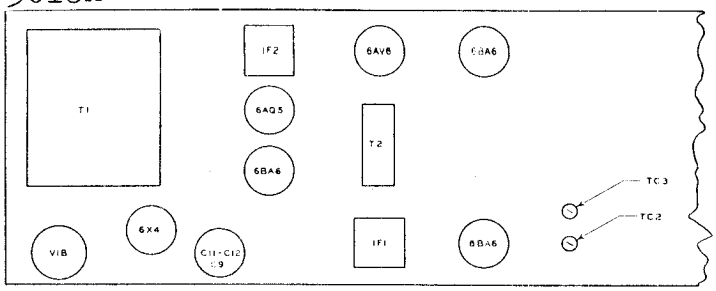
The alignment should be made with volume control fully on and the output voltage from the signal generator as low as possible to prevent A.V.C. action from interfering with the proper alignment. With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts using a signal which is modulated at 400 c.p.s.

Adjust all trimmers for maximum output. After adjusting IF1 and IF2, "rock" the tuner to make sure that the I.F. coils are not tuned to an image. Repeat the alignment procedure given below as a final check.

SIGNAL GENERATOR

Frequency	Dummy Antenna	Connection To Radio	Position Of Tuner	Adjust for Max. Output
257.5 KC	100 MMFD	6BE6 Grid Pin No. 7	Slugs Out	IF1 & IF2
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC3
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC2
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC1
1400 KC	100 MMFD	Ant. Jack	Tune in Signal Gen.	LA Slug & LR Slug

MODEL 05RA33-43-5016A



CHASSIS LAYOUT TOP VIEW 43-5016 K-1278

(Cut GS402, Chassis layout)

ELIMINATION OF INTERFERENCE

Remove the coil-to-distributor high-tension lead from the distributor. Cut the lead two inches from the end, and screw the distributor resistor onto the coil lead. Then screw the short length onto the resistor, and plug the cable into the distributor cap.

One noise-filter condenser is furnished. Condenser must be connected to the output terminal of the generator (never to the field terminal). The generator-condenser bracket should be fastened to the generator housing, under the screw that holds the field. In some particularly stubborn cases of motor interference, one or more of the following procedures may be necessary:

A condenser can often be used to advantage on the electrically operated oil gauge or gas gauge. Connect the condenser lead to the terminal of the gauge, and bolt the condenser case securely to the frame or some other grounded part of the car.

Bonding the steering column to the fire wall with a short braid may also be effective. Clean the paint from the steering column at the fire wall where the column enters the motor compartment, and solder on a short piece of braid. Ground the end of the braid to the fire wall.

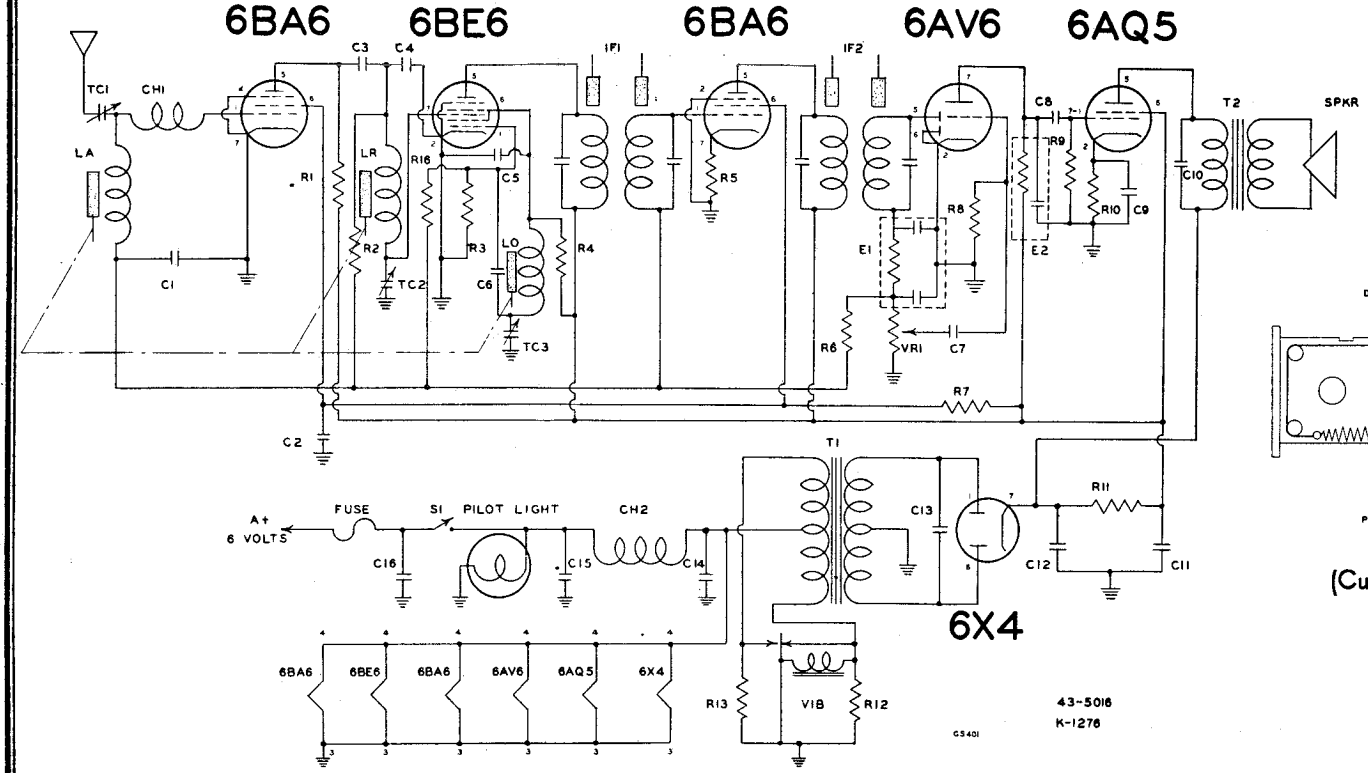
In some cases it may be necessary to ground the tubes and rods coming through the fire wall in order to reduce the interference. Clean them with emery cloth and spot-solder the braid, fastening the end under a convenient screw.

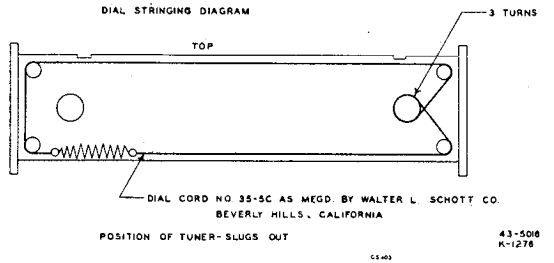
In some cases it may be necessary to connect an additional condenser to the ammeter or to the ignition switch.

It may be necessary to use a condenser on the voltage regulator. The condenser case should be mounted under one of the voltage-regulator mounting screws, or at some other convenient location, and the lead connected to the battery terminal of the voltage regulator.

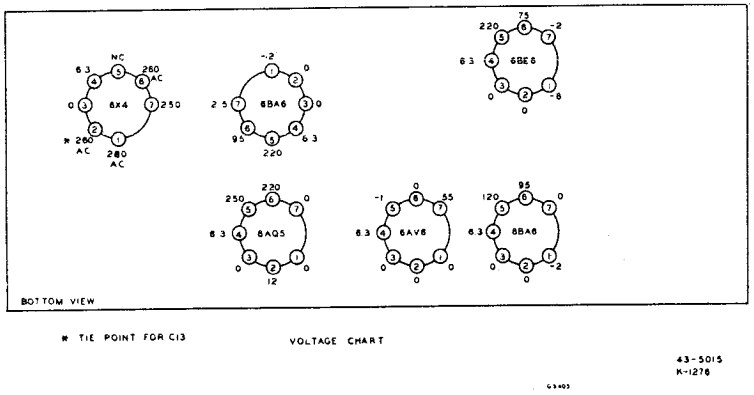
Interference from electric clocks can be eliminated by connecting a condenser to the ammeter terminal. The case of the condenser must be securely grounded.

If tire-static interference is noted in a particular installation, static collector springs should be obtained and installed in the front wheels of the car.

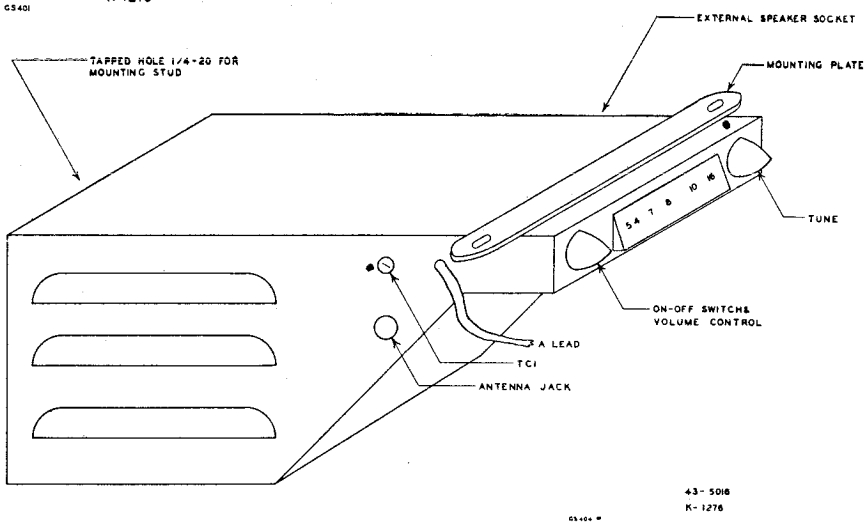




(Cut GS403, Dial stringing diagram)



(Cut GS405, Voltage chart)



(Cut GS404, Pictorial view)

MODEL 05RA33-43-5016A

PARTS NUMBERS

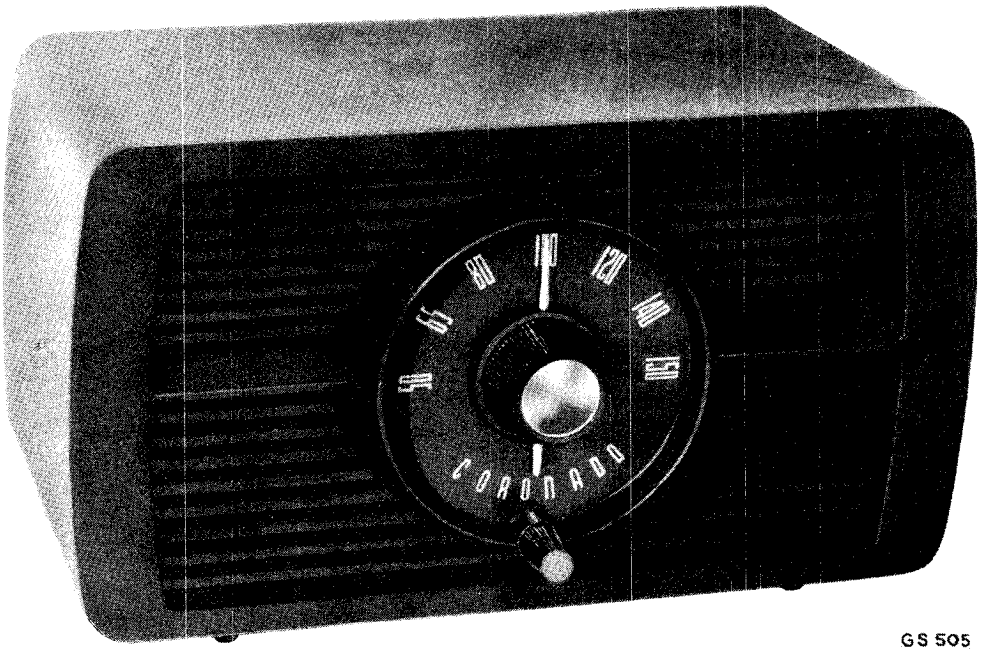
CIRCUIT COMPONENTS

SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING
TC2-TC3	VC1276-2	Dual Trimmer		
TC1	VC1276-1	Trimmer		
C9, C11, C12	C-15-15-25-3.5-.25	Electrolytic	15-15-25 MFD	350-350-25 volts
	C5G	Generator, capacitor	.5 MFD	
C14, C15	C52	Capacitor, paper	.5 MFD	200 volts
C1	CO472	Capacitor, paper	.047 MFD	200 volts
C2	CO474	Capacitor, paper	.047 MFD	400 volts
C8	CO156	Capacitor, paper	.015 MFD	600 volts
C7, C10	CO16	Capacitor, paper	.01 MFD	600 volts
C13	COO5616	Capacitor, buffer	.0056 MFD	1600 volts
C5	C14205M	Capacitor, mica	1420 MMFD	500 volts
C4	C3005M	Capacitor, mica	300 MMFD	500 volts
C6	C505M	Capacitor, mica	50 MMFD	500 volts
C3	C105M	Capacitor, mica	10 MMFD	500 volts
C16	C2002OM	Capacitor, spark	200 MMFD	2000 volts
LA	1276LA	Antenna coil		
LR	1276LR	R.F. coil		
LO	1276LO	Oscillator coil		
	LV-1276	Permeability tuner, complete		
CH2	L16	A choke		
CH1	L47	Spark choke	4.7 MH	
T1	PT1276	Vibrator transformer		
T2	OT1276	Output transformer		
IF1, IF2	IF1276	I.F. transformer		
R12, R13	R680.5	Resistor	68 ohms	1/2 watt
R5	R122.5	Resistor	1200 ohms	1/2 watt
R1, R3	R223.5	Resistor	22K ohms	1/2 watt
R4	R333.5	Resistor	33K ohms	1/2 watt
R9	R474.5	Resistor	470K ohms	1/2 watt
R2	R185.5	Resistor	1.8 megohm	1/2 watt
R6	R225.5	Resistor	2.2 megohm	1/2 watt
R8	R106.5	Resistor	10 megohm	1/2 watt
R10	R4511	Resistor	450 ohms	1 watt
R11	R1021	Resistor	1000 ohms	1 watt
R7	R2731	Resistor	27K ohms	1 watt
	R103S	Resistor, suppressor	10K ohms	
VR1	VR1276	Volume control	1 megohm	
S1	VR1276	Switch SP.S.T. on volume control		
E2	CR2	Capristor	270K ohm/100 MMFD	
E1	CR1	Diode filter unit	100-100 MFD/47K ohm	
SPKR	SPK1276	Speaker		
VIB	E659	Vibrator		
Fuse		Fuse 10 ampere		
		Pilot light No. 47		

MECHANICAL PARTS

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
M-1801	Chassis and wrapper	H-81651	Dial rivet
M-1802	Top cover	P-1802	Knob
M-1803	Speaker cover	GR14	Rubber grommet
M-1804	Panel	H-81644-5	Vibrator socket
M-1805	Dial plate	H-81644-6	Miniature tube socket
H-1801	I.F. Mounting clip	H-81644-9	Pilot light socket
H-1802	Speed nut	H-81644-6	Antenna jack
H-1803	Eyelet	H-81644-7	Speaker socket
H-1804	Spade lug No. 10	H-81644-8	Fuse holder
P-1801	Dial scale	H-81641-8	Terminal board No. 8
A-1801	Dial cord assembly	H-81641-3	Terminal board No. 3
M-1806	Dial pointer	H-81641-27	Terminal board No. 27
		H12754	Vibrator clamp

MODELS 05RA33-43-8136A,
05RA33-43-8137A



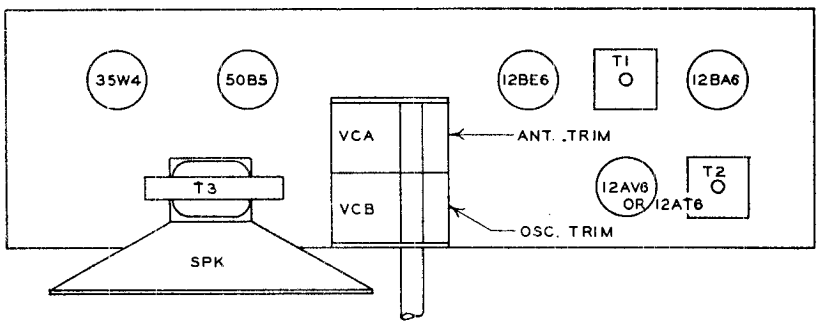
GS 505

SPECIFICATIONS

Power Supply	117 volts 60 cycle AC, 117 volts DC, 29 watts
Frequency Range	535 KC to 1630 KC
Intermediate Frequency	455KC
Antenna	Built-in Loop
Tuning	Variable Capacity
Speaker	4", P.M. voice coil impedance 3.2 ohms
Power Output	0.8 watt undistorted, 1.8 watts maximum
Sensitivity	400 uv/m average for 50 milliwatts output
Selectivity	55 KC broad at 1000 times, signal at 1000KC

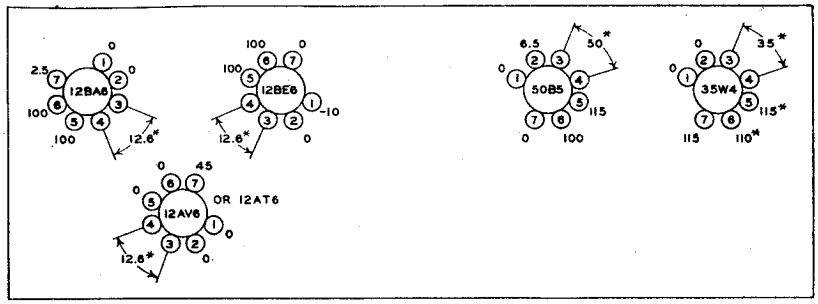
Tubes used are as follows:

12BE6 Oscillator-Converter
12AV6 or 12AT6 AVC, Detector, and Audio
12BA6 I.F. Amplifier
50B5 Power Output
35W4 Power Rectifier



CHASSIS LAYOUT TOP VIEW CSH502

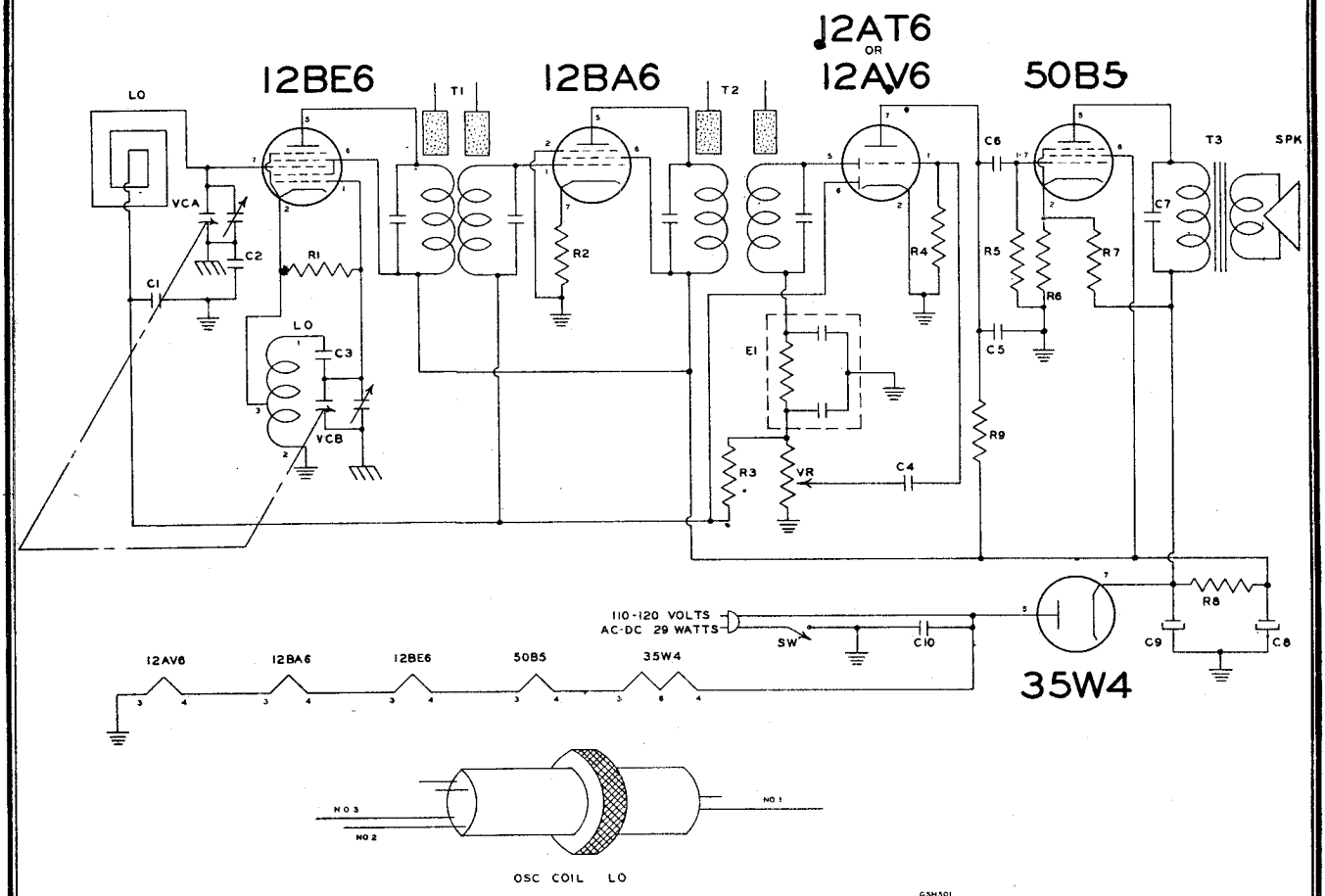
MODELS 05RA33-43-8136A,
05RA33-43-8137A



ALL DC VOLTAGES IN REFERENCE TO COMMON GROUND
*AC EXCEPT WHEN USED ON DC

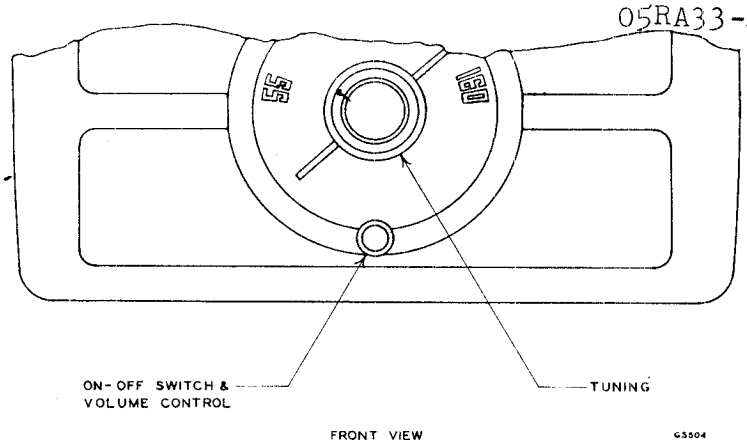
VOLTAGE CHART CHASSIS BOTTOM VIEW

GSH503



GSH501

MODELS 05RA33-43-8136A,
05RA33-43-8137A



FRONT VIEW G5504

ALIGNMENT PROCEDURE

The following procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent AVC action from interfering with proper alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts, using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat the alignment procedure given below as a final check.

CAUTION: This is an AC/DC receiver, and when aligning the set it is necessary to isolate the signal generator or the receiver from the line by use of a transformer, or to place a .2 MFD condenser in each test lead of the signal generator.

SIGNAL GENERATOR Frequency	Dummy Antenna	Connection to Radio	POSITION OF VARIABLE	ADJUST FOR MAXIMUM OUTPUT
455 KC	.1 MFD	12BE6 Grid Stator VCA	Fully Open	T1 & T2
1625 KC		12BE6 Grid Stator VCA	Fully Open	VCB Oscillator
1400 KC	.1 MFD	Loosely Coupled to Loop	Tune in Signal Generator	VCA Antenna

Connect low side of signal generator to common negative.

PARTS VALUES FOR T67G GAMBLE'S AC/DC CLIPPER

CIRCUIT COMPONENTS SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING
VCA-VCB	VCT67G	Condenser, 2 gang		
C1	C052	Condenser, paper	.05 MFD	200 volts
C2	C12	Condenser, paper	.1 MFD	200 volts
C3	C026	Condenser, paper	.02 MFD	600 volts
C4-C6-C7	C0056	Condenser paper	.005 MFD	600 volts
C5	C2505M	Condenser mica	250 MMFD	500 volts
C8	C40-20-1.5	Condenser electrolytic	20 MFD	150 volts
C9	C40-20-1.5	Condenser electrolytic	40 MFD	150 volts
C10	C054	Condenser, paper	.05 MFD	400 volts
R1	R223.5	Resistor	22K ohm	½ watt
R2	R391.5	Resistor	390 ohm	½ watt
R3	R105.5	Resistor	1 megohm	½ watt
R4	R106.5	Resistor	10 megohm	½ watt
R5-R9	R474.5	Resistor	470K ohm	½ watt
R6	R121.5	Resistor	120 ohm	½ watt
R7	R1031	Resistor	10K ohm	1 watt
R8	R1021	Resistor	1000 ohm	1 watt
E1	CR1	Diode filter unit	2X100 MMFD-47K ohm	
VR	VRT67G	Volume control	1 megohm	
LA	LT67A	Antenna loop		
LO	LOT67	Oscillator coil		
T1-T2	T111-31-A	I.F. transformer		
T3	E-81645-T	Output transformer		
SW	VRT67G	Switch S.P.S.T. on volume control		
SPK	SPKT67	4" P.M. speaker		

MECHANICAL PARTS

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
M-1801	Chassis	H-1805	Ground lug	P-1801	Cabinet, ivory
M-1802	Chassis cover	H-81644-6	Miniature tube socket	P-1704AW	Pointer knob, walnut
H-1601	Trimount 5/8"	W-1802	Line cord and plug	P-1704AI	Pointer knob, ivory
H-1802	Trimount 1/4"	SR-3P	Strain relief	P-1704W	Round knob, walnut
T111-31-B	I.F. mounting clip	P-1801W	Cabinet, walnut	P-1704I	Round knob, ivory

MODEL 15RA1-43-7654A

GENERAL DESCRIPTION

This radio is an 8 tube (including rectifier tube) AC receiver with automatic record changer, designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the FM Band of 88-108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include two built-in antennas, a grounded grid R-F amplifier stage on the FM Band, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise.

Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps

ELECTRICAL SPECIFICATIONS

Power Consumption —
117 volts AC—60 cycles 40 Watts
60 watts phono operating

Power Output —
1.5 watts maximum
.8 watts 10% distortion

Speaker—8" PM dynamic

Frequency Ranges —
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency —
AM 455 KC — FM 10.7 MC

Selectivity — AM — 45 KC broad at 1000 times signal, measured at 1000 KC

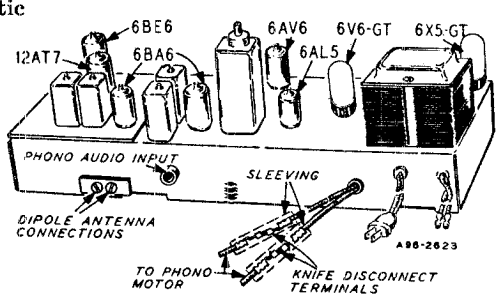
I.F. FM—200 KC broad at 2 times down

I.F. FM — 950 KC broad at 200 times down

AM Sensitivity—(For .5 watt output with external antenna)
25 microvolts average

FM Sensitivity—(For .5 watt output)
25 microvolts average

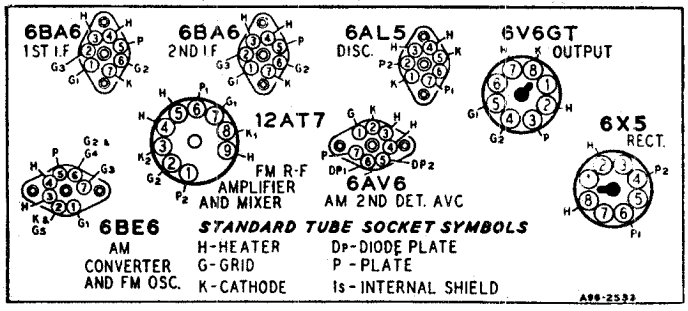
Record Changer —
See Manual No. 619-12



TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ±10% is usually permissible.



MODEL 15RA1-43-7654A

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR							
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open.	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

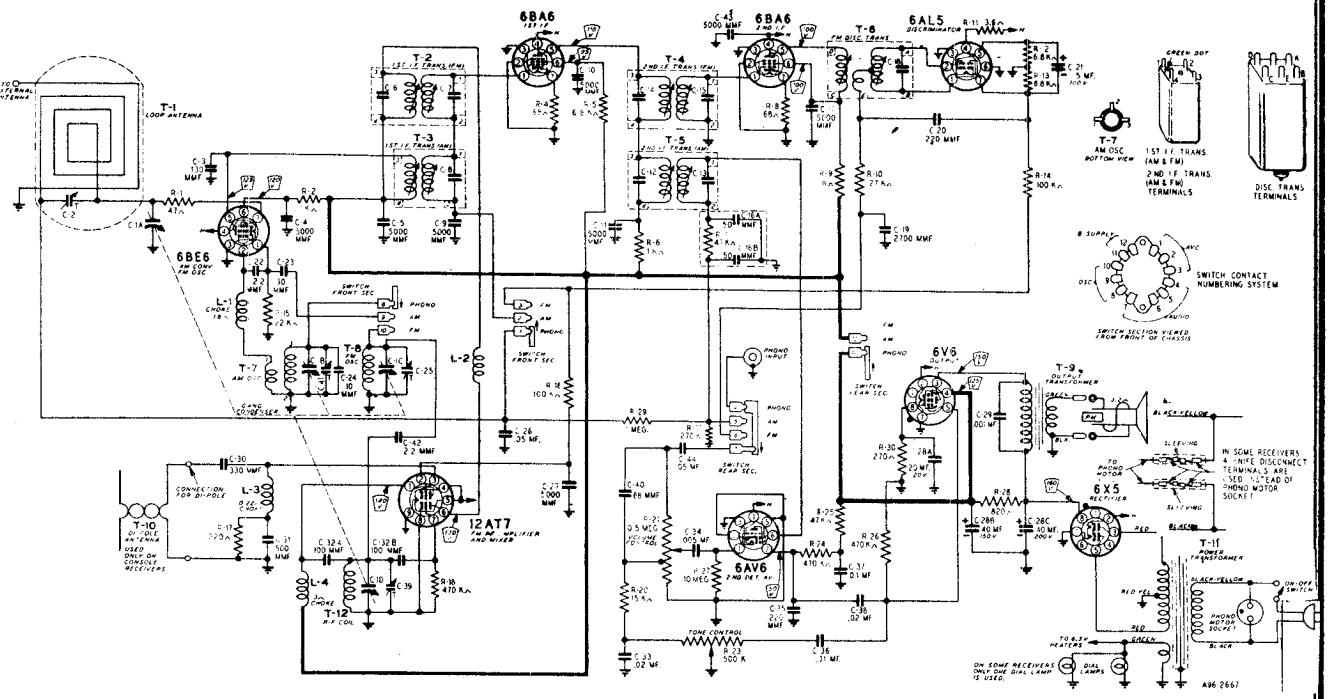
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

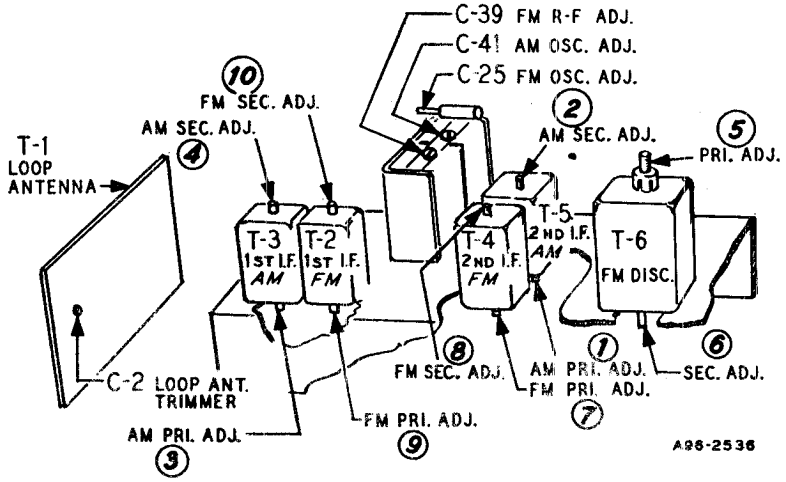
NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

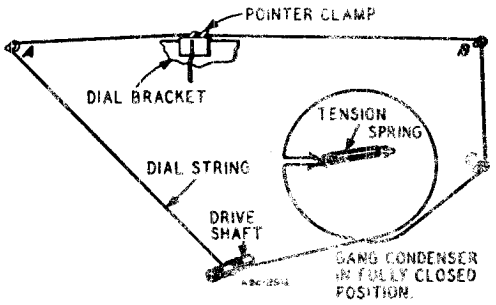
MODEL 15RA1-43-7654A





DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



MODEL 15RA1-43-7654A

REPLACEMENT PARTS LIST

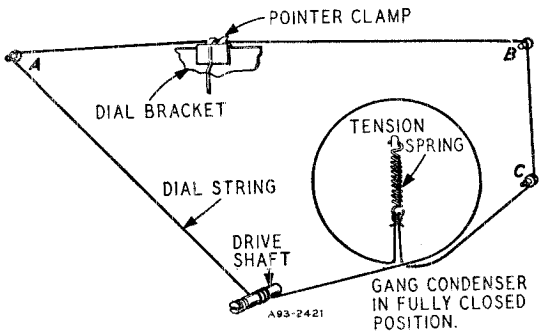
Ref. No.	DESCRIPTION	Part No.
	CAPACITORS	
C-1	Gang Condenser Assembly	14A209
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3	Capacitor, Ceramic; 130 mmf	47X559
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	Capacitor, Ceramic; 5000 mmf	47X507
C-6, C-7	Part of T-2 (1st I-F Trans. F.M.)	
C-8	Part of T-3 (1st I-F Trans. AM)	
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	Capacitor, Dual Mica; 50-50 mmf	47X112
C-18	Part of T-6 (Discriminator Trans.)	
C-19	Capacitor, Molded Mica; 2700 mmf	47X492
C-20, C-35	Capacitor, Ceramic; 220 mmf	47X468
C-21	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-22, C-42	Capacitor, Ceramic; 2.2 mmf	47X557
C-23	Capacitor, Ceramic; 30 mmf	47X558
C-24	Capacitor, Ceramic; 10 mmf	47X523
C-25	Capacitor, Trimmer; 1-8 mmf	17A255
C-26, C-44	Capacitor, Tubular; .05 mf 200 V	B66503
C-28A	20 mf 20 V	
C-28B, C-28C	Capacitor; Dry Electrolytic; 40 mf 150 V / 40 mf 200 V	45X360
C-29	Capacitor, Tubular; .001 mf 800 V	H66102
C-30	Capacitor, Molded Mica; 330 mmf	47X470
C-31	Capacitor, Ceramic; 500 mmf	47X508
C-32A, C-32B	Capacitor, Dual Ceramic; 100 mmf	76X4
C-33	Capacitor, Tubular; .02 mf 200 V	B66203
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .01 mf 200 V	B66103
C-37	Capacitor, Tubular; .1 mf 400 V	D66104
C-38	Capacitor, Tubular; .02 mf 400 V	D66203
C-39, C-41	Part of C-1 (Gang Condenser)	
C-40	Capacitor, Ceramic; 68 mmf	47X471
	RESISTORS	
R-1	Resistor, Carbon; 47 ohms 0.5 W	B85470
R-2, R-6, R-9	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-4, R-8	Resistor, Carbon; 68 ohms 0.5 W	B84680
R-5, R-12, R-13	Resistor, Carbon; 6800 ohms 0.5 W	B84682
R-7, R-25	Resistor, Carbon; 47 K ohms 0.5 W	B85473
R-10	Resistor, Carbon; 27 K ohms 0.5 W	B85273
R-11	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-14, R-16	Resistor, Carbon; 100 K ohms 0.5 W	B85104
R-15	Resistor, Carbon; 22 K ohms 0.5 W	B85223
R-17	Resistor, Carbon; 220 ohms 0.5 W	B85221
R-18, R-24, R-26	Resistor, Carbon; 470 K ohms 0.5 W	B85474
R-20	Resistor, Carbon; 15 K ohms 0.5 W	B85153
R-21	Volume Control & Switch; .5 megohm	36X372
R-23	Tone Control; .5 megohm	40X310
R-27	Resistor, Carbon; 10 megohms 0.5 W	B85106
R-28	Resistor, Carbon; 820 ohms 2.0 W	D84821
R-29	Resistor, Carbon; 1 megohm 0.5 W	B85105
R-30	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-31	Resistor, Carbon; 270 K ohms 0.5 W	B84274
	TRANSFORMERS AND COILS	
L-1	Choke, Insulated	35A5
L-2	Choke, Parasitic	9A2103
L-3	Choke, Insulated	35A9
L-4	Choke, Insulated	35A8
T-1	"B" Range Loop Antenna	9A2099
T-2	1st I-F Trans. (FM)	9A2060
T-3	1st I-F Trans. (AM)	9A2062
T-4	2nd I-F Trans. (FM)	9A2061
T-5	2nd I-F Trans. (AM)	9A2063
T-6	Discriminator Transformer	9A2161
T-7	Oscillator Coil (AM)	9A2065
T-8	Oscillator Coil (FM)	9A2067
T-9	Output Transformer	51X134
T-10	Dipole Antenna	9A2003
T-11	Power Transformer	53X291
T-12	Antenna Coil (FM)	9A2066
	DIAL AND TUNING PARTS	
	No. 47 Pilot Light	7A103
	Pilot Light Socket Assembly	7A199
	Escutcheon	4X1060
	Rubber Grommets (mtg. Gang Cond.)	6X66
	Drive Cord Assembly	10X72
	Pointer	15X251
	"C" Washer (Drive Shaft)	19X192
	Condenser Cushion Stud	20X260
	Dial Bracket	25X1650
	Drive Shaft	26X486
	Drive Cord Tension Spring	28X113
	Spring (Dial Glass)	28X564
	Dial Glass	58X744
	MISCELLANEOUS	
	Band Change Switch	2A393
	Phono Socket (Single Pin)	3A305
	Tube Socket (1st 6BA6)	3A426
	Tube Socket (6BE6)	3A427
	Tube Socket, Molded (Octal)	3A435
	Tube Socket (Miniature)	3A439
	Tube Socket (12AT7)	3A443
	Knob (Tuning)	10A699
	Knob (Off-Volume)	10A700
	Knob (Tone)	10A701
	Knob (FM-BC-PH)	10A702
	Speaker, 8" P.M.	12A477
	Record Changer — 3 speed	28A171
	Line Cord & Plug Assembly	13X546
	Line Cord Clamp	30X560

MODEL 15RA1-43-7902A

MODERN OAK RADIO PHONO CONSOLE

DRIVE CORD REPLACEMENT

Use a new 10X38 drive cord assembly or a new length of cord 46 inches long for the installation, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation, rotate the drive shaft a few turns to take up the slack in the cord.

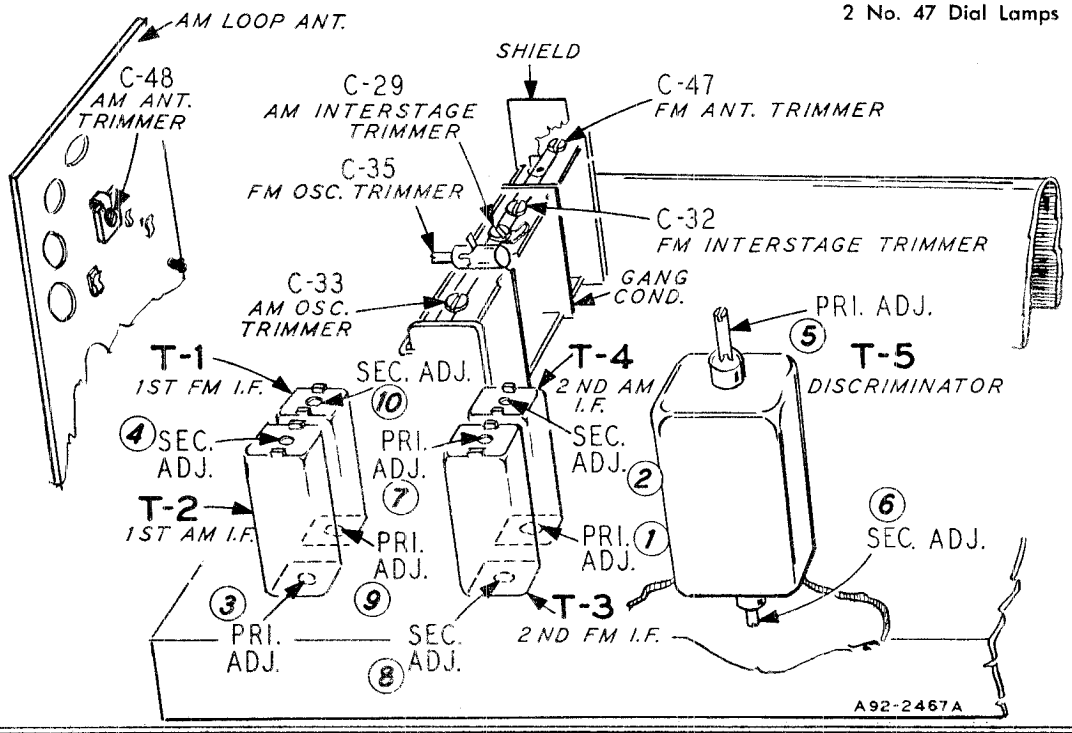


ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—43 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—760 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity	(For .5 watt output) 30 microvolts average
Power Output	8.5 watts maximum 6.0 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual No. 619-12

Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM & AM Osc. & Mixer
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6K6-GT Audio Output
1 5Y3-GT Rectifier
1 6AV6 Phase Inverter
2 No. 47 Dial Lamps



MODEL 15RA1-43-7902A

ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas —.1 mf, 200 mmf.

Volume Control—Maximum all Adjustments
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
I-F	455 kc	12AT7 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. (1) & (2) 1st I-F Pri. & Sec. (3) & (4)	Maximum Output
Broadcast	1620 kc	External ant. term.	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. term.	200 mmf	Broadcast	Turn Rotor to Max. Output	Broadcast Interstage C-29	
	1400 kc	External ant. term.	200 mmf	Broadcast	Set pointer to 1400 kc See Note A	Loop Antenna C-48	

Note A—If the pointer is not at 1400 KC on dial, reset pointer at the 1400 KC mark on the dial scale.

FM STAGES

The following equipment is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 1000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)
Allow chassis and signal generator to warm up for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the junction of resistor R-22 and condenser C-18 for all adjustments except the discriminator secondary adjustment, for which See Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and connect to junction of R-18 and C-62. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

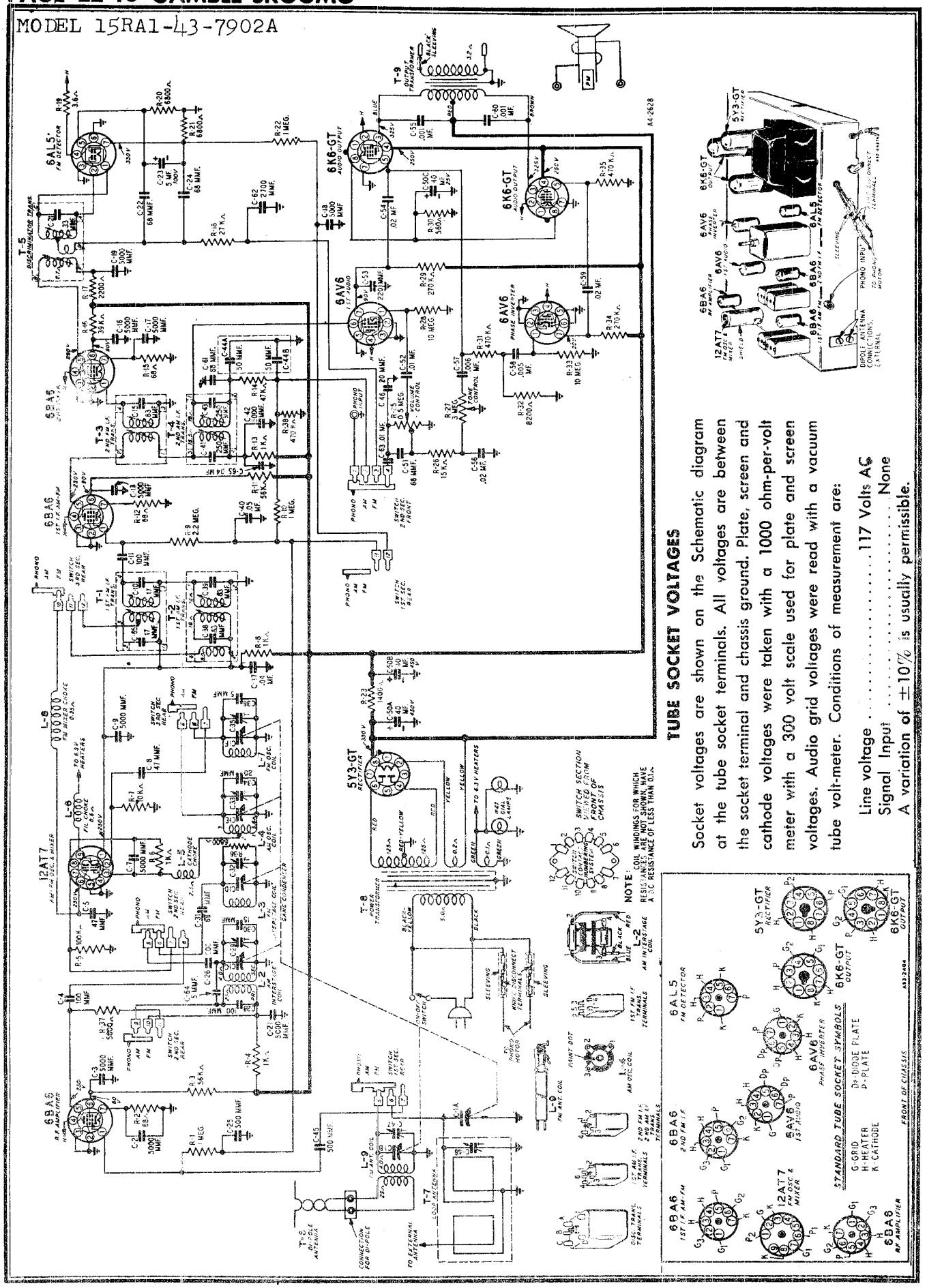
NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency above signal frequency.

NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.

MODEL 15RA1-43-7902A



MODEL 15RA1-43-7902A

REPLACEMENT PARTS LIST

Ref. No.	DESCRIPTION	Part No.
	CAPACITORS	
C-1	Gang Condenser and Pulley	14A207
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	Capacitor, Silvered Mica, 5000 mmf	47X507
C-4	Capacitor, Ceramic, 100 mmf ± 20%	47X497
C-5	Capacitor, Ceramic, 47 mmf ± 5%	47X499
C-8	Capacitor, Ceramic 47 mmf ± 10%	47X498
C-10, C-65	Part of T-1	
C-11, C-28	Capacitor, Ceramic, 100 mmf ± 10%	47X550
C-15	Part of T-3	
C-21	Part of T-5	
C-22, C-24, C-31, C-51	Capacitor, Ceramic, 68 mmf ± 10%	47X501
C-23	Capacitor, Dry Electrolytic, 5 mf 100 V.	45X361
C-25, C-26, C-45	Capacitor, Ceramic, 500 mmf ± 20%	47X496
C-29, C-32, C-33, C-47	Part of C-1	
C-30	Capacitor, Ceramic, 15 mmf ± 10%	47X552
C-34, C-46	Capacitor, Ceramic 20 mmf ± 10%	47X516
C-35	Capacitor, Trimmer, 1-8 mmf	26A489
C-36, C-64	Capacitor, Ceramic, 5 mmf ± 10%	47X549
C-37, C-65	Capacitor, Tubular, .04 mf 600 V	F66403
C-38, C-39	Part of T-2	
C-40	Capacitor, Tubular, .05 mf 200 V.	B66503
C-41, C-43	Part of T-4	
C-44A, C-44B	Capacitor, Dual Mica, 50-50 mmf.	47X112
C-48	Part of T-7	
C-50A, C-50B, C-50C	Capacitor, 3 section Electrolytic (40 mf 450 V. / 40 mf 450 V. / 40 mf 25 V.)	45X374

Ref. No.	DESCRIPTION	Part No.
C-52	Capacitor, Tubular, .01 mf 600 V.	F66103
C-53	Capacitor, Ceramic, 220 mmf ± 20%	47X468
C-54, C-59	Capacitor, Tubular, .02 mf 600 V	F66203
C-55, C-60	Capacitor, Tubular, .001 mf 600 V.	F66102
C-56	Capacitor, Tubular, .02 mf 200 V.	B66203
C-57	Capacitor, Tubular, .006 mf 600 V.	F66602
C-58	Capacitor, Tubular, .005 mf 200 V.	B66502
C-61	Capacitor, Ceramic, 68 mmf ± 20%	47X471
C-62	Capacitor, Molded Mica, 2700 mmf ± 10%	47X492
C-63	Capacitor, Tubular, .01 mf 120 V.	46X328
	RESISTORS	
R-1, R-10, R-22	Resistor, Carbon 1 Megohm .5 W.	B85105
R-2, R-12, R-15	Resistor, Carbon 68 Ohms .5 W.	B83680
R-3, R-11	Resistor, Carbon 56K Ohms .5 W.	B84563
R-4, R-6, R-8, R-13	Resistor, Carbon 1000 Ohms .5 W.	B84102
R-5	Resistor, Carbon 100K Ohms .5W.	B85104
R-7	Resistor, Carbon 10K Ohms .5 W.	B84103
R-9	Resistor, Carbon 2.2 Megohm .5 W.	B85225
R-14	Resistor, Carbon 47K Ohms .5 W.	B85473
R-16	Resistor, Carbon 39K Ohms 1.0 W.	C84393
R-17	Resistor, Carbon 2200 Ohms .5 W.	B85222
R-18	Resistor, Carbon 27K Ohms .5 W.	B84273
R-19	Resistor, Wire Wound 3.6 Ohms .5 W.	43X233
R-20, R-21	Resistor, Carbon 6800 Ohms .5 W.	B83682
R-23	Resistor, Wire Wound 1400 Ohms 5.0 W.	43X242
R-25	Volume Control & Switch .5 meg.	36X379
R-26	Resistor, Carbon 15K Ohms .5 W.	B85153
R-27	Tone Control 3 meg.	40X288
R-28, R-33	Resistor, Carbon 10 Megohm .5 W.	B85106
R-29, R-34	Resistor, Carbon 270K Ohms .5 W.	B85274
R-30	Resistor, Carbon 560 Ohms 2.0 W.	D83561
R-31, R-35, R-38	Resistor, Carbon, 470 K Ohms .5 W	B85474

MODEL 15RA1-43-7902A

REPLACEMENT PARTS LIST (continued)

Ref. No.	DESCRIPTION	Part No.
R-32	Resistor, Carbon 8200 Ohms .5 W.	B84822
R-36	Resistor, Carbon 6800 Ohms .5 W.	B84682
R-37	Resistor, Carbon 5600 Ohms .5 W.	B84562

COILS AND TRANSFORMERS

L-2	Coil, Interstage (AM)	9A2025
L-3	Coil, Interstage (FM)	9A2024
L-4	Coil, Oscillator (AM)	9A2022
L-5	Choke, Insulated	35A5
L-6	Choke, Filament	9A1881
L-7	Coil, Oscillator (FM)	9A2023
L-8	Choke (FM Mixer Plate)	35A7
L-9	Coil, Antenna (FM)	9A2027
T-1	1st I.F. Coil Assembly (FM)	9A2043
T-2	1st I.F. Coil Assembly (AM)	9A2029
T-3	2nd I.F. Coil Assembly (FM)	9A2030
T-4	2nd I.F. Coil Assembly (AM)	9A2042
T-5	Discriminator Coil Assembly	9A2161
T-6	Dipole Antenna Assembly	9A2004
T-7	"B" Range Loop Antenna Assembly	9A1972
T-8	Power Transformer	53X286
T-9	Output Transformer	51X142

DIAL AND TUNING PARTS

Escutcheon		4X1073
Rubber Grommets	Mtg. Gang Condenser	6X67
Condenser Mtg. Bracket	Mtg. Gang Condenser	25X1630
Drive Cord Assembly		10X38
Pointer		15X251
"C" Washer (Drive Shaft)		19X192
Drive Shaft		26X509
Drive Cord Tension Spring		28X113

Ref. No.	DESCRIPTION	Part No.
Dial Bracket Assembly		S-25X72
	Consisting of:	
	Tubular Rivet	20X1564
	Shoulder Rivet	20X1580
	Shoulder Rivet	20X1581
	Eyelet	20X1508
	Dial Bracket	25X1610
	Support Bracket, L. H.	25X1611
	Support Bracket, R. H.	25X1612
	Olive Green Lacquer Enamel (Type S)	1801J
Dial Assembly		S-58X46
	Consisting of:	
	Dial Bracket Assembly	S-25X72
	Rubber Band	8X185
	Rubber Strip	8X195
	Trimount Stud	28X56
	Spring	28X564
	Light Shield	41X86
	Dial Glass	58X716

MISCELLANEOUS

Band Change Switch	2A404
Phono Socket (Single Pin)	3A305
Molded Octal Tube Socket	3A435
Tube Socket (miniature, for AM-FM Converter)	3A436
Tube Socket (Miniature)	3A439
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A231
Knobs	10A772
12" P.M. Speaker	12A502
Record Changer	28A171
Line Cord & Plug Assembly	13X546
Tube Shield (AM-FM Converter)	32X388
Tube Shield (Miniature)	32X390

MODEL 15RA2-43-9105A

The Model 15RA2-43-9105A is a television, AM radio and phonograph combination The television chassis is in no way connected to the radio or phonograph, as the phono TV switch and audio input plug on the rear of the television chassis is not utilized.

The phonograph obtains its AC power through a connection to the radio chassis and also uses the audio section for amplification.

This manual covers only the service and repair parts information for the radio chassis. For service and repair parts information for the television receiver refer to television service manual

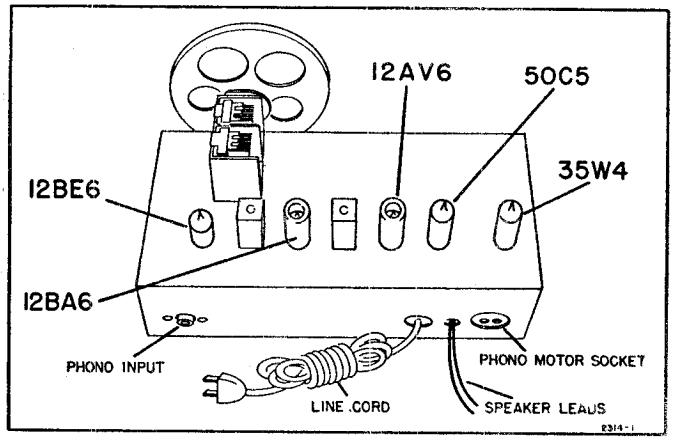
SERVICE DATA

ELECTRICAL SPECIFICATIONS

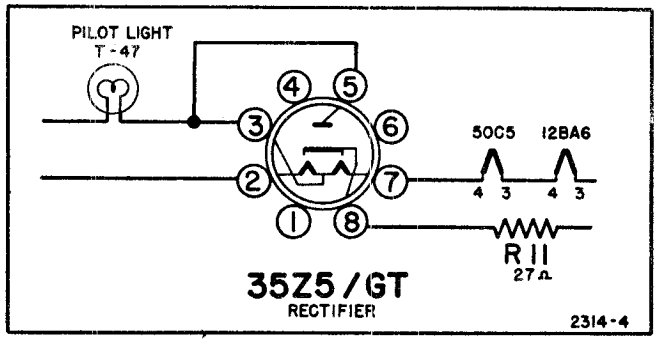
Power Supply	115 volts; 60-cycles AC, 60 watts. (Including phonograph)
Frequency Range	540 to 1600 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc. 50 kc. at 1000 x signal.
Sensitivity	20 microvolts average for .05 watts output.
Power Output	0.75 watts undistorted, 1.25 watts maximum.
Loud Speaker	12″ P.M., v.c. impedance 3.2 ohms.
Tube Complement	12BE6, converter. 12BA6, I.F. amplifier. 12AV6, detector, AVC, audio amplifier. 50C5, output amplifier. 35Z5 or 35W4, rectifier. Pilot lite, 6-8 volts, T-47.

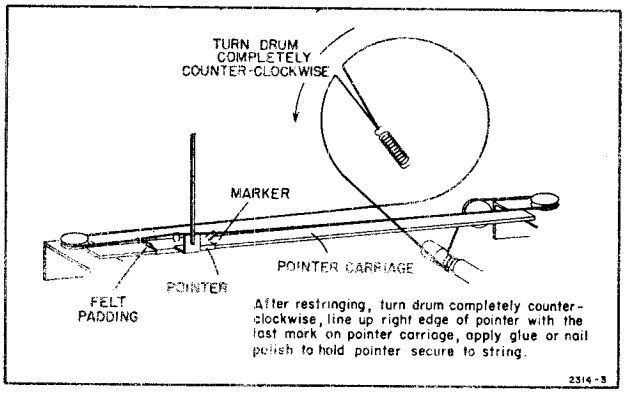
MAINTENANCE

DIAL LIGHT— If the dial lamp burns out, the set should not be operated until a new lamp has been installed. Failure to heed this caution may result in a burned-out rectifier tube. To replace the lamp, pull out the back cover inside the changer compartment. Use only a type T-47 lamp for replacement.



Chassis View





Dial Cord Stringing

PRODUCTION CHANGE

Due to procurement difficulties the 35W4 rectifier tube was replaced by a 35Z5. The only change in parts list is a A-15B-10440 octal tube socket. Refer to the drawing at the left for the 35Z5 wiring diagram.

MODEL 15RA2-43-9105A

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

Alignment must be done in the cabinet.

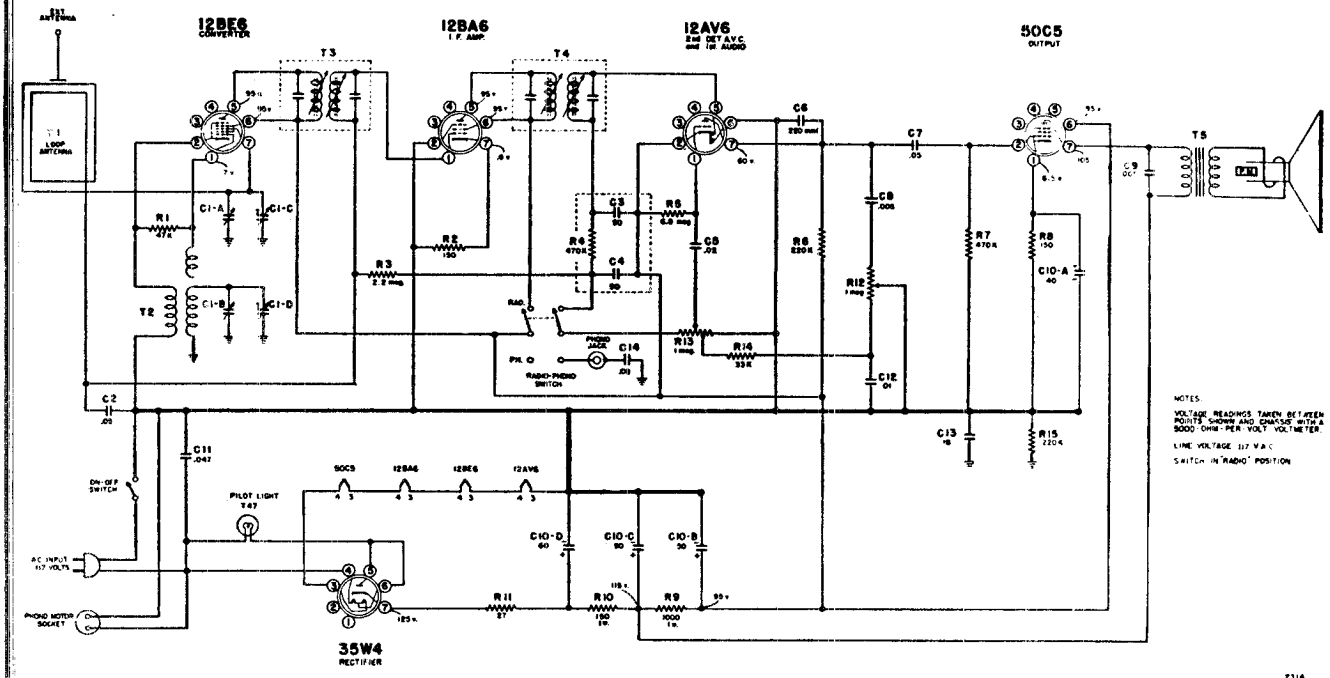
The signal source must be an accurately calibrated signal generator capable of supplying both RF and 455 kc signals modulated 30% with a 400-cycle audio signal. Variations of plus or minus 25% are usually permissable.

The table below lists the sensitivity at the input of each stage. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected.

- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf.	12BE6, Pin 7	B MINUS POINT BUSS LEAD	(Capacitor fully open) (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	60 microvolts
1620 kc.	.1 mf.	12BE6, Pin 7		(Capacitor fully open) (plates out of mesh)	Oscillator trimmer C1-D on gang	67 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	61 microvolts
1400 kc.	———	Lay Generator lead near back of cabinet		Set dial pointer at 1400 kc.	Antenna trimmer C1-C on gang	200 to 400 microvolts
400 cycles	.1 mf.	12AV6, Pin 1		———	———	.03 volts

SCHEMATIC DIAGRAM WITH VOLTAGES



NOTE: Either 12AV6 or 12AT6 tubes may be used.

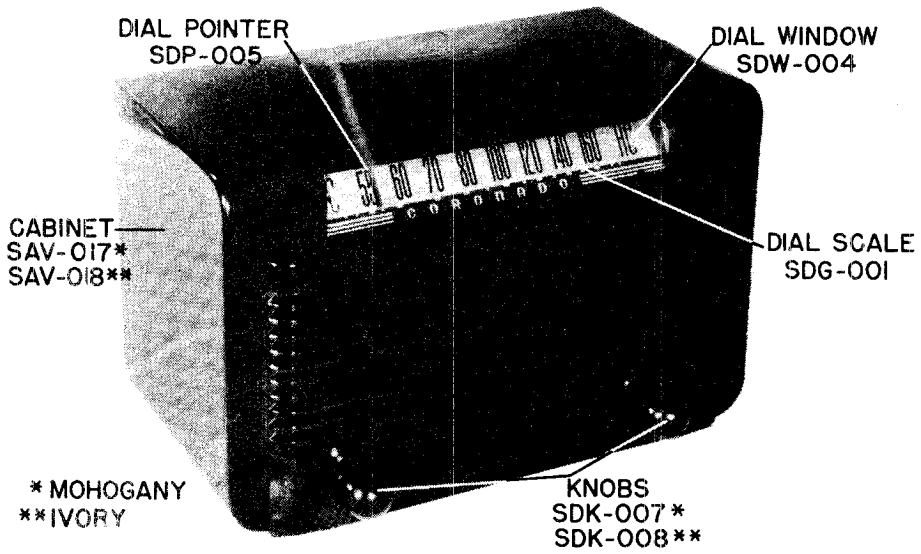
MODEL 15RA2-43-9105A

Please specify PART number and chassis model number when ordering replacements.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1A-B	B-8A-18997	Gang tuning condenser
C1C, D		Trimmers on gang
C2-7	C-8D-10770	.05 mfd x 200 volts
C3-4- & R4	A-201-15005	Filpec
C5	C-8D-11304	.02 mfd x 200 volts
C6	C-8G-14459	220 mmf, ceramic
C8-9	C-8D-10935	.005 mfd x 600 volts
C10-A-B-C-D	A-8C-19085	Electrolytic condenser
C11	C-8J-16081	.047 mfd x 400 volts
C12	C-8D-10761	.01 mfd x 400 volts
C13	C-8D-11111	.18 mfd x 400 volts
C14	C-8D-11251	.09 mfd x 400 volts
		RESISTORS
R1	C-9B1-82	47K ohms, 1/2 watt, 10%
R2-8	C-9B1-52	150 ohms 1/2 watt, 10%
R3	C-9B1-33	2.2 megohms, 1/2 watt, 20%
R5	C-9B1-36	6.8 megohms, 1/2 watt, 20%
R6-15	C-9B1-90	220K ohms, 1/2 watt, 10%
R7	C-9B1-29	470K ohms, 1/2 watt, 20%
R9	C-9B2-62	1000 ohms, 1 watt, 10%
R10	C-9B2-52	150 ohms, 1 watt, 10%
R11	C-9B1-43	27 ohms, 1/2 watt, 10%
R12	A-11A-19004	Tone control and radio phono switch
R13	A-10A-19005	Volume control and switch
R14	C-9B1-80	33K ohms, 1/2 watt, 10%
		TRANSFORMERS AND COILS
T1	C-13E-19087-1	Loop antenna assembly
T2	B-13D-19064	Oscillator coil
T3	B-13B-17731	Input IF transformer
T4	B-13B-17731	Output IF transformer
T5	B-12C-19009	Output transformer
		DIAL PARTS
	A-2D-17627	Pointer bar bracket
	B-2M-19006	Pointer bar
	A-3H-10299	Pulley
	B-2G-19433	Dial pointer
	B-53A-18547	Dial string
	A-49A-11324	Tension spring
		RECORD CHANGER
	B-201-18874	Record changer (VM Model 950)
	3129-H	Motor assembly Electro voice 33-4 crystal cartridge Electro voice 0-2, needle
		MISCELLANEOUS
	B-2C-19053	Background plate
	A-3A-19003	Tuning shaft
	B-47A-19060	Pilot light assembly
	A-46A-10793	Pilot light, T-47
	A-2H-10974	Tube shield
	A-15C-16007	7-prong socket
	A-23A-10344	Line cord lock
	B-14M-11479-5	A.C. line cord and plug
	A-19B-12170	Phono socket
	A-19B-12468	Phono motor socket
	B-2D-15432-1	Loop mounting bracket
		CABINET PARTS
	R-24D-19482	Cabinet
	C-2M-18944	Escutcheon
	D-2M-18943	Escutcheon mask
	C-30M-18966	Picture glass
	B-2M-18768	Channel indicator plate
	B-2M-17068	Contrast off volume plate
	B-18A-19130	12" PM speaker
	A-2G-18788	Pointer
	B-5B-18781-76	Tuning knob
	B-5B-17761-76	Off-on volume knob
	B-5B-17762-76	Contrast knob
	A-25M-18172	White rubber knob
	A-25M-18177	Red rubber knob
	A-25M-18178	Blue rubber knob
	C-23J-19178	Cabinet back
	B-14M-17758	Line cord and plugs
	N-43E-15569	Wing nut, 6-32
	N-201-18519-2	T.V. inside antenna
	B-5B-18382-36	Antenna knob
	A-3M-19398	Centering adjusting rod
	B-2C-19362	Cover plate
	B-30A-19481	Radio dial scale
	B-2G-18928	Radio escutcheon
	B-201-18874-1	Record changer
	B-5B-18876-76	Radio knob (line)
	B-5B-18877-76	Radio knob
	B-23M-19163	Bottom cover
	A-55L-16671	Plug receptacle
	B-14M-11479	Radio line cord
	A-23A-10344	Line cord lock

MODELS 43-37I-1, 43-37I-2,
43-8175, 43-8176



Model 43-37I-1 Mahogany Cabinet (Illustrated)
Model 43-37I-2 Ivory Cabinet (Not Illustrated)

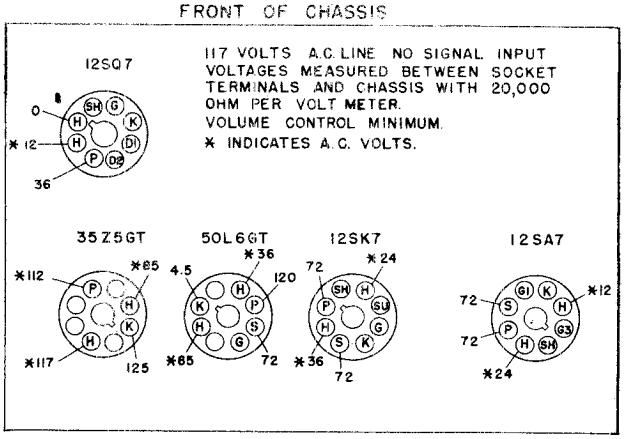
CAUTION: One side of the power line is connected to the chassis. Avoid any ground connection to the radio unless an isolating transformer is used in the power line.

SPECIFICATIONS

5 Tube Superheterodyne, including rectifier tube
Speaker--4 inch P.M. Dynamic, voice coil impedance 3.2
Antenna-----Self contained loop antenna, also provision for external antenna
Tuning----------Two gang capacitor
Power supply----------105-125 V. AC or DC
Frequency on AC----------40 to 60 cycles

Power Consumption----------30 watts
Power Output-----0.8 watts undistorted, 1.4 w. maximum
Frequency range----------540 to 1725 KC
Intermediate Frequency----------455 KC
Antenna Sensitivity---140 mv. average for 0.5 w output
Selectivity 70 KC at 1000 times signal at 1000 KC

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

SOCKET VOLTAGE DIAGRAM

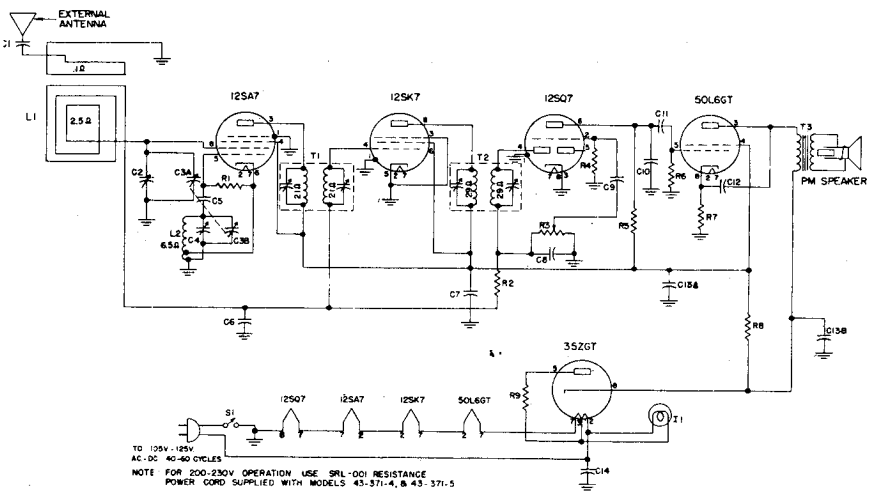
ALIGNMENT PROCEDURE

Allow unit to heat for a few minutes before starting alignment.
Volume control set to maximum.
Output meter across speaker.
Align for maximum output.
Keep input as low as readable meter reading of output will permit.

Note: If signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC through the capacitor will introduce hum and/or create the possibility of a burned out signal generator attenuator.

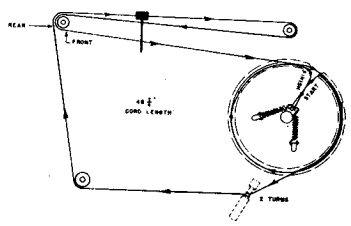
FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNING CONDENSER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
455 KC	0.1 mf	Converter grid	Chassis	Wide open	2nd IF transformer trimmers 1st IF transformer trimmers
1725 KC	200 mmf	Receiver antenna post	Chassis	Wide open	Oscillator trimmer C4
1500 KC	200 mmf	Receiver antenna post	Chassis	Tune for maximum output	Antenna trimmer C2

MODELS 43-371-1, 43-371-2, 43-8175, 43-8176

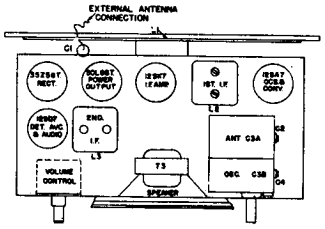


SCHEMATIC DIAGRAM

DRIVE CORD REPLACEMENT

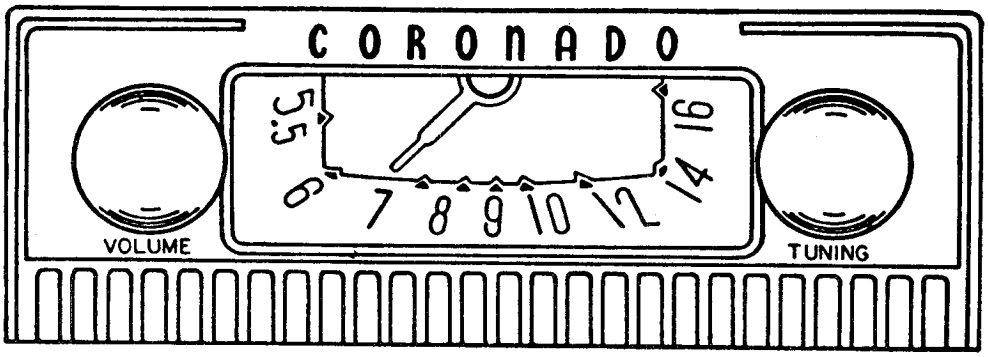


TUBE AND TRIMMER LOCATION



SYMBOL	TITLE	VALUE	RATING	PART NO.
C1	Paper capacitor	.02 mf.	400 V.	UCC-026
C2	Antenna trimmer			Part of SCT-015
C3	2 Gang variable condenser			SCT-015
C4	Oscillator trimmer			Part of SCT-015
C5	Mica capacitor	220 mmf.		UCU-036
C6	Paper capacitor	.05 mf.	400 V.	UCC-028
C7	Paper capacitor	.05 mf.	400 V.	UCC-028
C8	Paper capacitor	220 mmf.		UCU-036
C9	Paper capacitor	.01 mf.	400 V.	UCC-040
C10	Mica capacitor	220		UCC-036
C11	Paper capacitor	.01 mf.	400 V.	UCC-025
C12	Paper capacitor	.02	400 V.	UCC-026
C13A	Electrolytic capacitor	30 mf.	150 V.	SCE-022
C13B	Electrolytic capacitor	30 mf.	150 V.	SCE-022
C14	Paper capacitor	.05 mf.	400 V.	UCC-028
R1	Carbon resistor	22,000 ohm	½ W.	URD-081
R2	Carbon resistor	2.2 megohm	½ W.	URD-129
R3	Volume control & switch (S1)	1.0 megohm		SRC-045
R4	Carbon resistor	4.7 megohm	½ W.	URD-137
R5	Carbon resistor	470,000 ohm	½ W.	URD-113
R6	Carbon resistor	470,000 ohm	½ W.	URD-113
R7	Carbon resistor	150 ohm	½ W.	URD-029
R8	Carbon resistor	2,700 ohm	2 W.	URF-059
R9	Carbon resistor	18 ohm	½ W.	URD-007
S1	Switch, on-off part of R3			
L1	Loop antenna assembly			SAB-015
L2	Coil, oscillator			SLC-013
T1	Transformer, 1st I.F.			STL-001
T2	Transformer, 2nd I.F.			STL-002
T3	Transformer output, part of LS1			
LS1	Speaker, 4 inch P.M.			SOP-004
I1	Lamp, pilot	GE 47	6-8V.	UDL-018
	Socket, tube, octal-base			SJS-003
	Cord-power cord			SWL-002
	Back fasteners			RHH-002
	Pilot light socket assembly			SJS-001

MODELS 43-5006B,
43-5006C



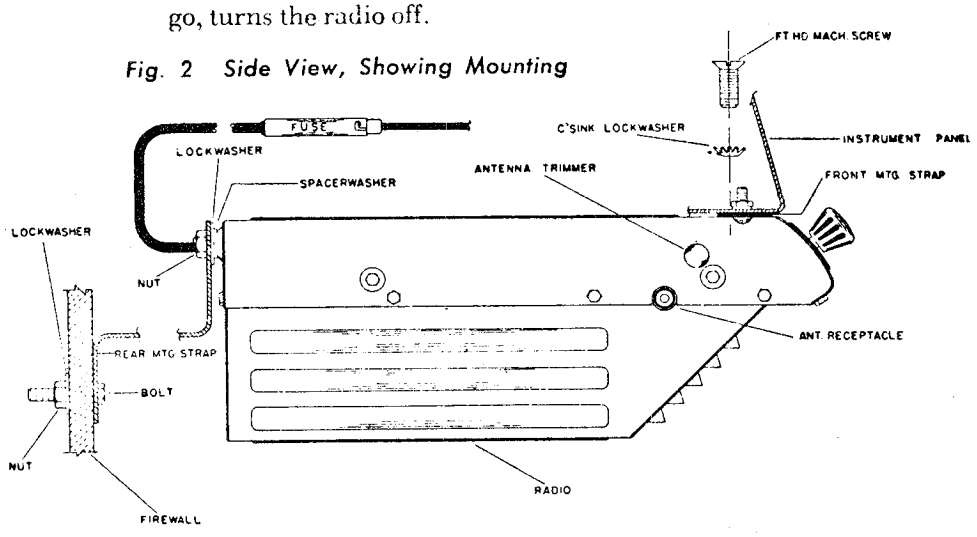
A52-257 KNOBS
B67-522 DIAL SCALE
D40-141 ESCUTCHEON
A58-55 DIAL POINTER

Fig. 1 Front View

OPERATION

To turn the receiver on, rotate the volume control and switch knob (left hand knob) to the right about half its range. After allowing about 30 seconds for the tubes to warm up, the desired station may be tuned by rotating the tuning control (right hand knob) to the desired frequency. The dial scale is calibrated in kilocycles minus the final two zeros. After the station has been properly tuned, the volume may be adjusted by means of the volume control knob. To increase the volume, turn the control to the right; to decrease the volume, turn it to the left. Turning this control to the left as far as it will go, turns the radio off.

Fig. 2 Side View, Showing Mounting



ELECTRICAL SPECIFICATIONS

The tube compliment of this receiver is as follows:

1—6SK7GT—R. F. Amplifier.

1—6SA7GT—Converter.

1—6SK7GT—I.F. Amplifier.

1—6SQ7—Detector—AVC—1st audio.

1—6V6GT—Power output.

1—6X5GT—Rectifier.

Power Supply	6.3 volts DC
Current	4.8 amp. average
Frequency Range	540 to 1600 KC
I. F. Frequency	455 KC
Speaker	4" P. M.
Power Output	1.2 watts, undistorted 2.5 watts, maximum
Sensitivity	10 microvolts average for 1 watt output
Selectivity	20 KC broad at 1000 times signal, at 1000 KC

MODELS 43-5006B, 43-5006C

SERVICE NOTES

Voltages taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 5).

All voltages should be measured with an input voltage of 6.3 volts DC.

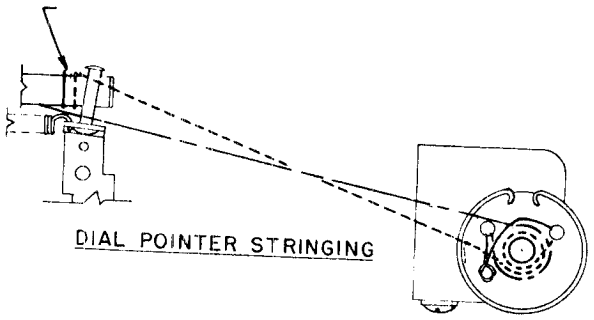
INSTRUCTIONS FOR REMOVING CHASSIS FROM THE CASE

The bottom cover (the one with the speaker louvers) can be removed to permit servicing of major components, such as tubes and vibrator, by removing the eight (8) screws holding it to the top cover. There are three (3) screws on each side, one (1) in the rear, and one (1) in the front.

FINAL ADJUSTMENTS

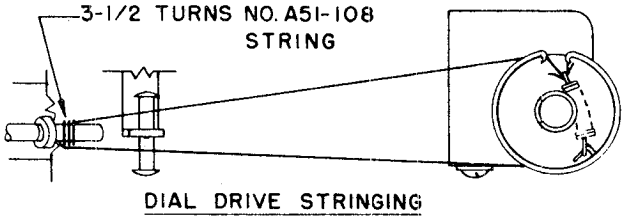
The input circuit has been especially designed to be used with a low capacity antenna, of the fish pole or whip type.

To adjust the antenna trimmer condenser, carefully tune the receiver to a weak station at approximately 600 kilocycles (K.C.). Remove the snap button covering the antenna trimmer (See Figure 2) and adjust the trimmer for maximum volume. A small screw driver will be needed for this purpose.



Dial Pointer Stringing

43-5006B & 43-5006C



Dial Stringing 43-5006B & 43-5006C

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

CAUTION: Before attempting to remove the top cover, to service condensers, resistors, etc., the screw connecting the spark plate to the "A" terminal (inside case) must be removed. This is a round head screw, and is located on the rear of the case, close to the mounting stud bolt. It is recessed in a ½ inch hole in the case itself, thereby permitting contact with the spark plate.

After removing the spark plate screw, remove the two knobs by pulling forward and remove the eight (8) screws securing the cover to the chassis. Lift the chassis at the rear, at the same time moving it away from the front of the case so that the volume and tuning shafts will clear the holes in the cover.

NOTE: When reinstalling the chassis into the case, be sure the screw connecting the spark plate to the "A" terminal (inside case) is tightened very securely, otherwise the receiver will not operate properly.

MODELS 43-5006B,
43-5006C

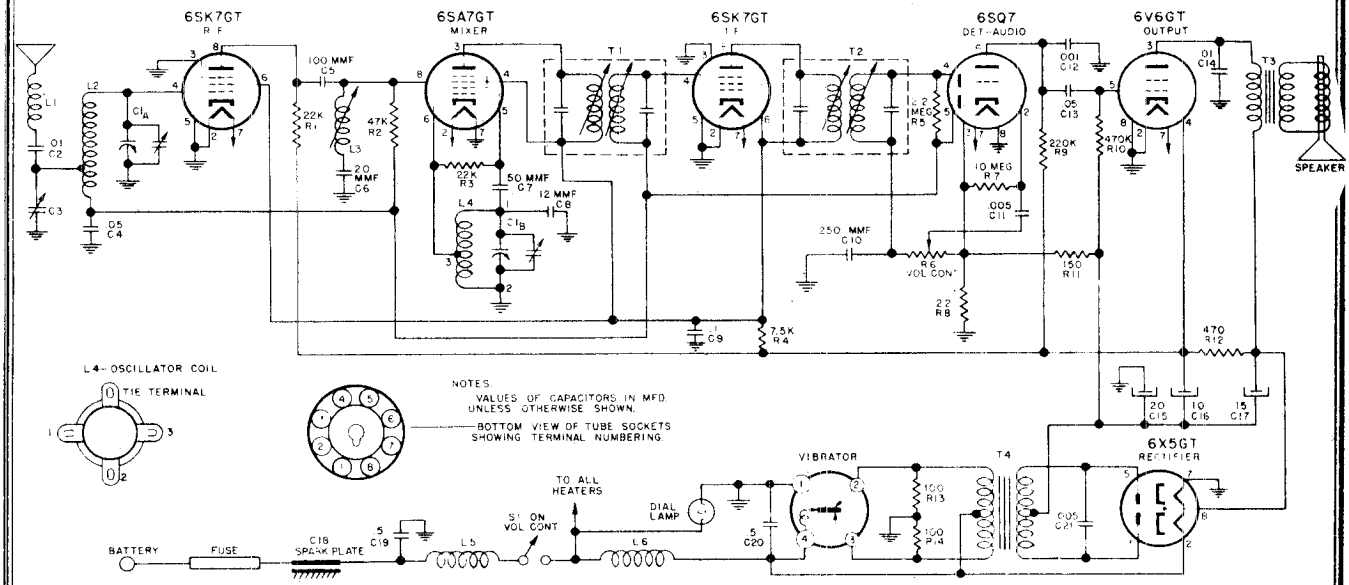


Figure 3 Schematic Drawing 43-5006B

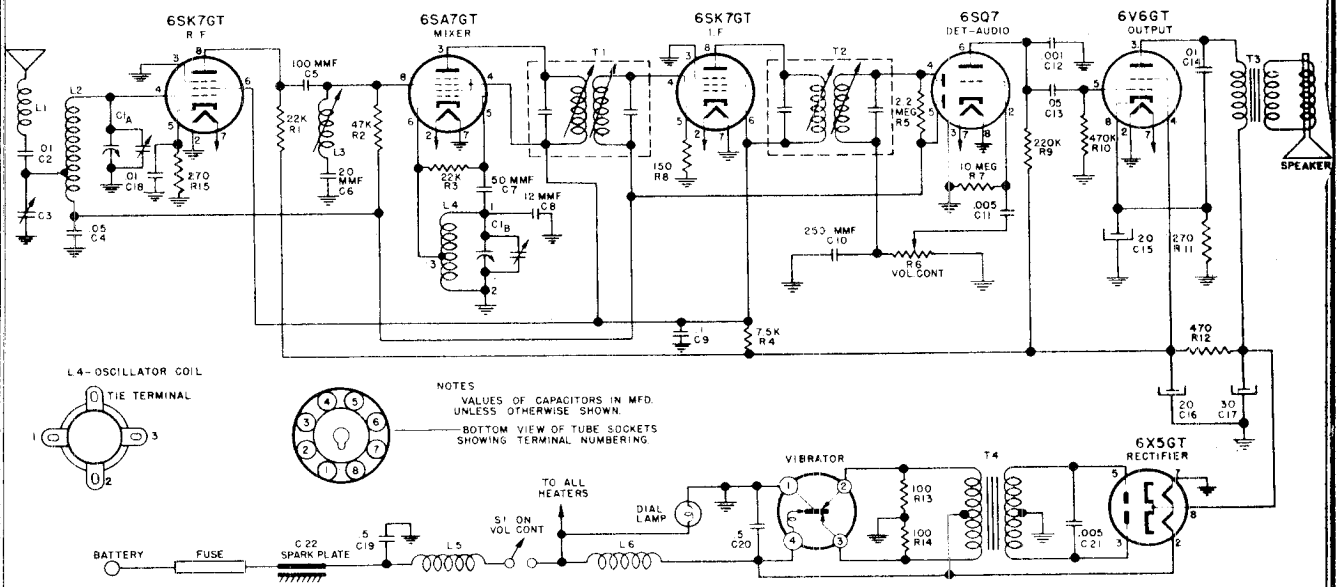
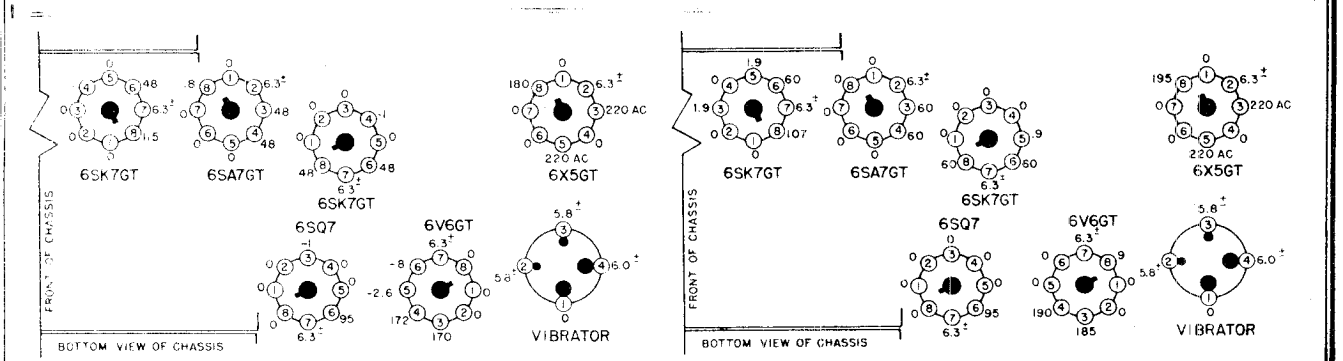


Figure 4 Schematic Drawing 43-5006C



43-5006B Figure 5 Socket Voltages 43-5006C

MODELS 43-5006B, 43-5006C

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.

No signal applied to antenna.

Power input—6.3 volts.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil.

Connect ground lead of signal generator to chassis.

Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.

Non-metallic screwdriver.

Output meter.

Dummy antennas—.1 MFD., 75 MMFD.

For alignment points refer to Figures 5 and 6.

Dial Setting	Generator Frequency	Dummy Ant.	Generator Connections	Trimmer Reference	Trimmer Adjustment	Trimmer Function
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T2	Maximum	Output I.F.
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T1	Maximum	Input I.F.
Fully Open	455 KC	75 MMFD.	Ant. lead	L3	Minimum	Wave trap
Fully Open	1600 KC	75 MMFD.	Ant. lead	C1B	Maximum	Oscillator
Tune in signal from generator	1400 KC	75 MMFD.	Ant. lead	C3	Maximum	Antenna

NOTE: The antenna trimmer condenser, C3, (see Fig. 2) should be adjusted after the radio is installed in the car. Tune the receiver to a weak station at about 1100 KC and adjust this trimmer for maximum volume.

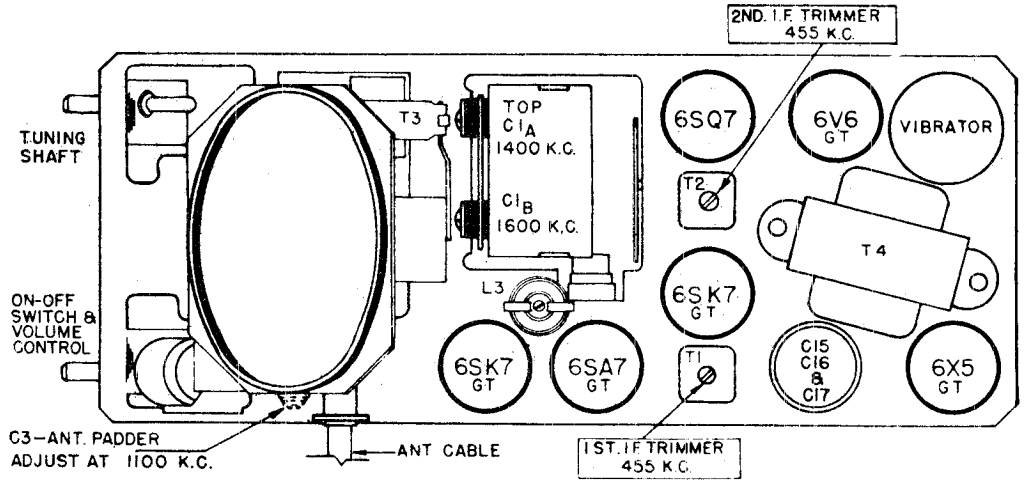


Figure 6 Tube & Trimmer Locations 43-5006B & 43-5006C

CONDENSERS

Ref. No.	Description	Model 5006B	5006C
C1A, C1B	Variable condenser	A19-201	A19-201
C2, C14	.01 MFD 400 volt condenser	A16-192	A16-192
C3	Trimmer condenser	A20-145	A20-145
C4	.05 MFD 400 volt condenser	A16-189	A16-189
C5	100 MMFD ceramic condenser	A15-196	A15-196
C6	20 MMFD ceramic condenser	A15-202	A15-202
C7	50 MMFD ceramic condenser	A15-204	A15-204
C8	12 MMFD, ceramic condenser, temp. comp.	A15-205	A15-205
C9	.1 MFD 400 volt condenser	A16-187	A16-187
C10	250 MMFD mica condenser	A15-176	A15-176
C11	.005 MFD 600 volt condenser	A16-190	A16-190
C12	.001 MFD ceramic condenser	A16-195	A16-195
C13	.05 MFD 600 volt condenser	A16-193	A16-193
C15	20 MFD 25 volt electrolytic condenser		
C16	10 MFD 350 volt electrolytic condenser	A18-293	
C17	15 MFD 350 volt electrolytic condenser		
C15	20 MFD 25 volt electrolytic condenser		
C16	20 MFD 350 volt electrolytic condenser		A18-289
C17	30 MFD 350 volt electrolytic condenser		
C18	.01 MFD 400 volt condenser		A16-192
C19, C20	.5 MFD 100 volt condenser	A16-184	A16-184
C21	.005 MFD 1600 volt oil filled condenser	A16-185	A16-185

MODELS 43-5006B,
43-5006C

Ref. No.	Description	Model 5006B	5006C
		Part Number	
	RESISTORS		
R1, R3	22K ohm ½ watt 20% resistor	A60-659	A60-659
R2	47K ohm ½ watt 20% resistor	A60-685	A60-685
R4	7.5K ohm 2 watt 10% resistor	A60-769	A60-769
R5	2.2 megohm ½ watt 20% resistor	A60-726	A60-726
R6	Volume control, 500,000 ohm, with switch	A24-177	A24-177
R7	10 megohm ½ watt 20% resistor	A60-728	A60-728
R8	22 ohm ½ watt 10% resistor	A60-768	
R8	150 ohm ½ watt 10% resistor		A60-767
R9	220K ohm ½ watt 20% resistor	A60-667	A60-667
R10	470K ohm ½ watt 20% resistor	A60-731	A60-731
R11	150 ohm ½ watt 10% resistor	A60-767	
R11	270 ohm ½ watt 10% resistor		A60-771
R12	470 ohm ½ watt 10% resistor	A60-770	A60-770
R13, R14	100 ohm ½ watt 10% resistor	A60-752	A60-752
R15	270 ohm ½ watt 10% resistor		A60-771
	COILS AND TRANSFORMERS		
L1	Antenna Loading Coil	A10-527	A10-527
L2	Antenna Coil	B10-511	B10-511
L3	I. F. Trap Coil	A10-510	A10-510
L4	Oscillator Coil	A10-512	A10-512
L5	Choke "A" Line	A33-229	A33-229
L6	Choke vibrator hash	A33-228	A33-228
T1	1st I. F. Transformer	A10-508	A10-508
T2	2nd I. F. Transformer	A10-509	A10-509
T3	Output Transformer (Part of Speaker, not furnished separately)	B80-242	B80-242
T4	Power transformer	B80-243	B80-243
	DIAL PARTS	5006B	5006C
	Bracket, Dial Scale	A11-303	A11-303
	Bracket, String Guide	B11-328	B11-328
	Bushing, Tuning Shaft Bearing	A72-29	A72-29
	Clip, Spring, for Tuning Shaft	A70-130	A70-130
	Dial Escutcheon	D40-141	D40-141
	Dial Pointer	A58-55	A58-55
	Dial Scale	B67-522	B67-522
	Gasket for Speaker	A28-101	A28-101
	Knob	A52-257	A52-257
	Link, String Guide	A11-329	A11-329
	Pilot Light, No. 47 Bayonet	A89-10	A89-10
	Rivet, Shoulder, for Dial Pointer Stringing	A65-37	A65-37
	Rivet, Shoulder, for String Guide Brkt. and Link	A65-41	
	Rivet, Shoulder, for String Guide Brkt. and Link		A65-42
	Rivet, Shoulder, for Dial Drive Stringing	A65-12	A65-12
	Shaft, tuning	A75-70	A75-70
	Shaft, for Dial Pointer	A75-74	A75-74
	Spring, for Pilot Light Socket	A70-132	A70-132
	Spring, Dial Drive String Tension	A70-135	A70-135
	Spring, Pointer Drive String Tension		A70-137
	Spring, Pointer Drive String Tension	A70-142	
	String, Pointer Travel, 17"		A51-105
	String, Condenser Drive, 19"		A51-108
	MISCELLANEOUS		
	"A" lead assembly	S84-233	S84-233
	Clip, I. F. Transformer Mounting	A83-421	A83-421
	Clip, Oscillator Coil Mounting	A83-517	A83-517
	Fuse, 15 Amp.	A43-10	A43-10
	Grommet, rubber, (Spkr. & Gang Mounting)	A47-112	A47-112
	Mounting strap, rear	B31-134	B31-134
	Mounting Plate, Front	B31-139	B31-139
	Mounting parts kit	S84-192	S84-192
	Receptacle, Antenna Cable	A87-38	A87-38
	Speaker, 4" P.M. (includes Output Transformer)	B79-362	B79-362
	Suppression Kit Assembly	S84-322	S84-322
	Vibrator	A34-105	A34-105
	Wiper, grounding, for case covers	A83-519	A83-519

ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible to prevent A.V.C. action from interfering with correct alignment.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.

CAUTION: This is an A.C.-D.C. receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or place a .2 MFD. condenser in both test leads of the Signal Generator.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T1	I.F.
Fully open	1625 KC	.00025	*Antenna Wire	C1B	Oscillator
Tune in signal from generator	1400 KC	.00025	*Antenna Wire	C1A	Antenna

*Connect ground lead of signal generator to chassis.

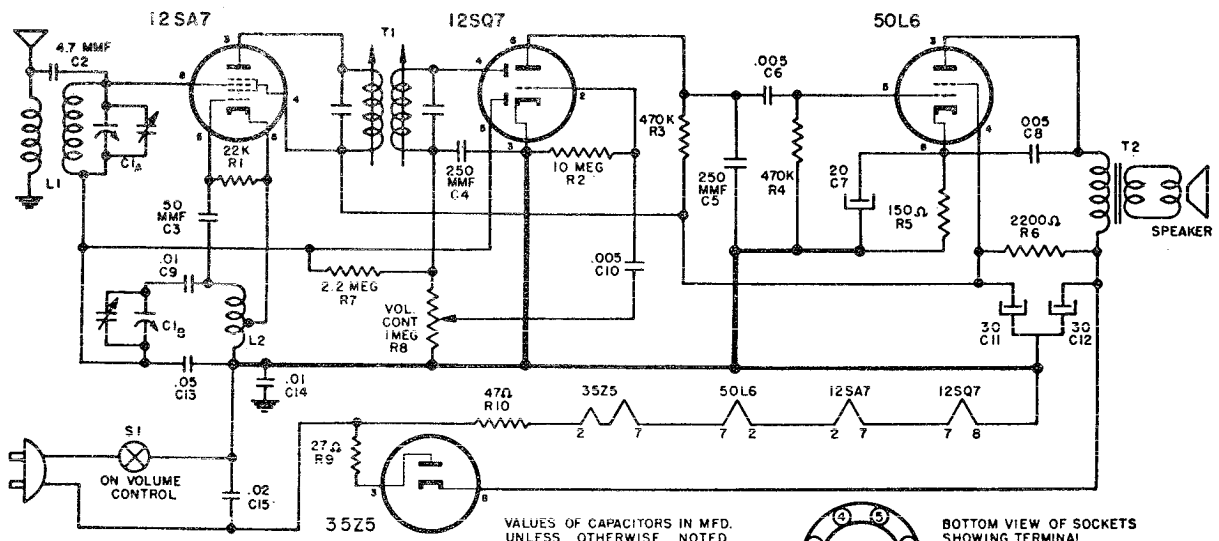
DESCRIPTION

Model 12801 is a superheterodyne receiver, designed for use on 105-125 volt 60 cycle AC or DC current.

The tubes used are:

12SA7—Oscillator-Mixer
12SQ7—Detector and first Audio
50L6—Power Output
35Z5—Rectifier

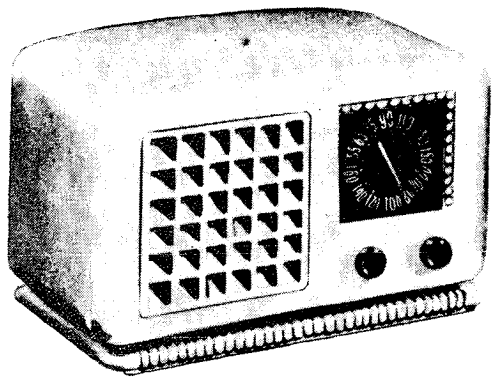
This receiver covers the frequency range from 540 to 1625 KC. The dial scale is calibrated in kilocycles, minus the final zero.

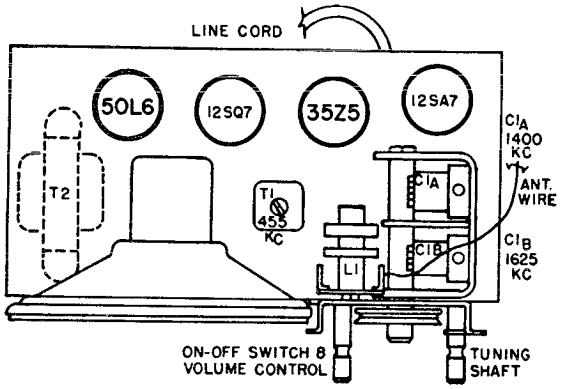


VALUES OF CAPACITORS IN MFD. UNLESS OTHERWISE NOTED.

CHASSIS GROUND.

BOTTOM VIEW OF SOCKETS SHOWING TERMINAL NUMBERING.





PARTS LIST

CODE	PART NO.	DESCRIPTION
C1A, C1B	B19-194	Variable Condenser
C2	A83-355	4.7 Mmfd Condenser
C3	A15-175	50 Mmfd Mica Condenser
C4, C5	A15-176	250 Mmfd Mica Condenser
C6, C8, C10	A16-153	.005 Mfd 600 Volt Condenser
C7	A18-278	20 Mfd 25 Volt Electrolytic Condenser
C9, C14	A16-156	.01 Mfd 400 Volt Condenser
C11, C12	A18-263	30x30 Mfd 150 Volt Electrolytic Condenser
C13	A16-152	.05 Mfd. 200 Volt Condenser
C15	A16-151	.02 Mfd 600 Volt Condenser

CODE	PART NO.	DESCRIPTION
R1	A60-659	22K ohm ½ watt Resistor
R2	A60-663	10 Megohm ½ watt Resistor
R3, R4	A60-662	470K ohm ½ watt Resistor
R5	A60-686	150 ohm ½ watt Resistor
R6	A60-737	2200 ohm 1 watt Resistor
R7	A60-684	2.2 Megohm ½ watt Resistor
R8	A24-174	Volume Control, 1 Megohm
R9	A60-690	27 ohm ½ watt Resistor
R10	A60-750	47 ohm 1 watt Resistor
L1	A10-485	Antenna Coil
L2	B10-502	Oscillator Coil
T1	A10-478	I.F. Transformer
T2	A80-239	Output Transformer

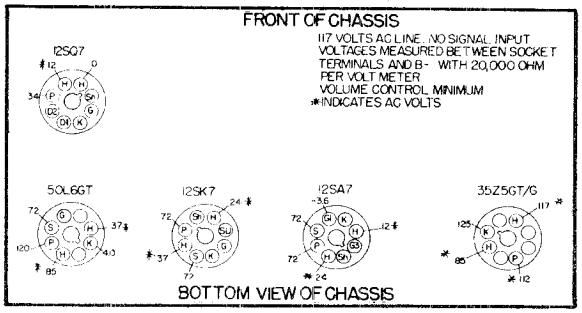
CODE	PART NO.	DESCRIPTION
	B79-360	Speaker, 5" P.M.
	A91-57	Antenna Wire, 20 feet
	C21-118	Cabinet Back
	D42-424	Cabinet, Ivory
	A42-433	Cabinet, Black
	A42-434	Cabinet, Red
	A42-435	Cabinet, Green
	A48-42	Dial Crystal
	B67-510	Dial Scale
	A58-69	Dial Pointer
	A52-222	Knob, White
	A52-243	Knob, Black

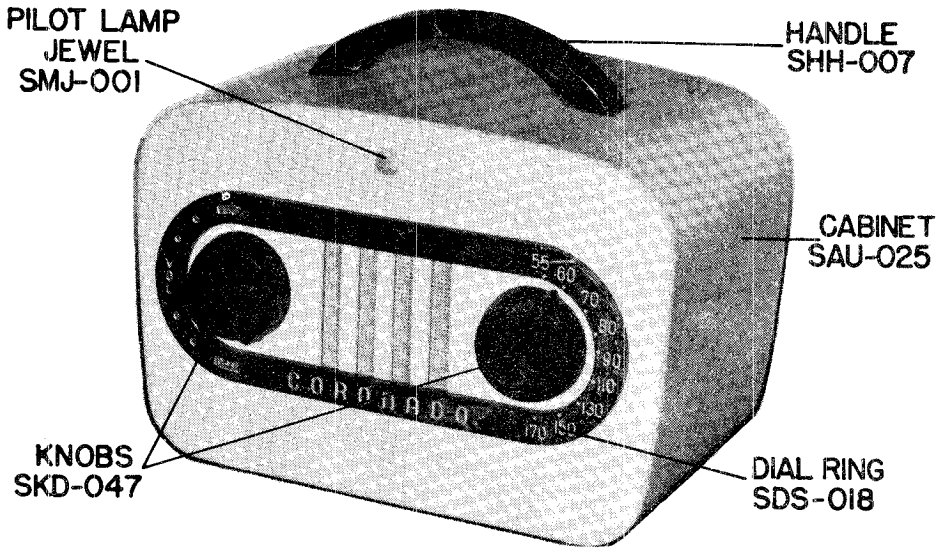
MODEL 43-8190

SPECIFICATIONS

5 Tube Superheterodyne, including rectifier tube
Speaker ------ 4 inch "Alnico 5" Magnet Dynamic, voice coil impedance 3.5 ohms (400 cycles)
Antenna ---- Self contained loop antenna, also provision for external antenna
Tuning ---------- Direct drive—2 gang condenser
Power supply ---------- 105 to 125 Volts, AC or DC
Frequency on AC ---------- 40 to 60 cycles
Power Consumption ---------- 25 watts
Power Output ---- 0.6 w undistorted, 1.5 w minimum full power output
Frequency range ---------- 540 to 1720 KC
Intermediate Frequency ---------- 455 KC
Antenna Sensitivity ---- 300 mv. average for 0.5 w output
Selectivity -- 75 KC broad at 1000 times signal at 1000 KC

SOCKET VOLTAGE DIAGRAM





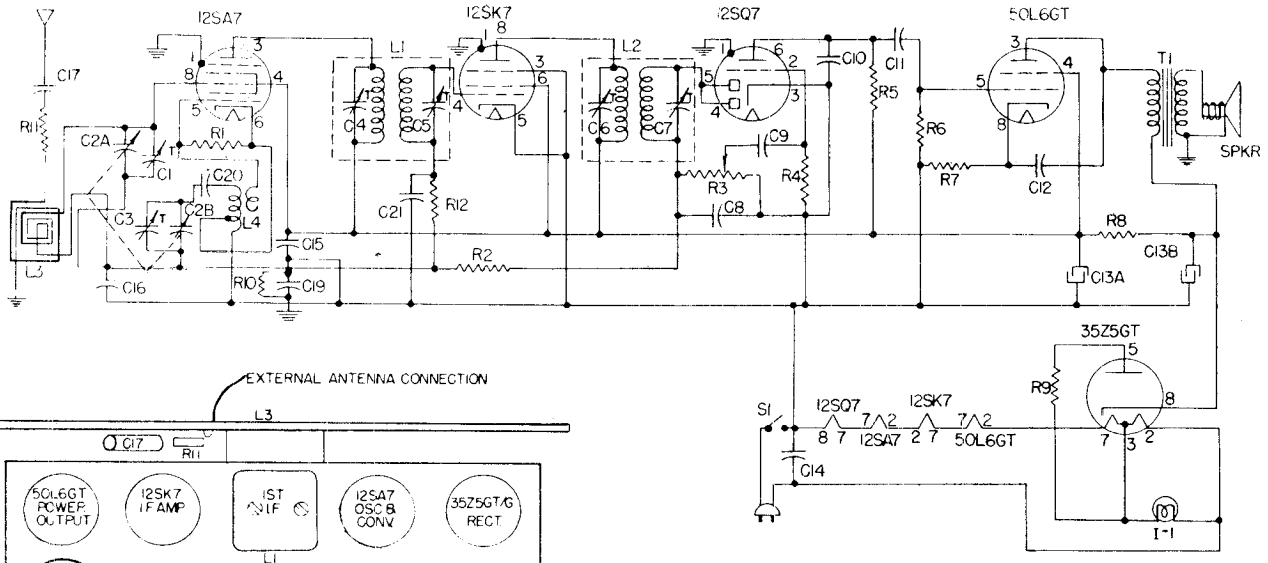
ALIGNMENT PROCEDURE

Allow unit to heat for a few minutes before starting alignment.
Volume control set to maximum.
Output meter across speaker.
Align for maximum output.
Keep input as low as readable meter reading of output will permit.

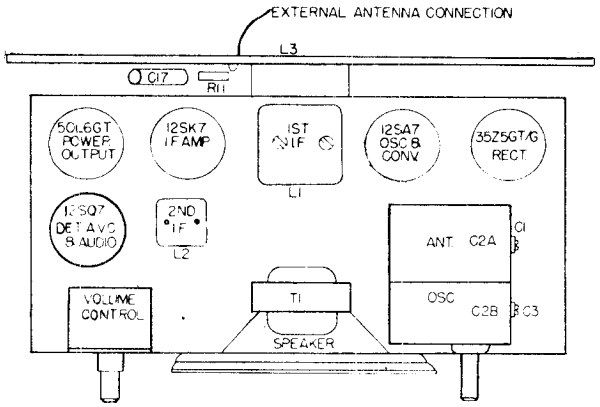
Note: If signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC through the capacitor will introduce hum and/or create the possibility of a burned out signal generator attenuator.

FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNING CONDENSER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
455 KC	0.1 mf	Converter grid	B-	Wide open	2nd IF transformer trimmer 1st IF transformer trimmer
1720 KC	200 mmf	Receiver antenna post	Chassis	Wide open	Oscillator trimmer C3
1500 KC	200 mmf	Receiver antenna post	Chassis	Tune for maximum output	Antenna trimmer C1

MODEL 43-8190



SCHEMATIC DIAGRAM



TUBE AND TRIMMER LOCATION

PARTS DESCRIPTION LIST

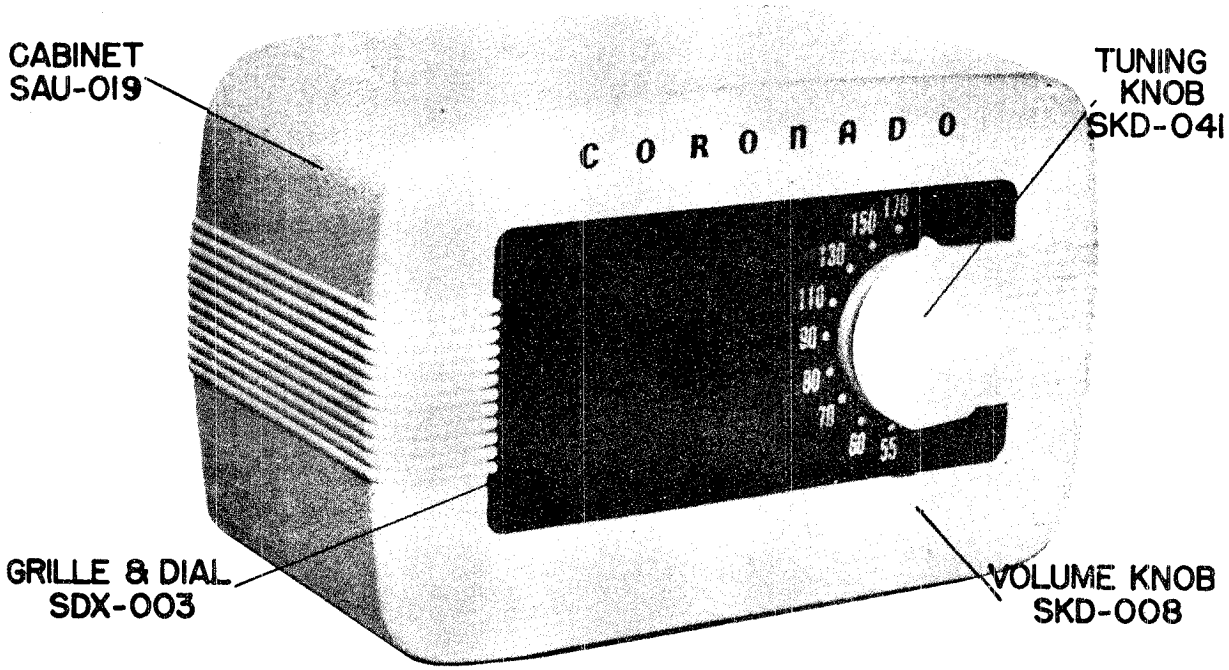
SYMBOL	TITLE	VALUE	RATING	TOLERANCE	PART NO
C1	Antenna trimmer				*
C2A	Variable Condenser ant. section				SCT-013
C2B	Variable Condenser osc. section				SCT-013
C3	Oscilaltor trimmer				*
C8	Mica capacitor	220 mmf	500WVDC	±20%	UCU-036
C9	Paper capacitor	.005mf	600WVDC	+40-15%	UCC-044
C10	Mica capacitor	220 mmf	500WVDC	±20%	UCU-036
C11	Paper capacitor	.01mf	600WVDC	±20%	UCC-040
C12	Paper capacitor	.02mf	600WVDC	±20%	UCC-041
C13A	Electrolytic capacitor	30mf	150WVDC		SCE-026
C13B	Electrolytic capactor	30mf	150WVDC		SCE-026
C14	Paper capacitor	.05mf	600WVDC	±20%	UCC-045
C15	Paper capacitor	.05mf	600WVDC	±20%	UCC-045
C16	Paper capacitor	.05mf	600WVDC	±20%	UCC-045
C17	Paper capacitor	.01 mf	600WVDC	±20%	UCC-040
C19	Paper capacitor	.1mf	600WVDC	+20-10%	UCC-048
C20	Paper capacitor	.02mf	600WVDC	±20%	UCC-041
C21	Paper capacitor	.005mf	600WVDC	+40-15%	UCC-044
R1	Carbon resistor	22,000 ohm	½ W	±20%	URD-081
R2	Carbon resistor	2.2 megohm	½ W	±20%	URD-129
R3	Volume control	0.5 megohm			SRC-070
R4	Carbon resistor	4.7 megohm	½ W	±20%	URD-137
R5	Carbon resistor	470,000 ohm	½ W	±20%	URD-113
R6	Carbon resistor	470,000 ohm	½ W	±20%	URD-113
R7	Carbon resistor	150 ohm	½ W	±20%	URD-029
R8	Carbon resistor	2700 ohm	2 W	±20%	URE-059
R9	Carbon resistor	18 ohm	½ W	±10%	URD-007
R10	Carbon resistor	470,000 ohm	½ W	±10%	URD-113
R11	Carbon resistor	470 ohm	½ W	±20%	URD-041
R12	Carbon resistor	470,000 ohm	½ W	±20%	URD-113
L1	1st IF Transformer				STL-016
L2	2nd IF Transformer				STL-015
L3	Antenna loop				SLL-002
L4	Oscillator coil				SLC-001
S1	Power switch, with R3				SRC-070
I1	Pilot lamp	GE 47	6.8v-.15A		UDL-013
T1	No. P104J58 output transformer				STO-004
SPKR	No. P104J59 speaker				SOP-005
SPKR & T1	Speaker and output transformer assembly for models not covered by previous two listings				SOP-006
	Octal base tube socket				SJS-003

*Part of SCT-013

MODEL 43-8201

SPECIFICATIONS FOR CORONADO RADIO MODEL 43-8201

5 Tube Superheterodyne, including rectifier tube
Speaker ------- 4 inch "Alnico 5" Magnet Dynamic, voice coil impedance 3.5 ohms (400 cycles)
Antenna ---------- external hank antenna
Tuning ---------- Direct drive—2 gang condenser
Power supply ---------- 105 to 125 Volts, AC or DC
Frequency on AC ---------- 40 to 60 cycles
Power Consumption ---------- 28 watts at 117V
Power Output --------- 0.8 w undistorted, 1.5 w minimum full power output
Frequency range ---------- 540 to 1720 KC
Intermediate Frequency ---------- 455 KC
Antenna Sentivity ------- 50 mv. average for 0.5 w output
Selectivity -- 50 KC broad at 1000 times signal at 1000 KC



PARTS DESCRIPTION LIST

SYMBOL	TITLE	VALUE	RATING	TOLERANCE	PART NO.
C1	Paper capacitor	.05mf	600WDVC	+40-10%	UCC-045
C2A	Electrolytic capacitor	40mf	150WVDC	+100-10%	SCE-003
C2B	Electrolytic capacitor	40mf	150WVDC	+100-10%	SCE-003
C3	Paper capacitor	.02mf	600WDVC	+40-10%	UCC-041
C4	Mica capacitor	330mmf	500WVDC	±20%	UCU-1040
C5	Paper capacitor	.01mf	600WDVC	+40-10%	UCC-040
C6	Paper capacitor	.005mf	600WDVC	+40-10%	UCC-039
C7	Mica capacitor	330mmf	500WVDC	±20%	UCU-1040
C8	Mica capacitor	47mmf	500WVDC	±20%	UCU-1020
C9	Antenna Trimmer				*
C10A	Variable condenser, ant. sect.				SCT-003
C10E	Variable condenser, osc. sect.				SCT-003
C11	Oscillator trimmer				*
C12	Paper capacitor	.05mf	600WDVC	+40-10%	UCC-045
C18	Paper capacitor	.05mf	600WDVC	+40-10%	UCC-045
C19	Paper capacitor	.005mf	600WDVC	+40-10%	UCC-039
R1	Carbon resistor	18 ohm	1w	±20%	URE-007
R2	Carbon resistor	150 ohm	2w	±20%	URF-053
R3	Carbon resistor	150 ohm	½w	±20%	URD-029
R4	Carbon resistor	470,000 ohm	½w	±20%	URD-113
R5	Carbon resistor	220,000 ohm	½w	±20%	URD-105
R6	Carbon resistor	10 megohm	½w	±20%	URD-145
R7	Volume control	.5 megohm			SRC-004
R8	Carbon resistor	2.2 megohm	½w	±20%	URD-129
R9	Carbon resistor	22,000 ohm	½w	±20%	URD-081
L2	1st IF transformer				STL-003
L3	2nd IF transformer				STL-004
L4	Oscillator coil				SLC-002
L5	Antenna coil				SLA-001
T1	Output transformer				SOP-001
S1	Power switch, with R7				SRC-004
SPKR	4" PM speaker				SOP-001
	Back Cover for cabinet				SAB-009
	Baffle for speaker				SAE-001
	Socket-octal base tube socket				SJS-002
	Speed nuts—for fastening grill in cabinet				SMC-003
	Fasteners—for fastening back cover				SMF-003

*Part of SCT-003

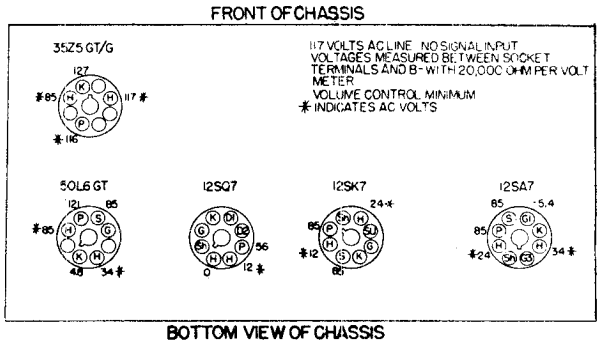
MODEL 43-8201

ALIGNMENT PROCEDURE

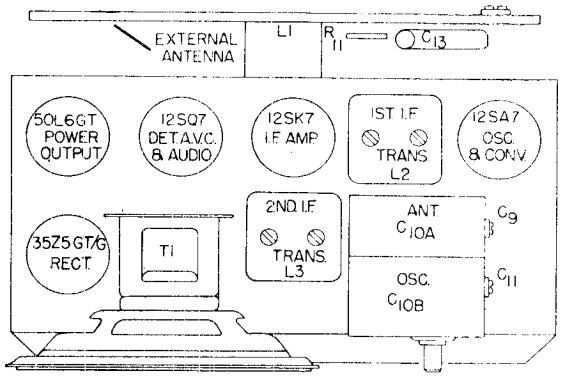
Allow unit to heat for a few minutes before starting alignment.
Volume control set to maximum.
Output meter across speaker.
Align for maximum output.
Keep input as low as a readable meter reading of output will permit.

Note: If signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC through the capacitor will introduce hum and/or create the possibility of a burned out signal generator attenuator.

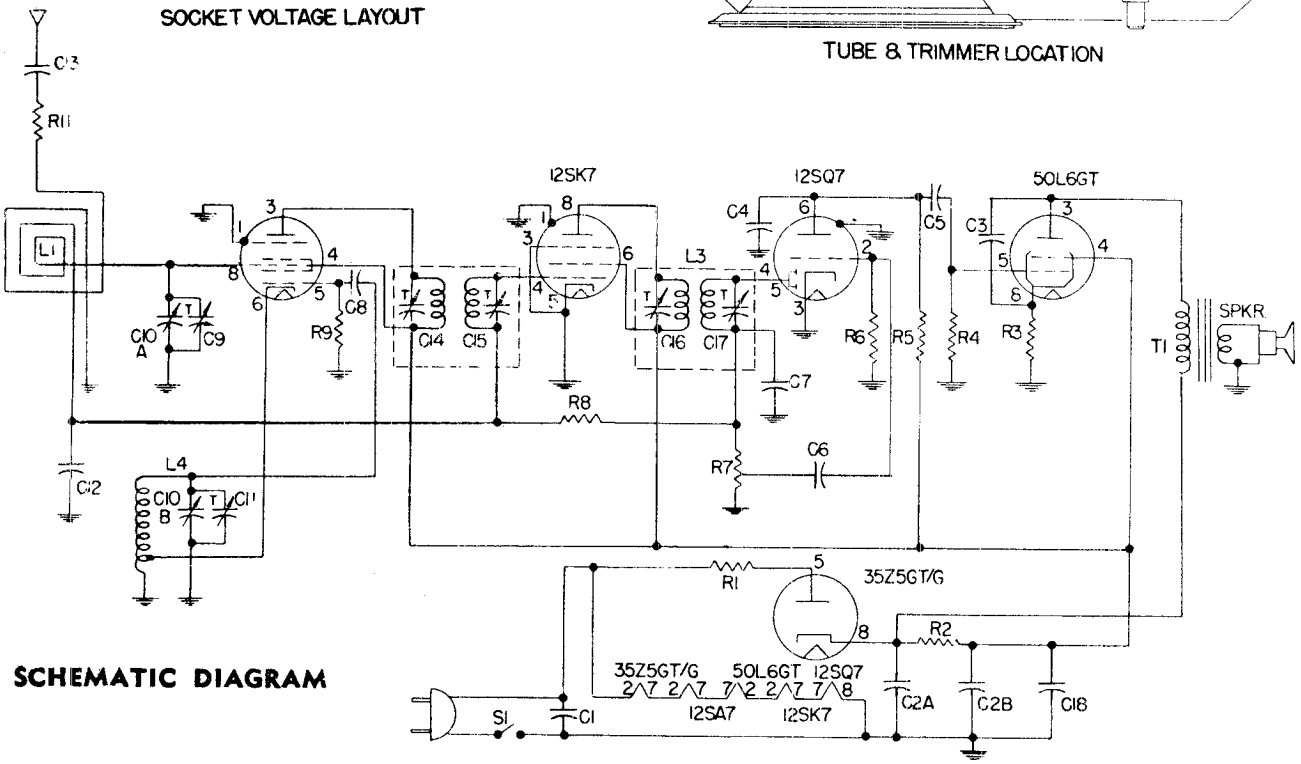
FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	CONNECTION TO RADIO	GROUND CONNECTION	TUNING CONDENSER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
455 KC	0.1 mf	Converter grid	Chassis	Wide open	2nd IF transformer trimmer 1st IF transformer trimmer
1720 KC	200 mmf	Receiver antenna post	Chassis	Wide open	Oscillator trimmer C11
1500 KC	200 mmf	Receiver antenna post	Chassis	Tune for maximum output	Antenna trimmer C9



SOCKET VOLTAGE LAYOUT



TUBE & TRIMMER LOCATION



SCHEMATIC DIAGRAM

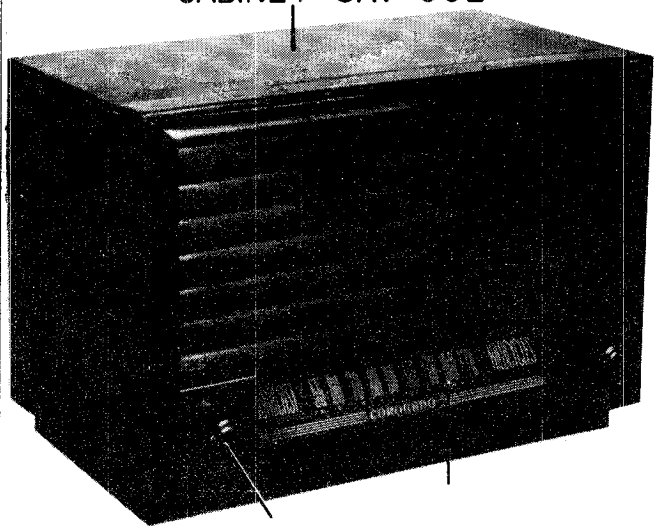
MODELS 43-8330,
43-8420

SPECIFICATIONS

5 Tube Superheterodyne, including rectifier tube
Speaker--5 1/4 inch "Alnico 5" Magnet Dynamic, voice coil impedance 3.5 ohms (400 cycles)
Antenna----Self contained loop antenna, also provision for external antenna
Power supply----------105-125 V. AC or DC
Frequency on AC----------40 to 60 cycles

Power Consumption----------25 watts
Power Output-----0.8 watts undistorted, 1.5 w. minimum full power output
Frequency range----------540 to 1720 KC
Intermediate Frequency----------455 KC
Antenna Sensitivity---170 uv. average for 0.5 w output
Selectivity------60 KC at 1000 times signal at 1000 KC

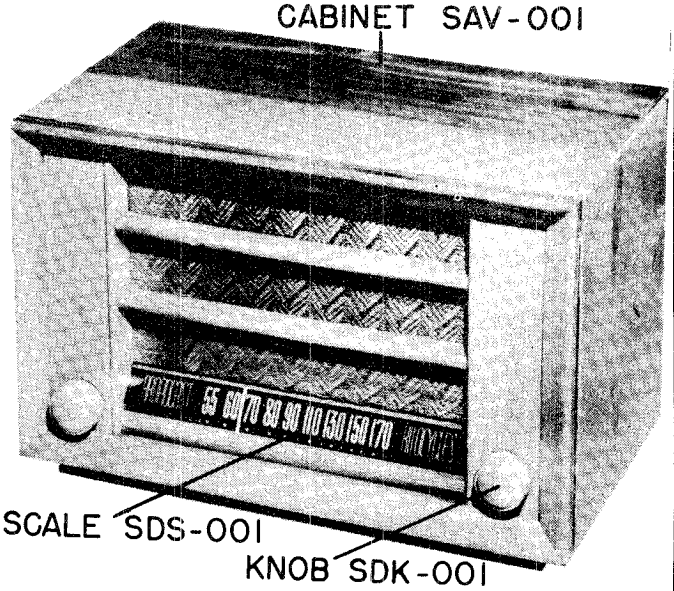
CABINET SAV-002



SCALE SDS-002
KNOB SDK-002

43-8330

CABINET SAV-001



SCALE SDS-001
KNOB SDK-001

43-8420

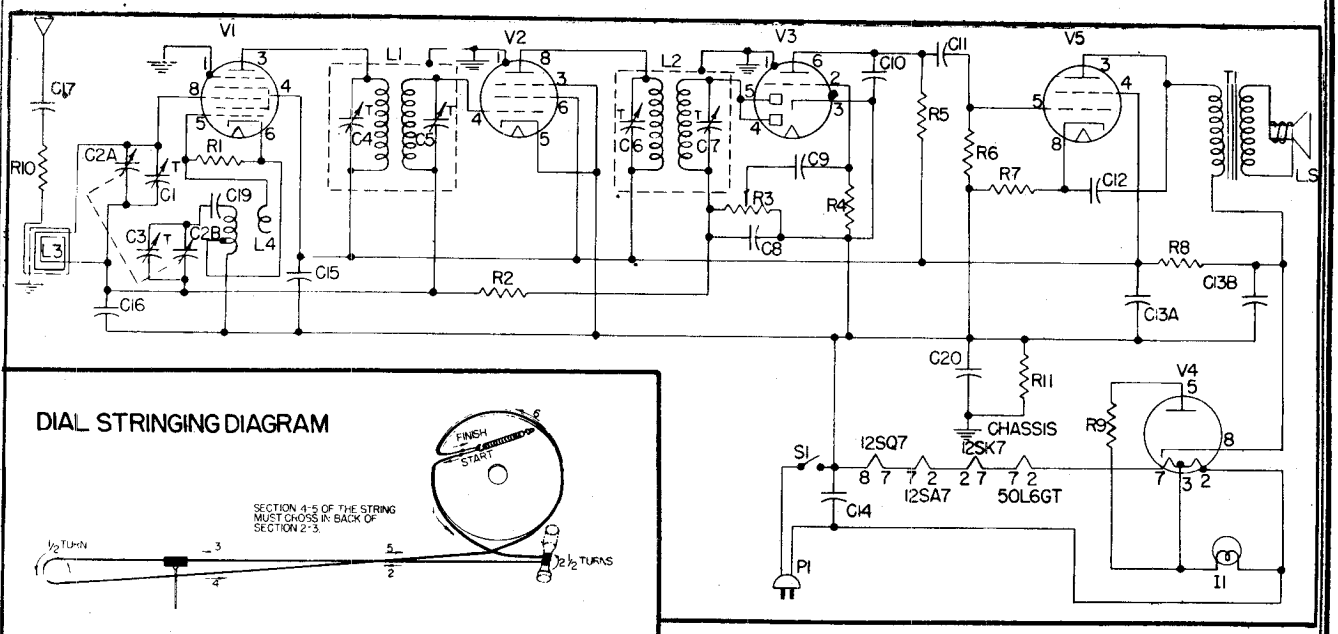
ALIGNMENT PROCEDURE

Allow unit to heat for a few minutes before starting alignment.
Volume control set to maximum.
Output meter across speaker.
Align for maximum output.
Keep input as low as readable meter reading of output will permit.

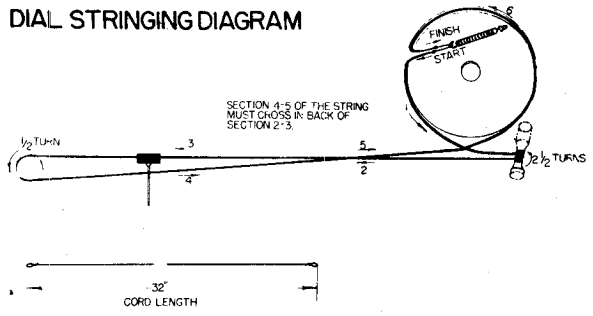
Note: If signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC through the capacitor will introduce hum and/or create the possibility of a burned out signal generator attenuator.

FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNING CONDENSER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
455 KC	0.1 mf	Converter grid	B-	Wide open	2nd IF transformer trimmer 1st IF transformer trimmer
1720 KC	200 mmf	Receiver antenna post	Chassis	Wide open	Oscillator trimmer C3
1500 KC	200 mmf	Receiver antenna post	Chassis	Tune for maximum output	Antenna trimmer C1

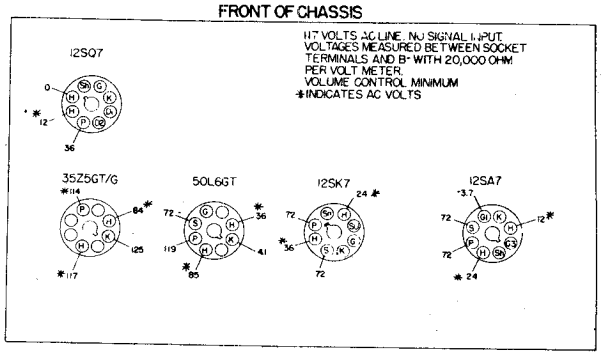
MODELS 43-8330, 43-8420



DIAL STRINGING DIAGRAM

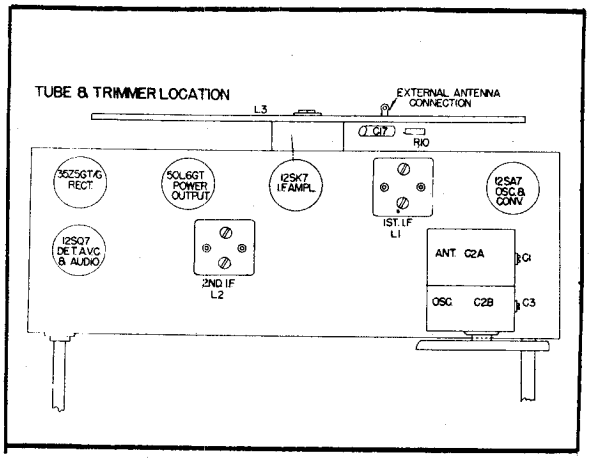


SOCKET VOLTAGE DIAGRAM



SYMBOL	TITLE	VALUE	TOLERANCE	RATING	PART NO.
C1	Ant. Trimmer				SCT-002
C2A	Variable Cond. Ant. Sect.				SCT-002
C2B	Variable Cond. Osc. Sect.				SCT-002
C3	Osc. Trimmer				SCT-002
C4	Trimmer 1st I.F.				STL-007
C5	Trimmer 1st I.F.				STL-007
C6	Trimmer 2nd I.F.				STL-008
C7	Trimmer 2nd I.F.				STL-008
C8	Capacitor, Mica	330 uuf	20%	500 V	UCU-040
C9	Capacitor, Paper	.005 uf	40-15%	600 V	UCC-039
C10	Capacitor, Mica	330 uuf	20%	500 V	UCU-040
C11	Capacitor, Paper	.01 uf	40-10%	400 V	UCC-025
C12	Capacitor, Paper	.02 uf	20%	600 V	UCC-041
C13A	Electrolytic Capacitor	30 uf		150 V	SCE-022
C13B	Electrolytic Capacitor	30 uf		150 V	SCE-022
C14	Capacitor, Paper	.05 uf	20%	600 V	UCC-045
C15	Capacitor, Paper	.05 uf	40-10%	400 V	UCC-028
C16	Capacitor, Paper	.05 uf	40-10%	400 V	UCC-028
C17	Capacitor, Paper	.01 uf	40-10%	400 V	UCC-025
C19	Capacitor, Paper	.02 uf	40-10%	400 V	UCC-026
C20	Capacitor, Paper	.1 uf	40-10%	400 V	UCC-030
R1	Resistor, Carbon	22 Kohm	20%	½W	URD-G81
R2	Resistor, Carbon	2.2 Meg	20%	½W	URD-129
R3	Volume Control	.5 Meg	20%	½W	SRC-003
R4	Resistor, Carbon	4.7 Meg	20%	½W	URD-137
R5	Resistor, Carbon	470 Kohm	20%	½W	URD-113
R6	Resistor, Carbon	470 Kohm	20%	½W	URD-113
R7	Resistor, Carbon	150 Ohm		½W	URD-029
R8	Resistor, Carbon	2700 Ohm	10%	2 W	URF-059
R9	Resistor, Carbon	22 Ohm	20%	½W	URD-009
R10	Resistor, Carbon	470 Ohm	20%	½W	URD-G41
R11	Resistor, Carbon	470 Kohm	20%	½W	URD-113
L1	1st I.F. Transformer				STL-007
L2	2nd I.F. Transformer				STL-006
L3	Loop Assembly				SLL-001
L4	Oscillator Coil				SLC-001
S1	Power Switch				SRC-003
I1	Pilot Light, GE 51				UDL-013
LS	Speaker 5-1/4 Pm				UOP-528
T1	Output Transformer				STO-006
V1	12SA7				
V2	12SK7 Metal Tube				
V3	12SQ7 Metal Tube				
V4	35Z5GT/G				
V5	50L6GT				
	Dial Cord				SDC-001
	Terminal Strip				SJB-014
	Socket-Octal Base Tube Socket				SJS-003
	Drum Spring				SMS-013
	Drive Shaft & Bushing Assembly				SMU-005
	Cabinet Jack				SAB-002
	Tee Pins				SHF-003
	Cabinet Used on Model 43-8420				SAV-001
	Knob Used on Model 43-8420				SDK-001
	Dial Scale Used On Model 43-8420				SDS-001
	Cabinet Used on Model 43-8330				SAV-002
	Knob Used On Model 43-8330				SDK-002
	Dial Scale Used On model 43-8330				SDS-002
	Tuning Condenser				SCT-002
	Dial Pointer				SDP-001
	Output Terminals				SJP-002
	Pilot Light Assembly				SJP-001
	Idler Pulley				SMW-001
	Power Cord				SWL-001

BOTTOM VIEW OF CHASSIS



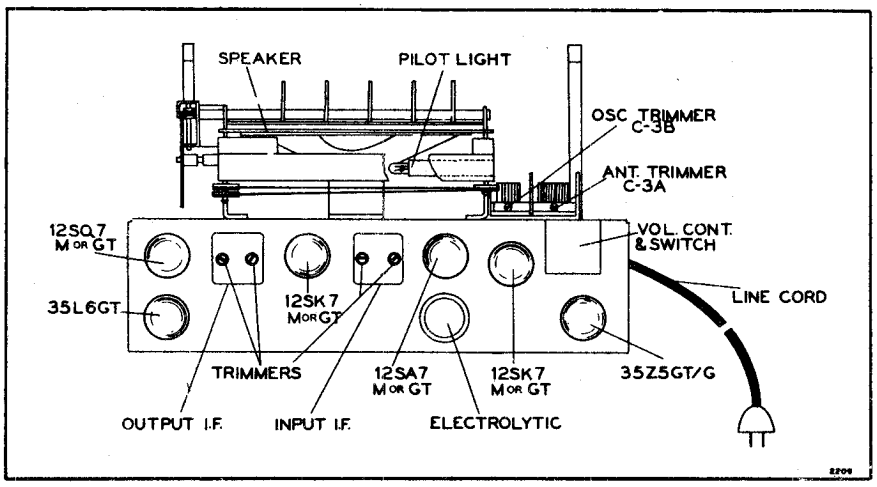
MODELS 43-8353,
43-8354

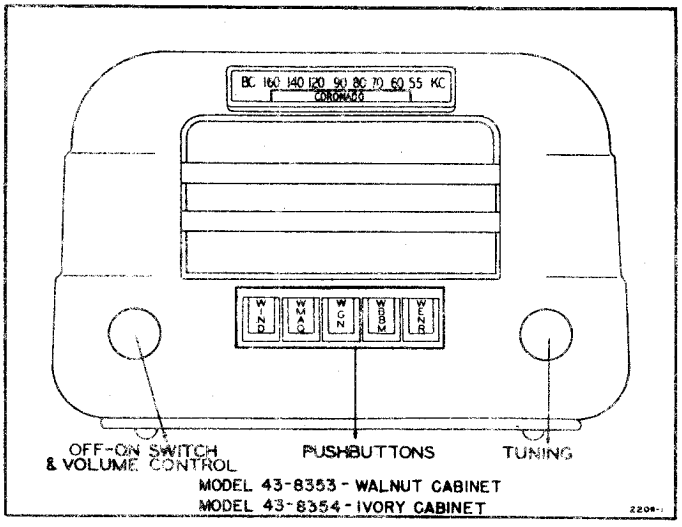
SPECIFICATIONS

6 tube superheterodyne, including rectifier

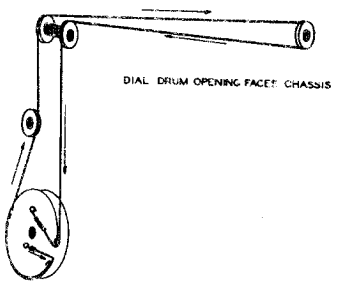
Intermediate Frequency	455KC
Power Output	.65W. undistorted
Frequency Range	530 to 1650 KC
Tuning	two-gang capacitor
Power Supply	105-125 Volts ac/dc
Power Consumption	35W
Speaker	4" by 6" oval P.M. Voice Coil 3.2 ohms
Antenna	Built-in loop, also provision for external antenna

CHASSIS VIEW



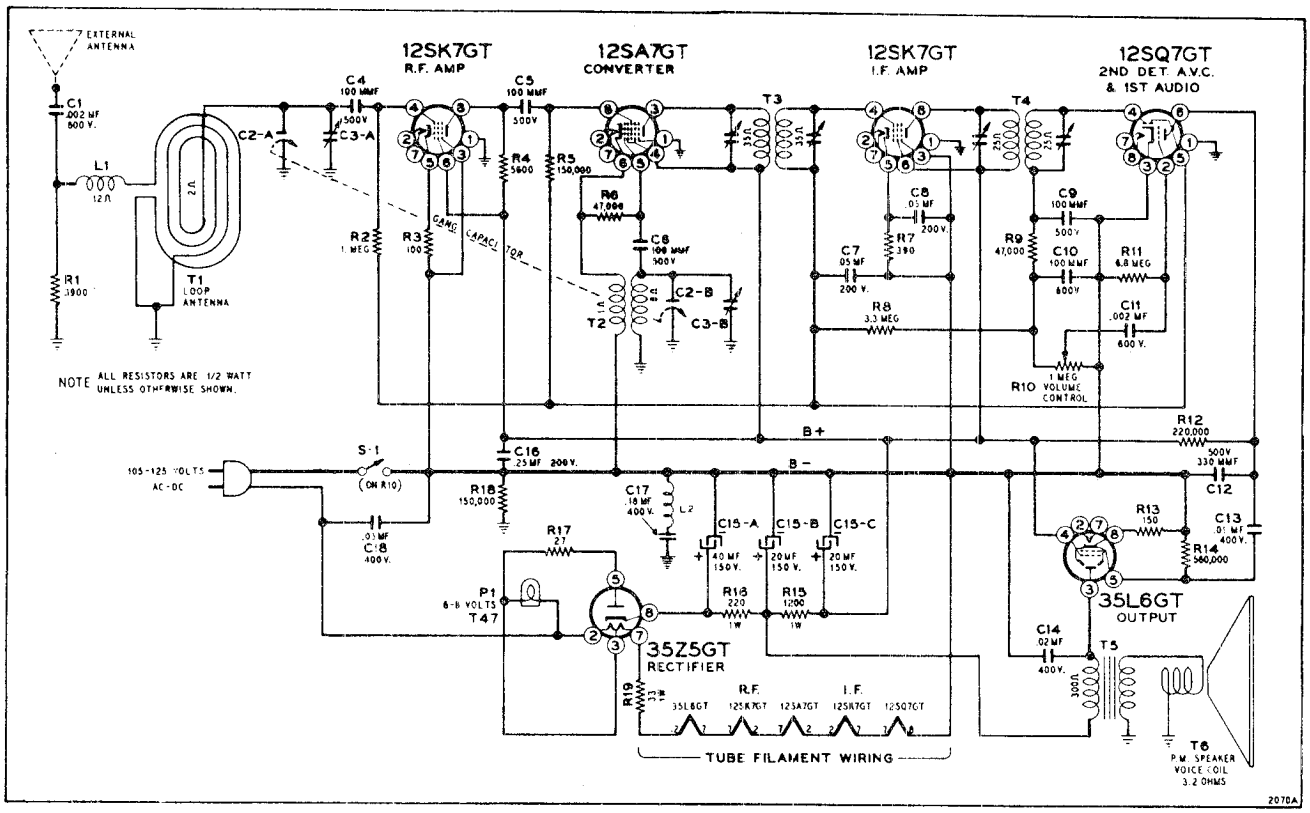


DRIVE CORD REPLACEMENT



MODELS 43-8353, 43-8354

SCHEMATIC DIAGRAM



X-1045 GAMBLES 43-8353, 54

ALIGNMENT PROCEDURE

(Refer to Chassis View)

- Output meter across 3.2-ohm output load.
- Volume control at maximum.
- Connect ground post of signal generator to B— of radio.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR			*TUNER SETTING*	*ADJUST FOR MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*		
455 kc	0.1 mf	Stator of antenna section of gang	Rotor full open (plates out of mesh)	Trimmers on output and input I.F. cans
1650 kc	0.1 mf	Stator of antenna section of gang	Rotor full open (plates out of mesh)	Oscillator trimmer C3B
1400 kc	200 mmf	External antenna clip	1400 kc	Antenna trimmer C3A

PARTS LIST

Ref. No.	Part No.	Description	Qty.
		CONDENSERS	
C2-A,B			
C3-A,B,	B-8A-11136	Two gang Variable Cond.	1
C17	C-8D-11111	Condenser .18 Mf. x400 V. 10%	1
C18	C-8D-10813	Condenser .05 Mfx400 V. 20%	1
C1,11	C-8D-10778	Condenser .002 Mfx600V. 15%	2
C16	C-8D-10775	Condenser .25 Mfx200 V. 20%	1
C14	C-8D-10774	Condenser .02 Mfx400 V. 20%	1
C7,8	C-8D-10770	Condenser .05 Mfx200 V. 20%	2
C13	C-8D-10761	Condenser .01 Mfx400 V. 20%	1
C12	C-8F3-119	Mica Condenser 330 Mmf 10%	1
C4,5,6,9,10	C-8F3-113	Mica Condenser 100 Mmf 500 V. 10%	5
C15-A,B,C,	A-8C-10077	Electrolytic Filter Condenser	1
		RESISTORS	
R10,51	A-10A-11146	Volume Control & Switch	1
R19	C-9B2-44	Resistor 33 ohms 1 watt 10%	1
R6,R9	C-9B1-23	Resistor 47K ohms, ½ watt 20%	2
R5,R18	C-9B1-26	Resistor 150 K ohms, ½ watt 20%	2
R12	C-9B1-27	Resistor 220K ohms ½ watt 20%	1
R2	C-9B1-31	Resistor 1 megohm, ½ watt 20%	1
R8	C-9B1-34	Resistor 3.3 megohm ½ watt 20%	1
R11	C-9B1-36	Resistor 6.8 megohms, ½ watt 20%	1
R17	C-9B1-43	Resistor 27 ohms, ½ watt 10%	1
R3	C-9B1-50	Resistor 100 ohms, ½ watt 10%	1
R13	C-9B1-52	Resistor 150 ohms, ½ watt 10%	1
R7	C-9B1-57	Resistor 390 ohms, ½ watt 10%	1
R1	C-9B1-69	Resistor 3900 ohms, ½ watt 10%	1
R4	C-9B1-71	Resistor 5600 ohms, ½ watt 10%	1
R14	C-9B1-95	Resistor 560K ohms, ½ watt 10%	1
R16	C-932-54	Resistor 220 ohms, 1 watt 10%	1
R15	C-932-63	Resistor 1200 ohms, 1 watt 10%	1
		COILS & TRANSFORMERS	
L1	A-16A-11177	Loop loading coil	1
T1	C-212-11176	Walnut loop antenna assembly	1
T1	C-212-11176-1	Ivory loop antenna assembly	1
T5	B-12C-11203	Output transformer for speaker	1
T2	A-13D-11160	Broadcast osc. coil	1
T3	B-13A-11133	Input I.F. Coil	1
T4	B-13B-11132	Output I.F. coil	1
		SPEAKER	
T6	B18A-11137	Speaker	1

Ref. No.	Part No.	Description	Qty.
		DIAL & TUNING PARTS	
	A-55A-10093-1	Pilot lite socket & bracket	1
	B-2M-7758	Snap in rivets to fasten diffuser	2
	A-31-7192	Pinion gear	
	A-2C-10607	Gear segment with bushing	1
	A-49A-10628	Return spring for levers	1
	A-2C-10654	Retainer yoke	5
	A-2C-10655	Cam yoke	1
	A-3F-10656	Yoke lock screw	1
	A-2C-10658	Cam	1
PI	A-46A-10793	6-8 Volt pilot lite bulb type T-47	5
	A-49A-10887	Tension spring for dial string	1
	A-53-10989	Dial String 3 ft.	1
	B-5B-11131-8	Knob Ivory	3 ft.
	B-5B-11131-37	Knob Walnut	2
	C-6D-11140	Dial Scale	2
	C-5B-11144-8	Pushbutton Ivory	1
	C-5B-11144-37	Pushbutton Walnut	5
	A-3C-11148	Spacer-between cams	5
	A-3C-11149	Spacer between cams	4
	A-2G-11151	Pointer	2
	A-2C-11152	Key Washer	1
	A-3A-11153	Tuning Shaft	11
	A-2L-11162	Lever with cam roller	1
	A-6A-11166	Diffuser	5
	A-6C-11458	Acetate tabe-to cover call letters	1
	A-23L-11459	Set station call letters	1
		MISCELLANEOUS	
	5C-10042-9	Bakelite cabinet-Ivory	
	5C-10042-36	Bakelite cabinet-Walnut	
	B-15B-10076	Socket for electrolytic	
	B-14M-10088	Line cord & plug	1
	A-2M-10096	Stud- to mount antenna to cabinet	
	A-23A-10344	Line cord lock	2
	A-15B-10440	Socket-Eight prong octal	1
	A-2H-10715	Tube shield-for use with metal based 12SA7GT or 12SK7GT	4
	A-25B-10736	Rubber bumpers-for bottom of cabinet	2
	B-23J-11134	Speaker baffle	4
	A-15C-11201	Socket-Eight prong octal laminated	1
	B-2M-11205	Stud-to mount antenna to cabinet	2
	A-2H-11271	Tube shield- use with bakelite based 12SA7GT or 12SK7GT	3
	B-23K-12674	Grille Screen	2
	A-43D-12779	Push on fastener to fasten baffle	1

MODELS 4A-1B, 4A-2B

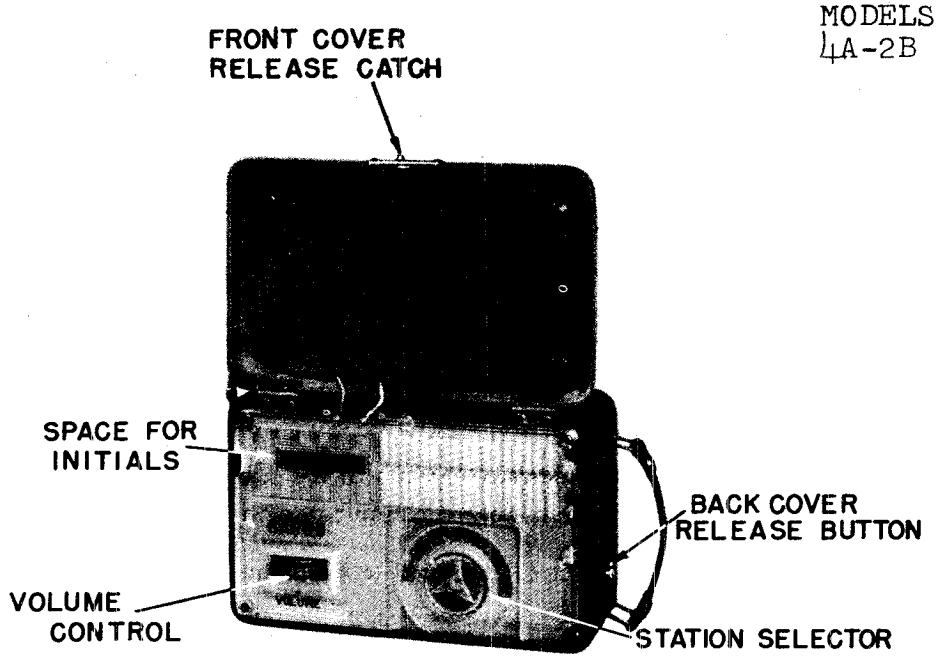


FIG.1 RECEIVER IN OPERATING POSITION

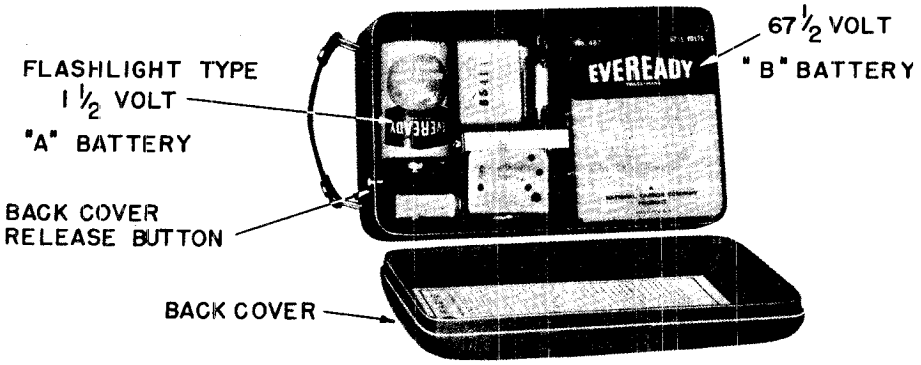


FIG 2 REAR VIEW - BACK COVER REMOVED SHOWING LOCATION OF BATTERIES

BATTERY REQUIREMENTS: The following batteries are required:

QUANTITY	TYPE	MANUFACTURER
1	1½ volt "A"	Eveready size "D", Burgess No. 2, Ray-O-Vac size "D" or equivalent.
1	67½ volt "B"	Eveready #467, Burgess Type XXD, Ray O-Vac Type 4367 or equivalent.

TUNING RANGE: Broadcast 540 to 1650 Kilocycles (180 to 555 meters).

DIAL SCALE: The dial scale is calibrated in kilocycles. Example: Read "60" as 600 Kc.

TUBES: The tubes used and their functions are as follows:

1R5 Converter	1S5 Detector, AVC and Audio Amp.
1T4 I.F. Amplifier	3S4 Power Amplifier

INSTALLATION: The Model 4A is a complete personal receiver for broadcast reception, after battery installation. The complete receiver is housed in a small attractive case with a self-contained loop antenna concealed in the recessed portion of the hinged plastic front cover. A plastic handle located at one end of the case is provided for ease in carrying. The receiver is automatically turned on when the hinged front cover is opened, and in addition is instantaneous in its operation. Space is provided on the plastic front panel for inserting your initials if desired. The following procedure should be followed for the installation of the "A" and "B" batteries (see Fig. 2,

(a) Remove the back cover by depressing the back cover release button adjacent to the handle while sliding the back upward and out.

CAUTION: In removing the back cover, raise the lock end of the back cover only enough to clear the case edge before sliding the cover toward the strap handle to release the opposite end from the two protruding bottom case tabs that hold it down. Failure to observe this precaution may result in breaking out the two bottom holes from the cover.

(b) Insert the 1½ volt "A" battery into the spring holder with the protruding center contact at the top of the "A" battery always facing the position shown on the diagram rear of back cover or Fig. 2, opposite page. Do not insert the "A" battery in the opposite position in the spring holder.

(c) Connect the "B" battery contact strip fitted with snap fasteners to the corresponding contacts on the "B" battery.

(d) Insert the "B" battery into the compartment provided as shown on the diagram rear of back cover or Fig. 2, opposite page.

(e) Replace back cover by inserting the two holes at the bottom edge of the back cover into the two protruding case tabs at the rear edge of the case and slide forward while depressing the back cover release button. The receiver is now ready for operation.

ALIGNMENT: (Receiver removed from cabinet.) Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

(1) Set the signal generator to 455 KC and connect to the stator lug (rear section) of variable capacitor. Extend the loop leads and solder to original points. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the volume control to the maximum position. Turn the variable capacitor to the extreme clockwise position (minimum capacity).

(2) Adjust the trimmers located at the top of the first and second I.F. Transformers for maximum output, as indicated on the output meter.

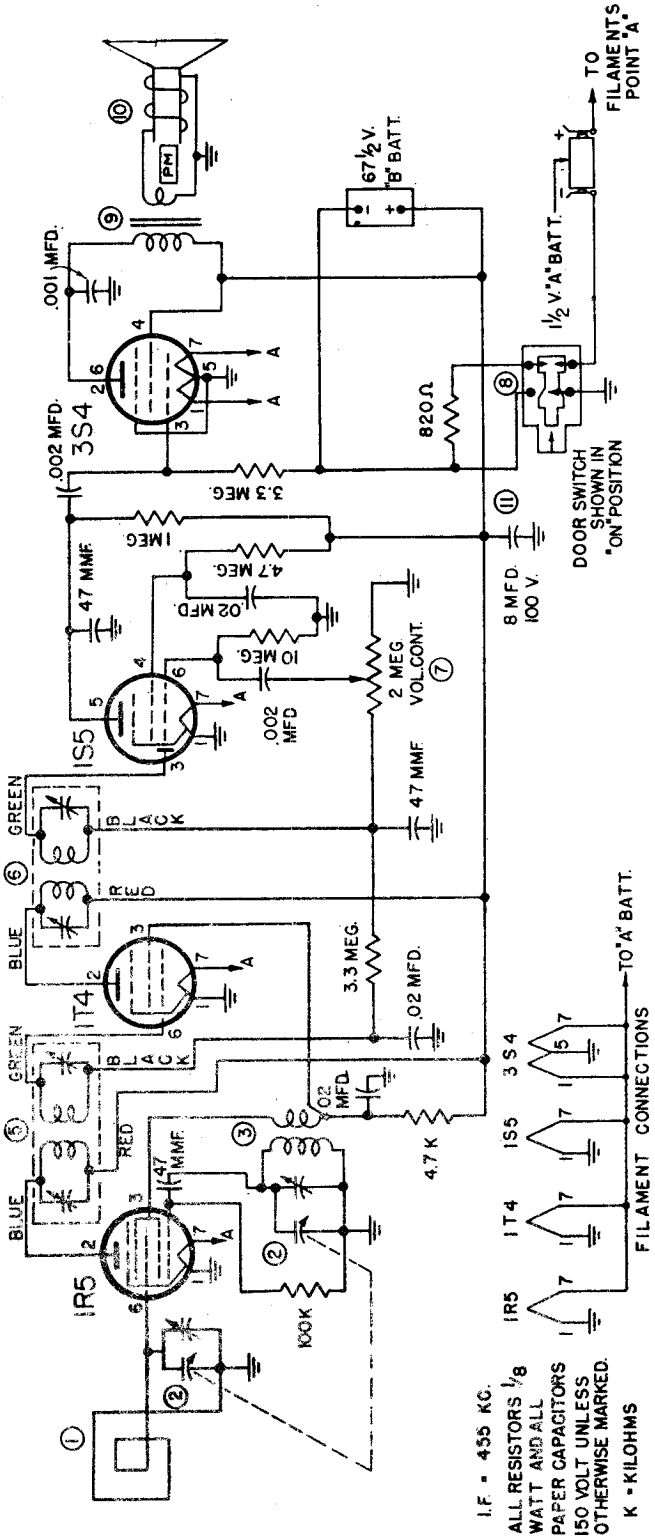
(3) Loosely couple the signal generator lead to the loop and set to 1650 KC.

(4) With the variable capacitor set at minimum capacity, tune in the 1650 KC signal by means of the oscillator trimmer on the variable capacitor (rear section).

(5) Set the signal generator to 1500 KC and turn the tuning control until this frequency is heard. Adjust the antenna trimmer on the variable capacitor (front section) for maximum output.

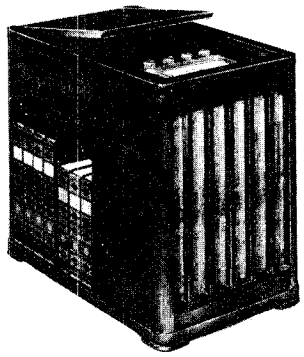
(6) Install the chassis into the cabinet and re-adjust the antenna trimmer at 1500 KC. No other adjustments are necessary.

MODELS 4A-1B, 4A-2B



MODEL 4A SCHEMATIC DIAGRAM AND TUBE LAYOUT

MODEL 6DCP-2,
The Chairside



CONTROLS:

A description of the four controls from left to right on the front panel is given below:

(A) On-Off Switch and Volume Control: This control combines the line On-Off Switch and Volume Control.

(B) Tone Control: When turned to the right (clockwise), a deep bass effect is produced, while rotation to the left (counter-clockwise) produces a more brilliant tone. Various shadings between the extremes may be obtained at intermediate settings of the control.

(C) Band Selector Switch: This three-position control selects the frequency band to be used, and also connects the "Phono" pickup into the circuit for use of the record changer. The extreme left hand position is the "Broadcast" band, the middle position the "Short Wave" band, and the extreme right hand position is the "Phono" position.

(D) Tuning Control: This control is coupled to the tuning capacitor through a reduction drive and serves to select the desired broadcast or short wave station along the slide-rule dial, the frequency of which is indicated by the dial pointer.

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION INCLUDING RECORD CHANGER: 85 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 Meters)

Short Wave: 5.7 to 18.5 Megacycles (16 to 53 Meters)

DIAL: The dial scale is calibrated in Kilocycles times 10 for the Broadcast Band, and in Megacycles for the Short Wave Band, corresponding with newspaper or periodical listings.

TUBES: The tubes used, and their functions, are as follows:

6SG7 R. F. Amplifier
6SA7 Converter
6SK7 I. F. Amplifier
6SQ7 Detector, Avc and Audio Amplifier
6V6 Beam Power Amplifier
5Y3GT Rectifier

ALIGNMENT:

Realignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator, which will cover the necessary bands, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure, all adjustments should be made under the following conditions (refer to Trimmer and Tube Location Diagram below for trimmer location):

(a) Line voltage as indicated on instruction sheet.

(b) Volume Control at maximum position.

(c) Tone Control at extreme left position (brilliant).

(d) Minimum input from signal generator. This procedure should be adhered to, otherwise adjustments will be broad, due to the action of the automatic volume control.

BROADCAST *(Band Switch in extreme left position)*

I. F. Adjustment:

(1) Set the signal generator to 455 KC and connect to the lower side of the Loop Antenna Trimmer through a .1 MFD capacitor. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the Variable Capacitor to the extreme clockwise position (minimum capacity).

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the output meter.

BC. R. F. Adjustment: It is desirable to align this band on the loop.

(1) Couple the signal generator to the receiver loop by means of a two or three turn loop.

(2) With the Variable Capacitor set at the extreme clockwise position (minimum capacity), tune in the 1650 KC signal by means of the broadcast oscillator trimmer (C2).

(3) Set the signal generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer (C1) on the loop for maximum output.

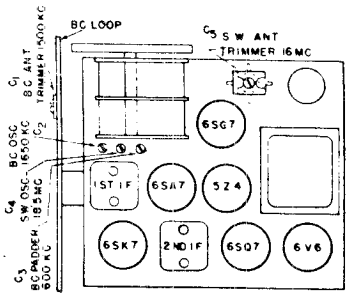
(4) Set the signal generator to 600 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the broadcast oscillator padder capacitor (C3) for maximum response while "rocking" the Variable Capacitor. Recheck the 1500 KC high frequency adjustment trimmer (C2).

SHORT WAVE *(Band Switch in the middle position)*

(1) Connect the signal generator through a standard short wave dummy antenna to the antenna (green wire) and the ground lead to the chassis of the receiver. Set the signal generator to 18.5 MC.

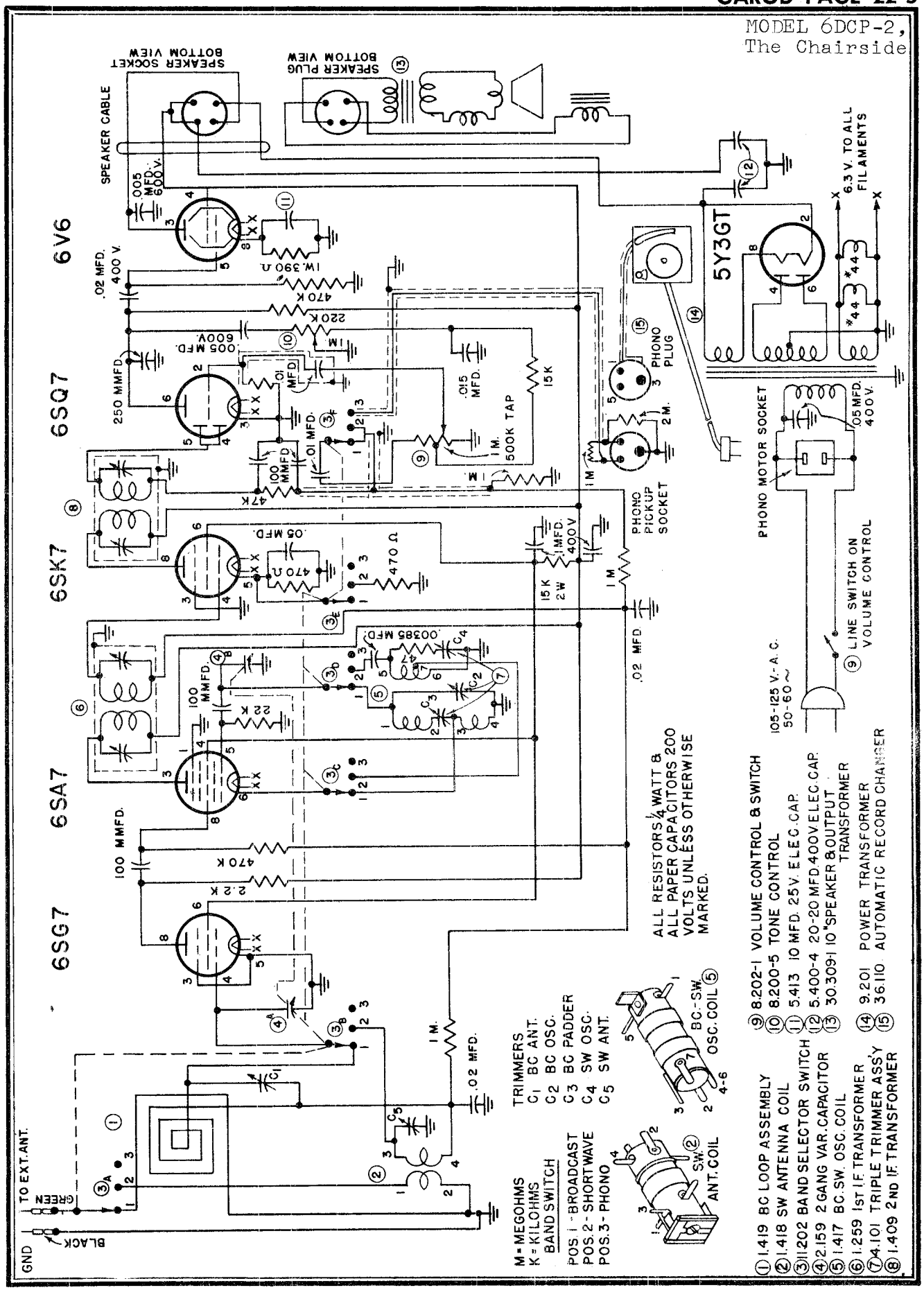
(2) With the Variable Capacitor set at the extreme clockwise position (minimum capacity), tune in the 18.5 MC signal by means of the S. W. oscillator trimmer (C4).

(3) Set the signal generator to 16 MC and turn the tuning control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer (C5) on the short wave coil for maximum output while rocking the Variable Capacitor from left to right for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM

NOTE : The receiver chassis is assembled to a shelf and may be removed for servicing purposes by removing the knobs and four screws. Two screws and washers are located on the inside panel of the record changer compartment. The two other screws and washers are located on the same panel below the changer compartment. Reverse the above procedure for installation to cabinet and reconnect changer cables to chassis sockets.


MODEL 6DCP-2,
The Chairside
6V6
6SQ7
6SK7
6SA7
6SG7
5Y3GT
SPEAKER CABLE
SPEAKER SOCKET BOTTOM VIEW
SPEAKER PLUG BOTTOM VIEW
PHONO PLUG
PHONO PICKUP SOCKET
PHONO MOTOR SOCKET
6.3 V. TO ALL FILAMENTS
LINE SWITCH ON VOLUME CONTROL
105-125 V. A. C. 50-60 ~
TO EXT. ANT.
GND
GREEN
BLACK
ALL RESISTORS ½ WATT & ALL PAPER CAPACITORS 200 VOLTS UNLESS OTHERWISE MARKED.
M = MEGOHMS
K = KILOHMS
BAND SWITCH
POS. 1 - BROADCAST
POS. 2 - SHORTWAVE
POS. 3 - PHONO
TRIMMERS
C1 BC ANT.
C2 BC OSC.
C3 BC PADDER
C4 SW OSC.
C5 SW ANT.
BC.-SW. OSC. COIL
SW. ANT. COIL
① 1.419 BC LOOP ASSEMBLY
② 1.418 SW ANTENNA COIL
③ 11.202 BAND SELECTOR SWITCH
④ 2.159 2 GANG VAR. CAPACITOR
⑤ 1.417 BC. SW. OSC. COIL
⑥ 1.259 1ST I.F. TRANSFORMER
⑦ 4.101 TRIPLE TRIMMER ASS'Y
⑧ 1.409 2ND I.F. TRANSFORMER
⑨ 8.202-1 VOLUME CONTROL & SWITCH
⑩ 8.200-5 TONE CONTROL
⑪ 5.413 10 MFD. 25 V. ELEC. CAP.
⑫ 5.400-4 20-20 MFD. 400 V. ELEC. CAP.
⑬ 30.309-1 10" SPEAKER & OUTPUT TRANSFORMER
⑭ 9.201 POWER TRANSFORMER
⑮ 36.110 AUTOMATIC RECORD CHANGER

MODELS 414, 415, 416, 430,

SPECIFICATIONS

CABINET:

MODEL	MATERIAL	COLOR
414	Plastic	Mahogany
415	Plastic	Ivory
416	Plastic	Maroon
430	Wood	Mahogany

ELECTRICAL RATING: Voltage..105-125, 50-60 cycles or DC
Watts..... 26

OPERATING FREQUENCIES: Standard Wave Band..... 540-1600 KC
I-F Amplifier..... 455 KC

POWER OUTPUT: Undistorted..... 1 watt
Maximum..... 1.75 watts

LOUDSPEAKER: Type..... Alnico PM
Outside Cone Diameter..... 4 inches
Voice Coil Impedance @ 400 cycles..... 3.2 ohms

TUBE COMPLEMENT:
V1 Oscillator-Converter..... 12SA7
V2 I-F Amplifier..... 12BA6
V3 Detector-Audio..... 12SQ7
V4 Rectifier..... 35W4
V5 Audio Power Amplifier.... 50C5
I1 Dial Light..... GE Mazda No. 47

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, 1 1/2 volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment points are shown in the illustration of Fig. 1.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.
2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers, to prevent short circuiting of equipment and shock hazard.
3. The output meter is connected across the terminals of the loudspeaker voice coil.
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1 1/4 volts output meter reading at the loudspeaker.
5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver B- Bus.
6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the generator's output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.
7. Relocate dial pointer on tuning shaft at 1500 KC on the dial to correspond to the tuning capacitor setting in Step 5.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Radio Dial Setting	Adjust for Maximum
	I-F ALIGNMENT			
1	V2,12BA6 grid (Pin 1), in series with .05 mfd.	455 KC	.....	Cores of second i-f transformer T3
2	V1,12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	Cores of first i-f transformer T2
3	V1,12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	Recheck adjustment of T1 and T2, for maximum
	R-F ALIGNMENT			
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C2A,C2B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	For Maximum	C1, r-f trimmer
6	Set pointer to 150. See Note 7.			

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring device may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings are taken with low signal input so that AVC is not effective.

1. I-F GAIN
12SA7 Grid to 12BA6 Grid 50 @ 455 KC
12BA6 Grid to 12SQ7 Diode Plate 100 @ 455 KC

2. AUDIO GAIN
Input of 0.15 volts at 400 cycles across volume control (R4) with control set at maximum will develop approximately 1/2 watt output across the speaker voice coil terminals.

3. OSCILLATOR GRID BIAS
D-C voltage developed across the oscillator grid leak (R1) averages 7.5 volts at 1000 kc dial setting (no signal).

4. TUBE SOCKET PIN VOLTAGES
The schematic diagram of Fig. 3 shows voltages from tube pins to B-. Voltage readings differing greatly from those specified may help localize defective components

MODELS 414,
415, 416, 430

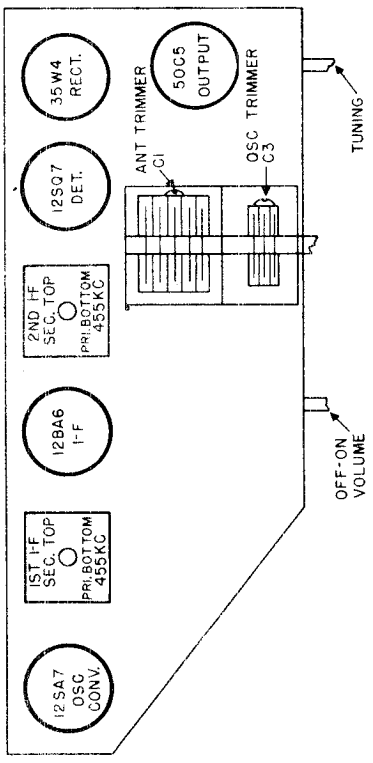


FIG. 1. LOCATION OF TUBES AND ADJUSTMENTS

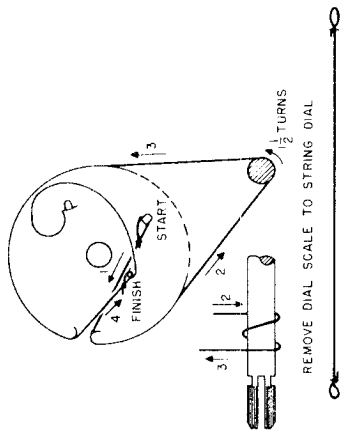
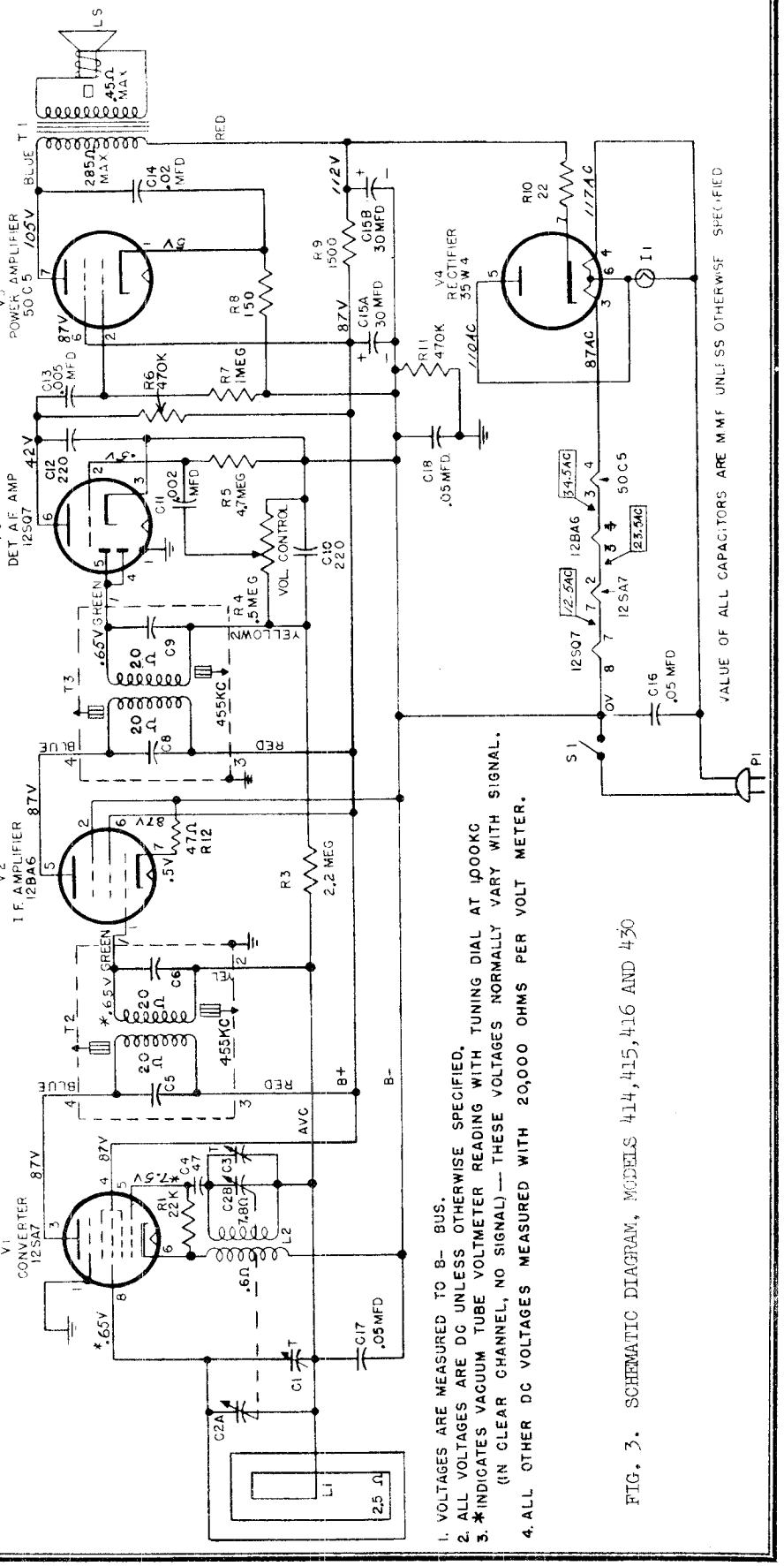


FIG. 2 DIAL CORDING DIAGRAM



1. VOLTAGES ARE MEASURED TO B- BUS.
2. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
3. * INDICATES VACUUM TUBE VOLTMETER READING WITH TUNING DIAL AT 1000KC (IN CLEAR CHANNEL, NO SIGNAL) — THESE VOLTAGES NORMALLY VARY WITH SIGNAL.
4. ALL OTHER DC VOLTAGES MEASURED WITH 20,000 OHMS PER VOLT METER.

VALUE OF ALL CAPACITORS ARE MMF UNLESS OTHERWISE SPECIFIED

FIG. 3. SCHEMATIC DIAGRAM, MODELS 414, 415, 416 AND 430

MODELS 414, 415, 416, 430

REPLACEMENT PARTS LIST
MODELS 414,415,416 and 430

Cat. No.	Symbol	Description
CAPACITORS		
*RCE-127	C15A,B	30 mf., 150 v.; 30 mf. 150 v., electrolytic
RCT-058	C2A,B, C1,C3	Tuning capacitor with trimmers
*RCW-3025	C10,11, 12,13	220 mmf., .002 mf., 220 mmf., .005 mf., 450 v., ceramic
*UCU-020	C4	47 mmf., ceramic
*UCC-041	C14	.02 mf., 600 v., paper
*UCC-045	C16,17, 18	.05 mf., 600 v., paper
RESISTORS (carbon)		
*URD-009	R10	22 ohms, 1/2 w.
*URD-017	R12	47 ohms, 1/2 w.
*URD-029	R8	150 ohms, 1/2 w.
*URD-081	R1	22,000 ohms, 1/2 w.
*URD-113	R6,11	470,000 ohms, 1/2 w.
*URD-121	R7	1 meg., 1/2 w.
*URD-129	R3	2.2 meg., 1/2 w.
*URD-137	R5	4.7 meg., 1/2 w.
*URF-053	R9	1500 ohms, 2 w.
POTENTIOMETER		
RRC-172	R4,S1	500,000 ohms, composition, volume control and ON-OFF switch
COILS AND TRANSFORMERS		
*RLC-090	L2	COIL - Oscillator coil for V1
*RTL-133	T2,C5, C6,T3, C8,C9	TRANSFORMER - 1st or 2nd i-f, with tuning cores (capacitors are part of molded base assembly)
*RTO-069	T1	TRANSFORMER - Audio output
MISCELLANEOUS ELECTRICAL		
*RJS-003		SOCKET - 8-pin wafer, 1 3/8 in. hole mount spacing, for 12SA7 or 12SQ7
RJS-092		SOCKET - 7-pin wafer 1 1/4 in. hole mount spacing for 35W4 or 50C5 tubes
*RJS-141		SOCKET - 8-pin wafer 1 3/8 in. hole mount spacing for 12BA6 tube
RWL-009	P1	POWER CORD - A-C power cord and plug (brown) for Models 414,416,430
*RWL-016	P1	POWER CORD - A-C power cord & plug (white) for Model 415
*RWX-040		SOCKET - Dial light socket with leads
*S403D7	LS1	LOUDSPEAKER - 4 inch PM
MISCELLANEOUS MECHANICAL		
RDC-032		CORD - Dial cord, bulk quantity 25 yds.
RDP-063		DIAL POINTER - Plastic pointer may be furnished in lieu of brass
RDS-109		DIAL SCALE - Plastic dial plate, gold finish, translucent numerals
*RHC-024		CLIP - 7/8 inch, mounts C15A, B

Cat. No.	Symbol	Description
MISCELLANEOUS MECHANICAL (cont'd)		
*RHC-034		CLIP - For mounting I-F can assembly to chassis
RHG-006		GROMMET - For 110 v. line cord, in back apron of chassis
*RHG-018		GROMMET - Rubber, for mounting tuning capacitor
*RHH-004		FASTNER - Snap fastner for Models 414, 415, or 416, holds cabinet back to cabinet
*RHJ-007		SPACER - Metal, in grommet mounting tuning capacitor
RHS-004		SCREW - #4 x 1/4 in. stove head shake-proof type #25, mounts speaker in Models 414, 415 or 416 cabinet
*RJC-004		CLIP - Female speaker connector on audio output leads
*RMC-002		CLIP - Osc. coil mounting clip, United carr #521D7
RMS-118		SPRING - Dial cord tension spring
RMS-214		CLIP - Metal clip used on plastic dial
RMX-195		SHAFT - Tuning shaft and bushing assembly
CABINETS AND CABINET PARTS		
RAB-172	L1	CABINET BACK - Antenna loop on cabinet back cover.
*RAG-033		GRILLE CLOTH - Maroon, behind speaker grille, in Model 414 or 416 cabinet
*RAG-034		GRILLE CLOTH - Ivory, behind speaker grille on Model 415 cabinet
RAU-350		CABINET - Plastic, Ivory, for Model 415
RAU-351		CABINET - Plastic, Maroon, for Model 416
RAU-352		CABINET - Plastic, Mahogany, for Model 414
RAV-177		CABINET - Wood, Mahogany for Model 430
*RDK-003		KNOB - Plastic, two tone fawn and gold leaf finish, volume or tuning for Model 430
RDK-260		KNOB - Plastic, fawn color, volume or tuning for Model 414, 415 or 416
RDW-052		DIAL WINDOW - Formed plastic with mounting tabs for Models 414, 415 or 416
RDW-053		DIAL WINDOW - 6 9/32" x 3 3/4" glass for Model 430
*RHF-008		FOOT - Cabinet foot rest, 1/2 inch, metal and felt composition, for Model 430

*Parts used on previous receivers

MODELS 422, 423

SPECIFICATIONS

CABINET:	Model 422.....Mahogany plastic Model 423.....Ivory plastic
POWER SUPPLY:	Voltage.....105-120 volts a-c or d-c Frequency.....50 or 60 cycles Wattage..... 30 watts
OPERATING FREQUENCIES:	Broadcast Band.....540-1600 KC I.F. Amplifier.....455 KC
POWER OUTPUT:	Undistorted.....1 watt Maximum..... 1.75 watts
LOUDSPEAKER:	Type.....Alnico 5 PM Outside cone Diameter... 5 1/4 inches Voice coil impedance at 400 cycles..... 3.2 ohms

TUBE COMPLEMENT:

SYMBOL	PURPOSE	TYPE
V1	RF Amplifier	12SK7
V2	Oscillator Converter	12SA7
V3	IF Amplifier	12BA6
V4	Detector-Audio Ampl.	12SQ7
V5	Rectifier	35Z5
V6	Audio Power Ampl.	35L6GT
I1	Pilot Lamp	GE Mazda No. 47

GENERAL INFORMATION

The Models 422 or 423 is a five-tube (plus rectifier tube) a-c or d-c superheterodyne AM standard broadcast receiver equipped with an efficient built-in antenna loop and incorporating automatic volume control, a permanent magnet speaker, and beam power output.

CAUTION: USE ISOLATION TRANSFORMER TO ISOLATE THE RECEIVER FROM THE POWER LINE.

ELECTRICAL CIRCUIT ALIGNMENT

Equipment required:

1. Test oscillator with tone modulation.
2. AC voltmeter, 1 1/2 volts full scale.
3. Paper capacitor, 0.05 mf.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation transformer.

Alignment Procedure:

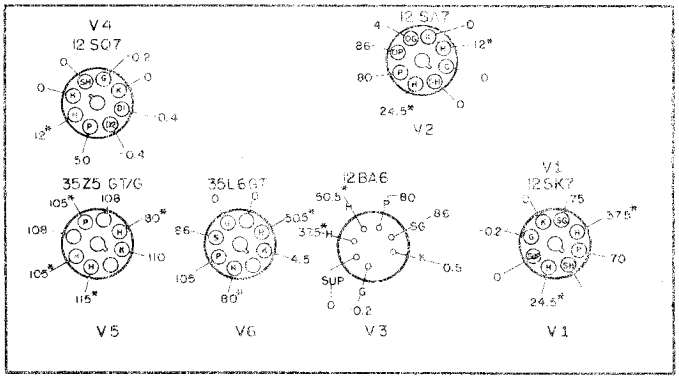
The alignment steps are given in table form of Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 3.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.
2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers to prevent short circuiting of equipment and shock hazard.
3. The output meter is connected across the terminals of the loudspeaker voice coil.
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1 1/4 volts output meter reading at the loudspeaker.
5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.
6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
	I-F ALIGNMENT			
1	V3, 12BA6 grid (Pin 1), in series with 0.5 mfd.	455 KC	.....	C9 and C8 of second i-f transformer T3.
2	V2, 12SA7 grid (Pin 8) in series with .05 mfd.		.....	C7 and C6 of first i-f transformer, T2.
3			.....	Recheck adjustment of C9, C8, C7, C6, for maximum
	R-F ALIGNMENT			
4	Inductively coupled to radio loop.	1620 KC	Minimum capacity C1A, C1B	C3, oscillator trimmer
5		1500 KC	Tune for Maximum	C1, r-f trimmer C2, ant. trimmer

FRONT OF CHASSIS



117 VOLTS AC LINE, NO SIGNAL INPUT.
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B WITH 20,000 OHMS PER VOLT METER. VOLUME CONTROL MINIMUM.
* INDICATES DC VOLTS.

BOTTOM VIEW OF CHASSIS

FIG. 2. SOCKET VOLTAGE DIAGRAM

MODELS 422, 423

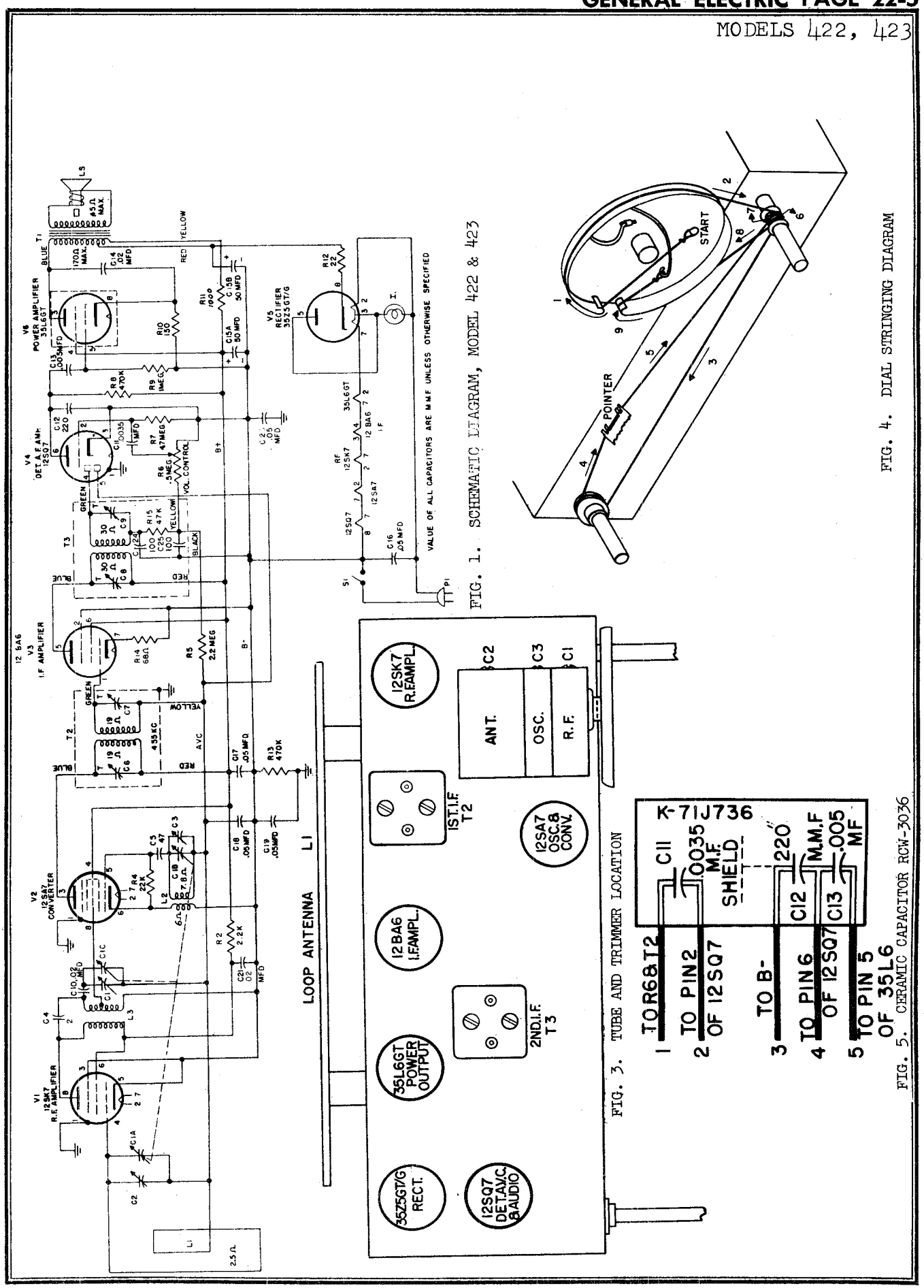


FIG. 1. SCHEMATIC DIAGRAM, MODEL 422 & 423

FIG. 4. DIAL STRINGING DIAGRAM

FIG. 3. TUBE AND TRIMMER LOCATION

FIG. 5. CERAMIC CAPACITOR RCW-3036

MODELS 422, 423

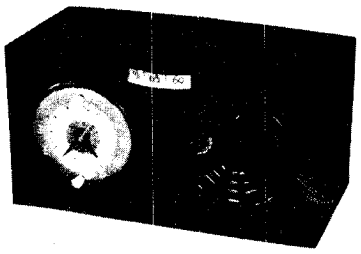
MODELS 422 AND 423 REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION
		CAPACITORS
RCE-050*	C15A,B	50 mf., 150 v., 50 mf., 150 v.; dry electrolytic
RCN-039*	C4	2 mmf., mica
RCT-046*	C1A,B,C, C2,C3	Tuning capacitor with trimmers
RCW-3036*	C11,C12, C13	.0035 mf., 220 mmf., .005 mf., three section ceramic (see UCC-037, UCC-039, UCU-1036)
UCC-037*	C11	.003 mf., 600 v., paper (alternate replacement for RCW-3036)
UCC-039*	C13	.005 mf., 600 v., paper (alternate replacement for RCW-3036)
UCC-041*	C14,C21	.02 mf., 600 v., paper
UCC-045*	C16,C17, C18, C19,C20	.05 mf., 600 v., paper
UCU-020*	C5	47 mmf., mica
UCU-1036*	C10,C12	220 mmf., mica (alternate replacement for RCW-3036)
		RESISTORS & POTENTIOMETER
RRC-149*	R6,S1	POTENTIOMETER - 500,000 ohms; volume control and switch S1
URD-009*	R12	RESISTOR - 22 ohms, 1/2 w., carbon
URD-021*	R14	RESISTOR - 68 ohms, 1/2 w., carbon
URD-029*	R10	RESISTOR - 150 ohms, 1/2 w., carbon
URD-057*	R2	RESISTOR - 2.2 K ohms, 1/2 w., carbon
URD-081*	R4	RESISTOR - 22,000 ohms, 1/2 w., carbon
URD-113*	R8,R13	RESISTOR - 470,000 ohms, 1/2 w., carbon
URD-121*	R9	RESISTOR - 1 meg., 1/2 w., carbon
URD-129*	R5	RESISTOR - 2.2 meg., 1/2 w., carbon
URD-137*	R7	RESISTOR - 4.7 meg., 1/2 w., carbon
URF-049*	R11	RESISTOR - 1000 ohms, 2 w., carbon
		COILS & TRANSFORMERS
RLC-105*	L2	COIL - Oscillator
RLI-125*	L3	COIL - R-F
RTL-115*	T2	TRANSF. - First I-F
RTL-116*	T3	TRANSF. - Second I-F
RTO-083*	T1	TRANSF. - Audio output
		MISCELLANEOUS ELECTRICAL
RJS-003*		SOCKET - Tube socket
RJS-141*		SOCKET - Tube, for 12BA6
ROP-020*		SPEAKER - PM, 5 1/4"

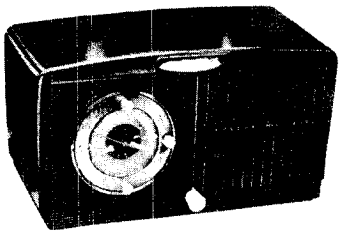
CAT. NO.	SYMBOL	DESCRIPTION
		MISCELLANEOUS ELECTRICAL
RWL-009		POWER CORD - A-C power cord and plug
RWL-016*		POWER CORD - Model 423
RWX-043		ASSEMBLY - Pilot light socket
		MISCELLANEOUS MECHANICAL
RDC-032*		CORD - Bulk dial cord
RDP-064		POINTER - Dial scale
RHC-018		CLIP - Loop clip
RHC-024*		CLIP - Capacitor clip
RHC-038*		CLIP - For R-F coil
RHG-006*		GROMMET - On tuning shaft
RHG-018*		GROMMET - Cushion mounting for tuning capacitor
RHG-032*		GROMMET - Speaker lead ins.
RHI-017*		STRAIN RELIEF
RHJ-007*		SPACER - Spacer bushing for mounting tuning capacitor
RHR-010*		RIVET-For terminal board
RHR-013*		RIVET - For output transf.
RHS-061*		SCREW - For loop back mounting
RHS-062*		SCREW - For chassis mounting
RHS-063		SCREW - For tuning capacitor mounting
RJC-004*		CONNECTOR - Antenna loop lead connecting clip
RMC-002*		CLIP - For oscil. coil
RMM-035*		SHIELD - Tube shield
RMM-200*		HOOD - Pilot light hood
RMS-118*		SPRING - Dial cord tension spring
RMW-070*		PULLEY - Idler pulley
RMX-196		SHAFT AND BUSHING - Tuning shaft and mounting bushing, late prod.
RMX-200		DRIVE SHAFT AND BUSHING ASSEMBLY, early prod.
		CABINET & CABINET PARTS
RAB-142*	L1	CABINET BACK - With antenna loop
RAG-038*		ASSEMBLY - Grill cloth assembly, Model 422
RAG-039*		ASSEMBLY - Grill cloth assembly, Model 423
RAU-353		CABINET - Mahogany cabinet (plastic) for Model 422
RAU-354		CABINET - Ivory cabinet (plastic), for Model 423
RDE-124		ESCUTCHEON - Dial esc.
RDS-110		SCALE - Dial scale
RDK-181*		KNOB - For Model 422
RDK-229*		KNOB - For Model 423

*Parts used on previous models.

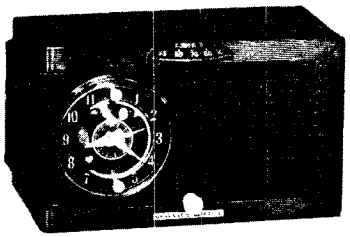
MODELS 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F, 522F



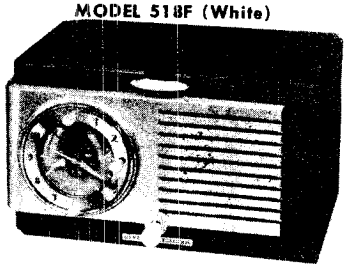
MODEL 510F (Brown)
MODEL 511F (Ivory)



MODEL 515F (Brown Mottle)
MODEL 517F (Maroon)
MODEL 516F (Ivory)
MODEL 518F (White)



MODEL 512F (Mahogany Mottle)
MODEL 513F (Antique Ivory)



MODEL 521F (Dark Mahogany)
MODEL 522F (Blonde Mahogany)

SPECIFICATIONS

OVER-ALL CABINET DIMENSIONS	Model	510F, 511F	515E, 516F, 517F, 518F	521F, 522F, 512F, 513F
	Height	$6\frac{1}{4}$ in.	$6\frac{3}{16}$ in.	$6\frac{3}{16}$ in.
	Width	$11\frac{3}{8}$ in.	$11\frac{15}{16}$ in.	$10\frac{1}{2}$ in.
	Depth	$5\frac{5}{16}$ in.	$4\frac{1}{4}$ in.	6 in.
ELECTRICAL RATING	Voltage	105–120		
	Frequency	60 cycles (only)		
	Watts	30		
OPERATING FREQUENCIES	R-F Broadcast	540–1600 kc		
	I-F Amplifier	455 kc		
POWER OUTPUT	Undistorted	1 watt		
	Maximum	1.75 watts		
LOUDSPEAKER	Type	Alnico PM		
	Outside Cone Diameter	4 inches		
	Voice Coil Impedance @ 400 Cycles	3.5 ohms		
TUBE COMPLEMENT	Purpose	Type		
	Oscillator-Converter	12BE6		
	I-F Amplifier	12BA6		
	Detector—1st Audio	12AV6		
	Audio Output	50C5		
	Rectifier	35W4		

GENERAL INFORMATION

The Models 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F and 522F clock—radio receivers employ four tubes, plus rectifier tube in an a-c/d-c superheterodyne circuit using a Beam-a-scope antenna. Each model has an electric time clock with wake-up alarm. The cabinets are of plastic composition in the finishes and design shown in the photos.

A special feature of the Model 515F, 516F, 517F, 518F, 521F and 522F receivers includes a receptacle at the rear of the receiver which is controlled by the clock to provide automatic power control to an external appliance. The slide switch adjacent to the receptacle is used to turn off the radio if desired, while using the appliance. *When radio operation is to be resumed, this switch must be set to the "ON" position.* In addition, the clocks of this group of receivers are equipped with a sleep control which may be used to automatically turn off the radio and/or appliance.

The Models 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F and 522F receivers employ a new type chassis construction and change of tube type from that of other General Electric clock radios, described in ER-S-510, ER-S-515 and ER-S-521, bearing the same model number but without the suffix "F."

The distinguishing feature of this new type chassis construction may be noted in the connection to components and layout. Resistors and capacitors are connected directly by their leads to special tube sockets or terminal board in contrast to previous conventional methods using conventional tube sockets.

The cabinets and clocks of this series receivers whose model numbers are suffixed by "F" are identical to respective model numbers which do not bear the letter "F" as shown upon the identification label.

CAUTION: One side of the power line is connected to B—. Avoid any ground connections direct to B—. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

COMPONENT REPLACEMENT—Except for tube socket replacement, it should not be necessary to remove the doughnut shaped shields over the tube sockets in servicing the chassis. The time and effort otherwise spent to remove shields and heat connections to free components may be spared and a neater job done without the risk of damage to the socket, by using the following method in wiring a replacement.

Clip the defective unit out, leaving enough of its leads to remain attached to the tube socket or terminal strip so an eye loop may be formed in each lead. Each lead of the new component may then be passed through the proper loop, pruned to length, crimped and soldered.

PRODUCTION WIRING CHANGE—Some early receivers will be found with one lead of the power cord connected to the pin 2 socket connection of the 35W4 rectifier tube. This connection has been known to be the cause of damage to the rectifier tube due to a 110 volt a-c arc within the tube between pin 2 and one of the tube elements. For this reason, it is recommended that the following change in wiring be made when the receiver is in the shop for service.

MODELS 510F, 511F, 512F, 513F, 515F, 516F, etc.

The power cord lead is removed from pin 2 of the rectifier tube socket by clipping it off close to the socket connection. The a-c power lead to the clock is similarly removed from pin 8 of the 50C5 output tube socket. Strip, splice, and solder the two leads together, properly taping the connection for adequate insulation. At least two wraps of standard friction tape is required. The remaining bus wire between pin 2 of the 35W4 tube and pin 8 of the 50C5 should then be clipped off close to the socket connection and removed. Some later sets have both leads inserted in pin No. 8 of the 50C5 socket and still later sets utilize pin No. 8 of the 35W4 socket and pin No. 8 of the 12AV6 socket for this connection. Both of these methods are satisfactory and should cause no trouble.

It is only when a solid B− connection is made to pins 1 or 2 of the 35W4 that the arc occurs. A direct short to one of these pins might by coincidence cause this phenomena.

OSCILLATOR COIL, T4—The oscillator coil is wired to be self-supporting through the use of solid bus wire connections. With the exception of some early receivers, the coil lugs are spaced sixty degrees from each other so that they are grouped over one half of the coil circumference as shown in Figure 2. An early type coil may occasionally be found whose lug spacing is eighty degrees. However this presents no difficulty in lug identification, if one bears in mind that the wider space of one hundred and twenty degrees is to be oriented with that half of the coil form which is bare of lugs in the illustration.

CLOCK SERVICE AND REPLACEMENT PARTS—For clock service data and repair parts, contact your local Wholesale General Electric Radio Distributor.

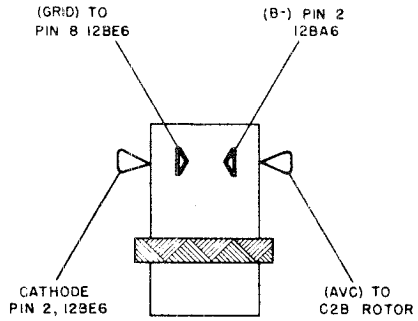


Fig. 1. Oscillator Coil Connections

C17, C19, C20, AND C26

The lead identification for the four-section ceramic capacitor RCW-3048 (K71J670) can be observed from the illustration of Figure 2.

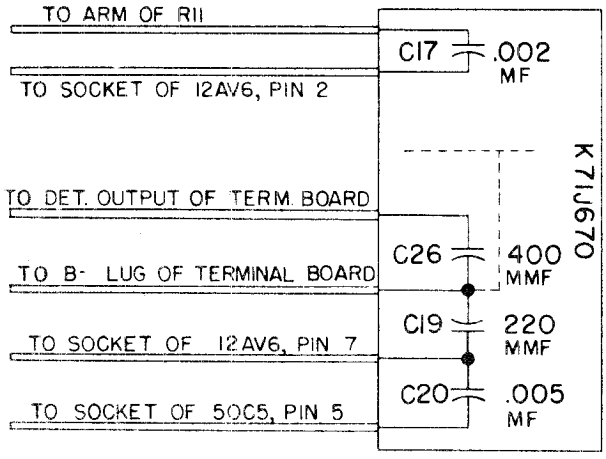


Fig. 2. Capacitor RCW-3048

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F	1500 kc
R-F	1620 kc
I-F	455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop. (See note 6.)
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the last calibration mark on the scale (low frequency side of 550 kc) should face directly to the front of the chassis so that the mark will align with the index tab or mark located on the cabinet over the tuning control wheel. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice coil terminals.

4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor, listed in column 2 of the alignment chart, between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust for Maximum Output
1	12BA6 grid (1) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd I-F transformer cores
2	12BE6 grid (7) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st I-F transformer cores
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

(1) I-F Stage Gains.
12BE6 Grid to 12BA6 Grid . . . . . 50 @ 455 kc
12BA6 Grid to 12AV6 Diode Plate . . . . . 50 @ 455 kc

(2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 6 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 4 shows voltages from all tube pins to B− unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

MODELS 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F, 522F

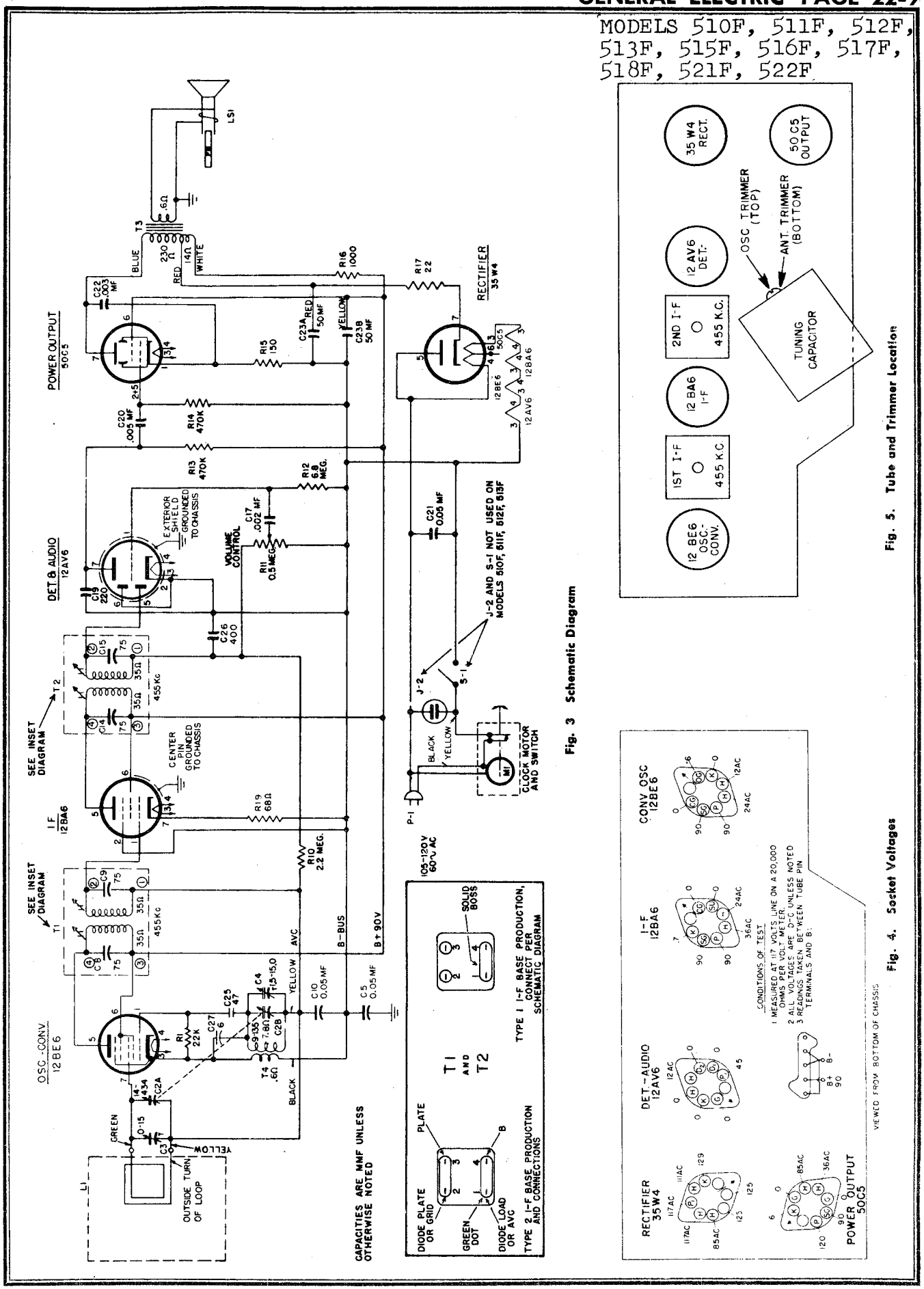


Fig. 3 Schematic Diagram

Fig. 5. Tube and Trimmer Location

Fig. 4. Socket Voltages

MODELS 510F, 511F, 512F,
513F, 515F, 516F, 517F,
518F, 521F, 522F

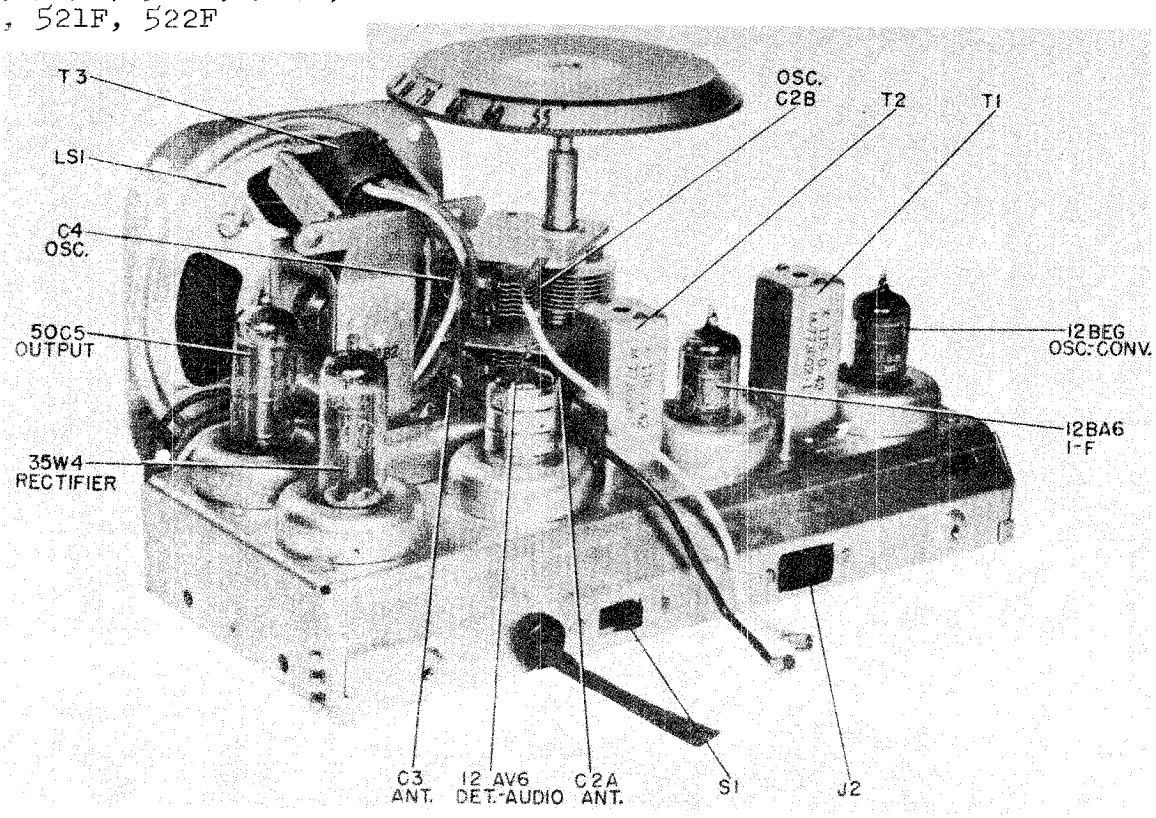


Fig. 6. Photo of Chassis (Top View)

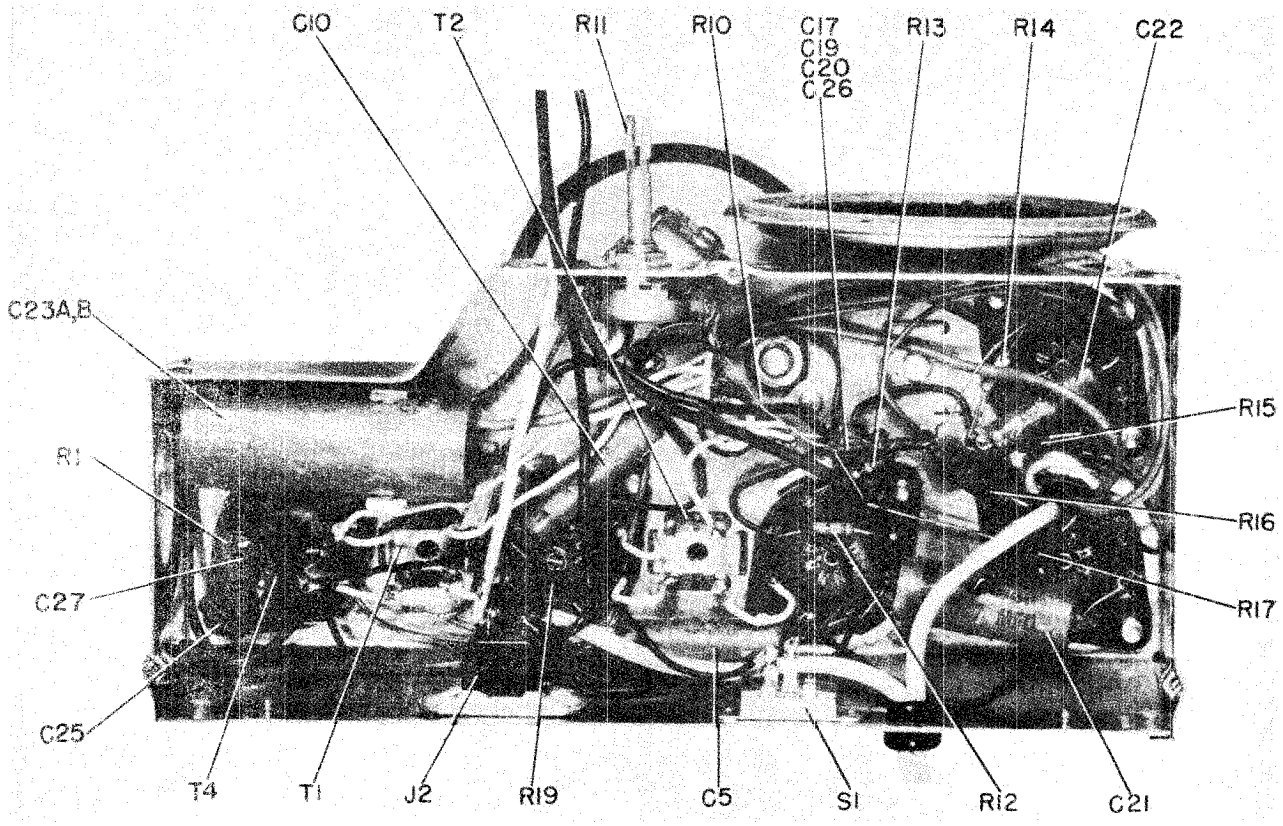


Fig. 7. Photo of Chassis (Bottom View)

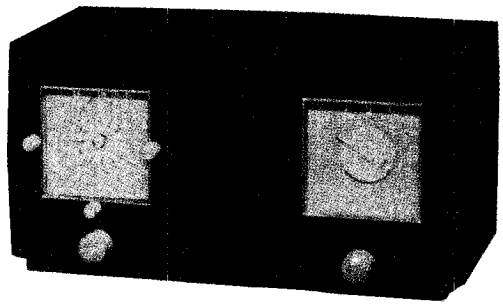
MODELS 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F, 522F

REPLACEMENT PARTS LIST—MODELS 510F, 511F, 512F, 513F, 515F, 516F, 517F, 518F, 521F, AND 522F

Cat. No.	Symbol	Description
RAB-149	L1	CABINET BACK—Back cover to cabinet, includes antenna loop, L1, for Models 510F, 511F
RAB-150	L1	CABINET BACK—Back cover to cabinet, includes antenna loop, L1, for Models 515F, 516F, 517F, 518F
*RAB-151	L1	CABINET BACK—Back cover to cabinet, includes antenna loop, for Models 512F, 513F, 521F, 522F
*RAC-085		BRACKET—Clock mounting bracket (metal shield cover over back of clock)
*RAG-033		GRILLE—Cabinet grille cloth (dark maroon) for Models 510F, 515F, 517F
*RAG-034		GRILLE—Cabinet grille cloth (ivory) for Models 511F, 516F
*RAG-035		GRILLE—Cabinet grille cloth (white) for Model 518F
RAG-037		GRILLE—Cabinet grille cloth (gold finish) for Models 521F or 522F
*RAU-336		CABINET—Brown, plastic cabinet for Model 510F
*RAU-337		CABINET—Ivory plastic cabinet for Model 511F
*RAU-338		CABINET—Brown mottle, plastic cabinet for Model 515F
*RAU-339		CABINET—Ivory, plastic cabinet for Model 516F
*RAU-340		CABINET—Maroon, plastic cabinet for Model 517F
*RAU-341		CABINET—White, plastic cabinet for Model 518F
*RAU-342		CABINET—Dark mahogany, plastic cabinet for Model 521F
*RAU-343		CABINET—Blonde mahogany, plastic cabinet for Model 522F
RAU-348		CABINET—Mahogany mottle, plastic cabinet for Model 512F
RAU-349		CABINET—Antique ivory, plastic cabinet for Model 513F
RCC-107	C21	CAPACITOR—.047 mf., 600 v., paper
RCC-108	C22	CAPACITOR—.003 mf., 600 v., paper
RCE-127	C23A, B	CAPACITOR—50–50 mf., 150 v., electrolytic
*RCT-045	C2A, B	CAPACITOR—420–126 mmf., dial tuning capacitor
RCW-3048	C17, 19, 20, 26	CAPACITOR—.002 mf., 220 mmf., .005 mf., 400 mmf., four section ceramic unit
RCW-3049	C27	CAPACITOR—6 mmf. ±5%, 1400 to 2200 neg. temp. coefficient, ceramic
*RDK-215		KNOB—Volume control knob (white) for Model 518F
*RDK-216		KNOB—Dial tuning control knob (maroon) for Models 510F, 511F
*RDK-217		KNOB—Dial tuning control knob (gold bronze color) for Models 515F, 516F, 517F, 521F, 522F
*RDK-218		KNOB—Volume control knob (maroon) for Model 517F
*RDK-219		KNOB—Dial tuning control knob (aluminum color) for Model 518F
*RDK-230		KNOB—Volume control knob (ivory) for Models 510F, 511F, 513F, 515F, 516F, 512F, 522F
RDK-243		KNOB—Volume control knob (fawn) for Model 512F
RDK-245		KNOB—Dial tuning control knob (ivory scale, maroon numerals) for Model 513F
RDK-246		KNOB—Dial tuning control knob (brown scale, gold numerals) for Model 512F
*RHC-024		CLIP—Mounting clip for electrolytic capacitor, C23A, B
*RHC-034		CLIP—Metal clip fastener used to mount 1st and 2nd i-f transformer can assemblies to chassis
*RHG-015		GROMMET—Rubber grommet used to insulate and shock mount tuning capacitor (C2A, B) to chassis

Cat. No.	Symbol	Description
*RHH-004		FASTENER—Snap-on fastener for holding cabinet back to cabinet (used only on Models 521F, 522F)
*RHI-010		GROMMET—Strain relief and insulating grommet in chassis back apron for power cord for Models 515F, 516F, 517F, 518F, 521F, 522F
*RHJ-005		SPACER—Metal spacer bushing in grommet mounting tuning capacitor (C2A, B) to chassis
*RHS-048		SHIELD—Metal tube shield for V3, 12-AV6
RHS-073		SHIELD—Doughnut shaped metal cover over soldered pin connections of tube sockets
RHS-074		SHIELD—Metal protective shield cover on top of chassis over wiring terminal board
RHS-075		SCREW—Screw No. 6 x ⅝-in. long used to fasten chassis in cabinet
*RJJ-008	J2	RECEPTACLE—AC power receptacle on chassis back apron used for automatic control of electrical appliances for Models 515F, 516F, 517F, 518F, 521F, 522F
RJS-158		SOCKET—Tube socket for V2, 12BA6
RJS-162		SOCKET—Tube socket for V1, 12BE6
RJS-163		SOCKET—Tube socket for V3, 12AV6; V4, 50C5; V5, 35W4
RLC-109	T4	COIL—Oscillator coil
*RMS-214		SPRING—Spring retaining ring for hub of dial tuning knob
*RRC-054	R11	POTENTIOMETER—500,000 ohms, composition volume control
*RSW-067	S1	SWITCH—Radio ON-OFF switch (slide type) on chassis back apron for Models 515F, 516F, 517F, 518F, 521F, 522F
*RTL-117	T1, 2	TRANSFORMER—1st or 2nd i-f coupling
RTO-099	T3	TRANSFORMER—Audio output
*RWL-009	P1	CORD—AC power cord and plug (brown) for Models 510F or 512F
*RWL-016	P1	CORD—AC power cord and plug (ivory) for Models 511F or 513F
*RWL-024	P1	CORD—AC power cord and plug (white) for Model 518F
*RWL-025	P1	CORD—AC power cord and plug (brown) for Models 515F, 517F, 521F, 522F
*RWL-026	P1	CORD—AC power cord and plug (ivory) for Model 516F
*RYN-005		NAMEPLATE—General Electric monogram (metal, on cabinet) for Models 512F, 513F, 521F or 522F
*RZC-009	M1	CLOCK—60 cycle, 105–125 v., clock assembly for Models 515F, 516F, 517F, 521F, 522F
*RZC-011	M1	CLOCK—60 cycle, 105–125 v. clock assembly for Model 518F
*RZC-012	M1	CLOCK—60 cycle, 105–125 v. clock assembly for Models 510F, 511F
RZC-014	M1	CLOCK—60 cycle, 105–125 v., clock assembly for Model 512F
RZC-015	M1	CLOCK—60 cycle, 105–125 v., clock assembly for Model 513F
ROP-022		LOUDSPEAKER—4 inch PM
*UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper
*UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper
*UCC-045	C5, 10	CAPACITOR—.05 mf., 600 v., paper
*UCG-020	C25	CAPACITOR—47 mmf., 500 v., silver mica
*UCU-1036	C19	CAPACITOR—220 mmf., mica
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-021	R19	RESISTOR—68 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R13, 14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon

MODEL 535



SPECIFICATIONS

CABINET

Color	Mottled Mahogany
Height, inches	5¾
Width, inches	11¼
Depth, inches	6

ELECTRICAL

Voltage	105-125 volts
Frequency	60 cycles
Wattage	35 watts

OPERATING FREQUENCIES

Broadcast Band	540-1620 kc
Intermediate Frequency	455 kc

AUDIO POWER OUTPUT

Undistorted	.75 watt
Maximum	1.5 watts

LOUDSPEAKER

Type	Alnico PM
Size	4-inch cone
Voice Coil Impedance at 400 cycles	3.2 ohms

TUBES

R-F Amplifier	Type 12BA6
Oscillator-Converter	Type 12BE6
I-F Amplifier	Type 12BA6
Detector and 1st Audio	Type 12AV6
Power Output	Type 35C5
Rectifier	Type 35W4

CLOCK

Motor	60 cycles, 110 volts, self-starting
Hands	Luminous, except sweep second hand
Switch	"Wake-up" and "Sleep" type
Dial	Square dial, luminous Arabic numerals

GENERAL INFORMATION

The Model 535 is an a-c/d-c superheterodyne receiver which uses five amplifier tubes, and one rectifier tube. The sensitivity of the r-f amplifier stage plus provisions for using an external antenna make this radio especially suitable for use in low signal strength areas.

Special features include an electric alarm clock, with a "wake-up" and "sleep" control switch. In addition, the timer receptacle at the rear of the receiver provides an outlet connection for external appliances consuming up to 1100 watts, which is controlled by alarm and "sleep" control mechanism of the clock. The radio ON-OFF switch adjacent to the timer outlet permits the radio to be turned off if so desired while using the external appliance.

STAGE GAIN AND VOLTAGE CHECKS

CAUTION: One side of the power line is connected to B—. Avoid any direct connections to ground. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

Stage gain measurements, using a vacuum tube voltmeter or similar measuring device, may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20 per cent. Readings should be taken with low signal input so that AVC is not effective.

R-F and I-F GAIN

12BA6 R-F Grid to 12BE6 Grid	6 @ 1000 kc
12BE6 Grid to 12BA6 I-F Grid	50 @ 455 kc
12BA6 I-F Grid to 12AV6 Diode	100 @ 455 kc

AUDIO GAIN

0.15 volts at 400 cycles across the volume control with the control set at maximum will produce approximately 1.2 volts (½ watt) at the speaker voice coil.

AUDIO POWER

With a 400 cycle signal driving the 35C5 sufficiently to begin to overload the output circuit as shown by distortion of the waveshape on an oscilloscope, an output meter at the speaker terminals should read about 1.5 volts (.75 watt). Maximum output should be about 2.2 volts or 1.5 watts.

OSCILLATOR GRID BIAS

The d-c voltage developed across the oscillator grid leak resistor (R4) averages 6 volts at 1000 kc using a 20K ohms/volt meter.

HUM MEASUREMENT

With the volume control at minimum, an oscilloscope connected through a 0.25 mfd. capacitor across C18A shows a 14-volt sawtooth wave; across C18B, a 0.7-volt rounded-hump wave (both peak-to-peak).

Hum measured across C18A with a 1000 ohms/volt output meter in series with a 1.0 mf. capacitor should not exceed 4.0 volts RMS. Hum at the speaker voice coil should not exceed .007 RMS volts.

ALIGNMENT FREQUENCIES

R-F	1500 kc and 1620 kc
I-F	455 kc

EQUIPMENT REQUIRED

1. Signal generator with 400 cycle modulation.
2. A-C output meter.
3. 0.05 mf. paper capacitor.
4. Loop. (See note 3.)
5. Insulated screwdriver.
6. Isolation transformer.

PROCEDURE—GENERAL

1. With the tuning condenser plates fully meshed, set the tuning dial pointer at the index line just below the 550 mark on the dial.

2. Connect an output meter across the loudspeaker voice coil terminals. Keep the volume control at maximum and attenuate the signal generator output so that the output meter never exceeds 1 volt.

3. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals. Locate the loop parallel to the radio antenna about one foot away.

CAUTION: One side of the power line is connected to B—. Avoid any ground connections direct to B—. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

MODEL 535

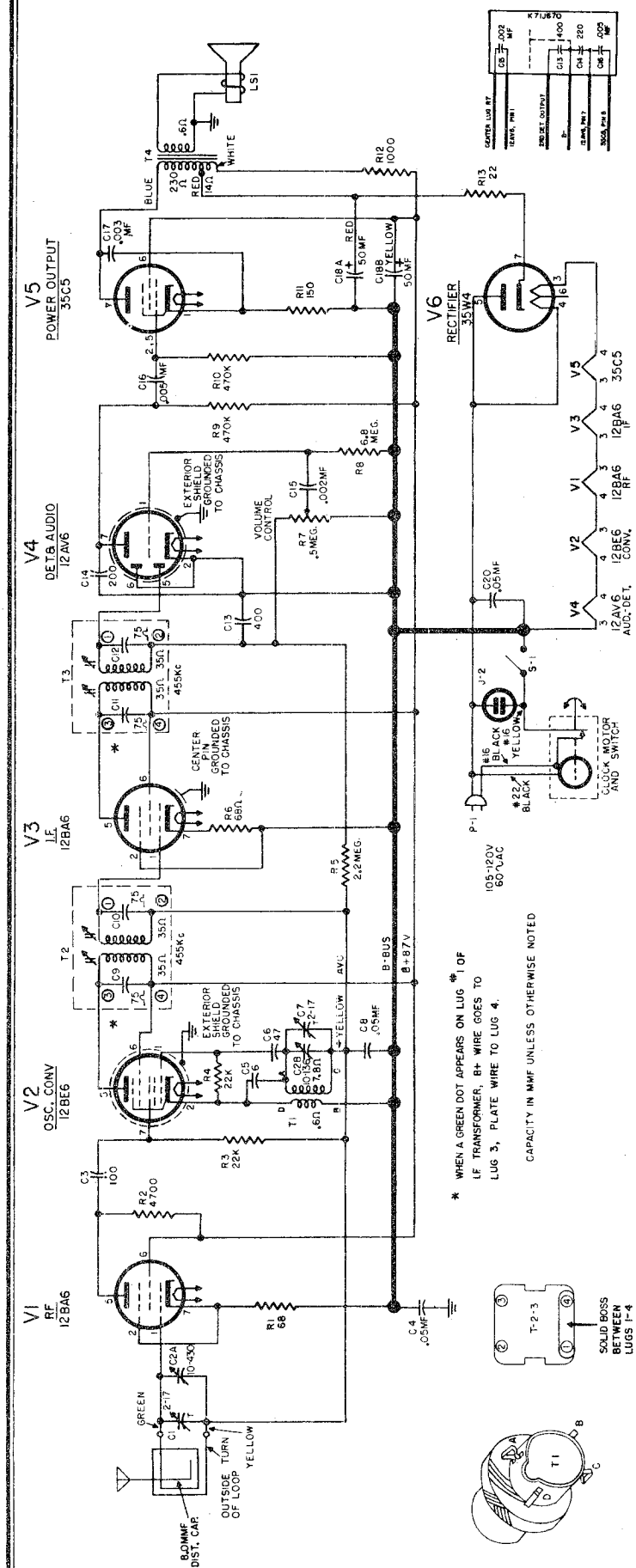


Fig. 1 Schematic Diagram

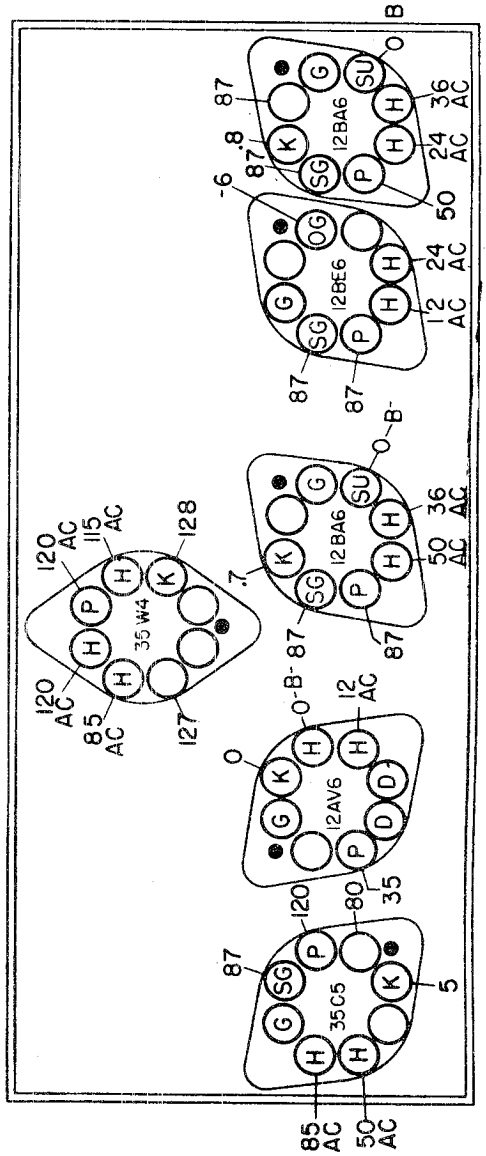


Fig. 2 Socket Voltages

ALIGNMENT CHART

STEP	CONNECT TEST OSCILLATOR TO	TEST OSC. SETTING	TUNING CAPACITOR SETTING	ADJUST FOR MAXIMUM OUTPUT
1	12BA6 IF grid pin No. 1 in series with 0.05 mf. cap.	455 KC	Minimum Capacity	2nd I.F transformer cores.
2	12BE6 grid Pin No. 7 in series with 0.05 mf. cap.	455 KC	Minimum Capacity	1st and 2nd I.F. transformer cores
3	Inductively coupled to radio loop	1620 KC	Minimum Capacity	C7 (oscillator)
4	Inductively coupled to radio loop	1500 KC	Tune for Maximum	C1 (antenna)

MODEL 535

TEST CONDITIONS

All readings to B— ground

D-C readings taken with 20K ohms/volt meter

Line voltage 120 volts, 60 cycles

No signal applied or received during test

Pin #8 on each socket is a dummy pin used for a spare terminal. A small hole in the tube socket between pins #1 & #8 is used to key these pins.

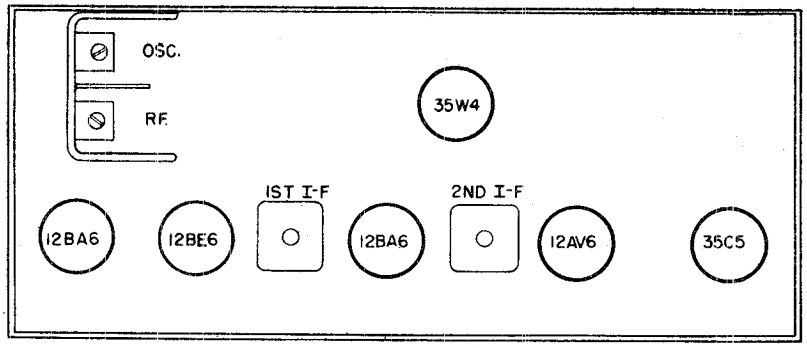


Fig. 3 Tube and Trimmer Location

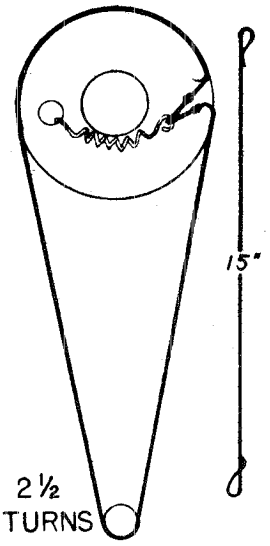


Fig. 4 Dial Stringing

SERVICE SUGGESTIONS

COMPONENT REPLACEMENT

Except for tube socket replacement, it should not be necessary to remove the doughnut-shaped shields over the tube sockets. The following method of wiring replacement parts is recommended:

Cut the defective unit out, leaving enough wire attached to the socket or terminal strip to form a small loop. Pass the lead of the new component through the loop, trim excess wire, crimp, and solder.

CLOCK SERVICE

To remove the clock from the cabinet, remove the metal shield which covers the clock mechanism. Four screws holding the clock to the cabinet then become accessible.

Clock parts and service instructions may be obtained from your General Electric Distributor or any Telechron Service Store.

PRODUCTION CHANGES

Early production sets omitted R1, a 68-ohm resistor in the cathode circuit of the R-F amplifier. R4 osc. grid leak went directly to B—.

Due to procurement difficulties, it may be necessary to use I-F transformers from two manufacturers. The electrical ratings are identical, the primary leads of one are reversed internally, requiring special hook-up considerations. The transformer having its No. 1 lug coded green should have its primary lugs wired in reverse order from that shown on the schematic.

REPLACEMENT PARTS LIST

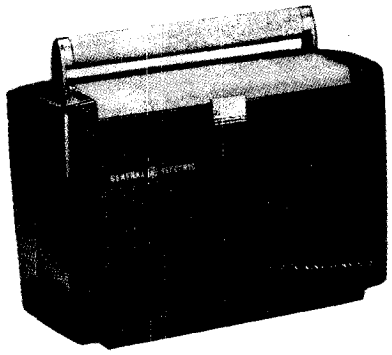
Cat. No.	Symbol	Description
RAB-157		BACK—Cabinet back and loop antenna
RAC-090		COVER—Metal cover for clock mechanism
RAC-091		SHIELD—Metal plate shields bottom of chassis
RAG-040		CLOTH—Maroon grille cloth mounted on cardboard
RAU-347		CABINET—Mahogany plastic cabinet for Model 535
*RDC-032		CORD—Dial cord (25 yards bulk)
RDE-109		BEZEL—Dial window escutcheon bezel
RDK-242		KNOB—Alarm set knob (fawn)
RDK-243		KNOB—Volume control and tuning knob (fawn)
RDK-254		KNOB—Sleep and manual switch knob (fawn with white dot)
RDP-059		POINTER—Dial pointer
RDS-104		SCALE—Dial scale and mounting plate
RDW-046		WINDOW—Dial window
*RHC-024		CLIP—Electrolytic capacitor mounting clip
*RHC-034		CLIP—I-F transformer mounting clip
RHC-048		CLIP—Dial scale mounting clip
*RHG-015		GROMMET—Tuning gang mounting grommet
*RHI-010		INSULATOR—Power cord strain relief insulator
*RHJ-005		SPACER—Tuning gang mounting spacer
*RHS-048		SHIELD—Short tube shield for converter V2
*RHS-073		SHIELD—Tube socket pin cover shield
*RHS-074		SHIELD—Terminal board cover shield
*RHS-075		SCREW—Chassis mounting screw
RHS-085		SHIELD—1¾" long tube shield for 2nd detector V4
*RJC-004		CONNECTOR—Loop lead connector
*RJJ-008	J2	OUTLET—110 v., appliance outlet
*RJS-158		SOCKET—V3 (I-F) tube socket with center shield pin
*RJS-162		SOCKET—V2 (conv.) impregnated tube socket
*RJS-163		SOCKET—V1, V4, V5 and V6 tube socket
RLC-110	T1	TRANSFORMER—Oscillator transformer
RMC-002		CLIP—Oscillator coil mounting clip
RMS-243		SPRING—Dial cord tension spring
RMX-180		SHAFT—Tuning shaft and bushing assembly
ROP-021		SPEAKER—4-inch PM loudspeaker
*RSW-067	S1	SWITCH—ON-OFF switch (slide type)
*RTL-117	T2, 3	TRANSFORMER—1st or 2nd I-F transformer
RTO-100	T4	TRANSFORMER—Output transformer
*RWL-025	P1	CORD—Brown heavy-duty AC power cord
†RZC-013		CLOCK ASSEMBLY—Includes all appearance items, less metal cover

RESISTORS

RRC-153	R7	POTENTIOMETER—0.5 meg., volume control
*URD-009	R13	RESISTOR—22 ohms, ½ w., carbon
*URD-021	R6	RESISTOR—68 ohms, ½ w., carbon
*URD-29	R11	RESISTOR—150 ohms, ½ w., carbon
*URD-065	R2	RESISTOR—4700 ohms, ½ w., carbon
*URD-081	R3, 4	RESISTOR—22K ohms, ½ w., carbon
*URD-113	R9, 10	RESISTOR—470K ohms, ½ w., carbon
*URD-129	R5	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R8	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R12	RESISTOR—1000 ohms, 2 w., carbon

CAPACITORS

*RCC-108	C17	CAPACITOR—.003 mf., 600 v., paper
*RCE-127	C18A, B	CAPACITOR—50-50 mf. @ 150 v., electrolytic capacitor
*RCN-053	C4, 7	CAPACITOR—.047 mf., 600 v., paper
RCT-050	C1; C2A, B; C7	CAPACITOR—126 and 420 mmf., tuning capacitor and trimmers
*RCW-3048	C13, 14, 15, 16	CAPACITOR—400 mmf., .002 mf., 220 mmf., .005 mf., ceramic "bullplate"
RCW-3049		CAPACITOR—6 mmf. ±10%, ceramic
*UCC-045	C20	CAPACITOR—.05 mf., 600 v., paper
*UCG-020	C6	CAPACITOR—47 mmf., 500 v., silver mica
*UCG-028	C3	CAPACITOR—100 mmf., 500 v., silver mica



SPECIFICATIONS

CABINET

Model 605 . . . . . Maroon Plastic
Model 606 . . . . . Green Plastic
Height, inches . . . . . $6\frac{3}{4}$
Width, inches . . . . . $10\frac{1}{8}$
Depth, inches . . . . . $3\frac{9}{16}$
Weight with batteries . . . . . $5\frac{1}{2}$ lbs.

ELECTRICAL

Voltage (AC-DC) . . . . . 105-125 volts
Frequency (AC) . . . . . 50-60 cycles
Wattage . . . . . 10 watts

BATTERY REQUIREMENTS

A Battery . . . . . $7\frac{1}{2}$ volts, Eveready #717
B Battery . . . . . $67\frac{1}{2}$ volts, Eveready #467

OPERATING FREQUENCIES

Broadcast Band . . . . . 540-1600 KC
I-F Amplifier . . . . . 455 KC

POWER OUTPUT:

Undistorted . . . . . 100 milliwatts
Maximum . . . . . 125 milliwatts

LOUDSPEAKER:

Type . . . . . Alinco PM
Cone Diameter . . . . . 4 inches
Voice Coil Impedance (400 Cycles) . . . . . 3.2 ohms

TUBE COMPLEMENT:

Oscillator-Converter 1R5
I-F Amplifier 1T4
Detector and 1st Audio 1U5
Power Amplifier 3V4

GENERAL INFORMATION

The Models 605 and 606 portable radios utilize the new ferrite antenna, a long tuning coil with a powdered iron core. Its small size facilitates mounting without the necessity of flexible connections. Because of its construction, its signal pick-up is principally electro-magnetic, resulting in reduced electrostatic interference.

This receiver has a "floating" chassis, connected to the power line only thru a resistor and a capacitor. All chassis voltages are in reference to the internal B— circuit except the speaker voice coil, which is grounded to the chassis. The use of an isolation transformer is recommended to protect line-powered test equipment.

STAGE GAIN AND VOLTAGE CHECKS

CAUTION: One side of the power line is connected to B— Avoid any direct connections to ground. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

Stage gain measurements, using a vacuum tube voltmeter or similar measuring device, may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20 per cent. Readings should be taken with low signal input so that AVC is not effective.

I-F GAIN

1R5 Grid to 1T4 Grid . . . . . 40 @ 455 kc
1T4 Grid to 1S5 Diode . . . . . 65 @ 455 kc

AUDIO GAIN

.03 volts at 400 cycles across the volume control with the control set at maximum will produce approximately .4 volts (50 mw) at the speaker voice coil.

AUDIO POWER

With a 400 cycle signal driving the 3V4 sufficiently to begin to overload the output circuit as shown by distortion of the waveshape, an oscilloscope at the speaker terminals should read 1.5 volts (peak-to-peak), which equals about 0.1 of a watt. Maximum possible output is about 1.8 volts (peak-to-peak) or 0.13 of a watt.

OSCILLATOR GRID BIAS

The d-c voltage developed across the oscillator grid leak resistor (R1) averages 5 volts as calculated by measuring the grid current (.0002 amp) through R1 (100K ohms).

HUM MEASUREMENT

With the volume control at minimum, an oscilloscope connected through a 0.25 mfd capacitor across C8A shows a 14-volt sawtooth wave; across C8B, a 0.4-volt rounded, hump wave (both peak-to-peak).

Hum measured across C8A with a 1000 ohm/volt output meter in series with a 1 mfd capacitor should not exceed 5 volts RMS. Hum at the speaker voice coil should not exceed .007 RMS volts.

MODELS 605, 606

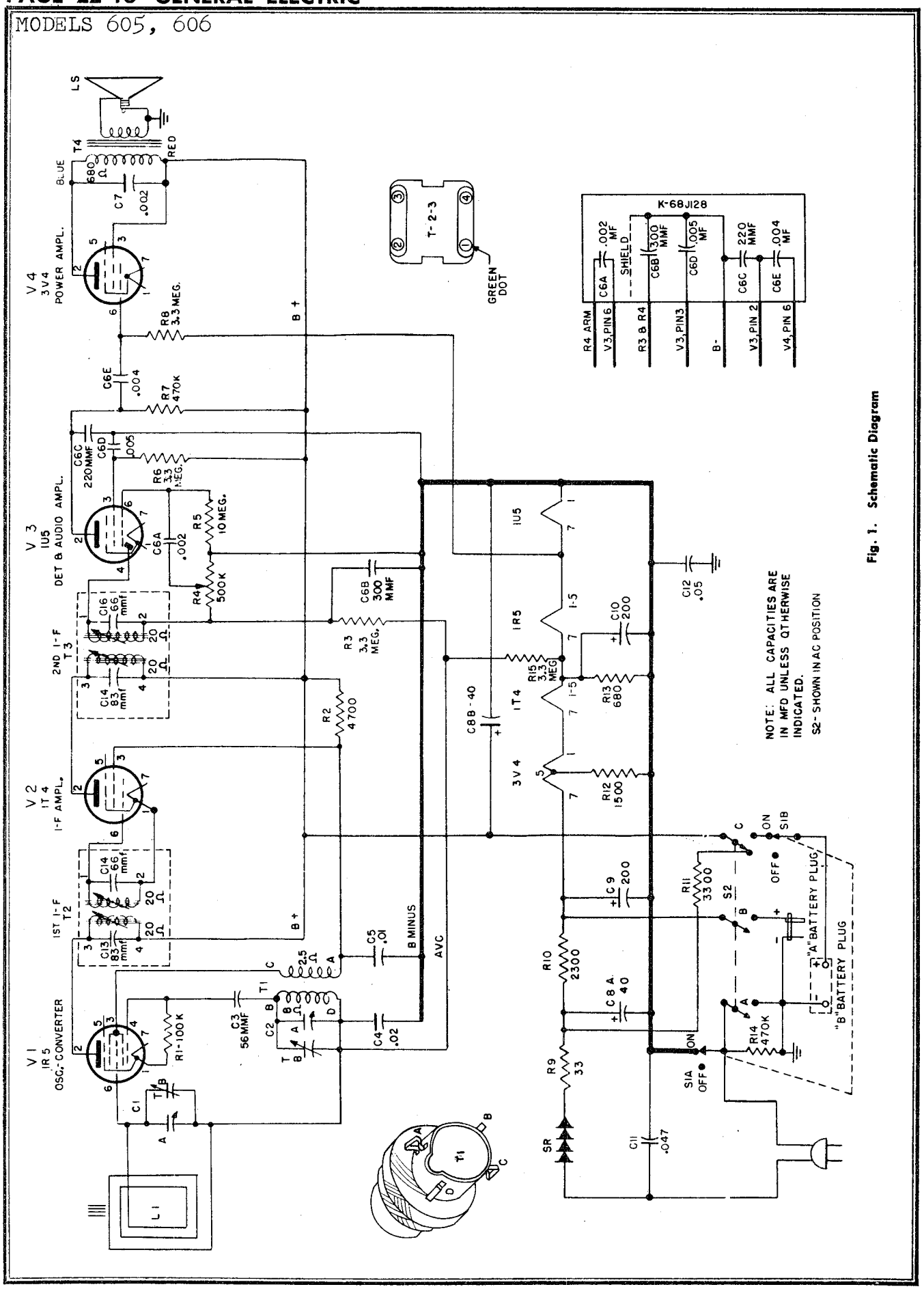


Fig. 1. Schematic Diagram

REPLACEMENT PARTS LIST—MODELS 605 AND 606

Cat. No.	Symbol	Description
		CAPACITORS
*RCE-051	C8, A, B	40-40 mfd., 150 w.v., electrolytic filter capacitor
RCE-132	C9, 10	200 mfd., 10 w.v., electrolytic filter capacitor
RCT-053	C1A, C1B, C2A, C2B	Tuning capacitor
*RCW-3015	C6A, B, C, C6D, E	.002 mfd., .004 mfd., .005 mfd., 220 mmf., 300 mmf., ceramic
*RCW-3018	C7	.002 mfd., ceramic
*RCW-3054	C5	.01 mfd., ceramic
*UCC-041	C4	.02 mfd., 600 v., paper
*RCN-053	C11	.047 mfd., 600 v., molded paper
*UCC-045	C12	.05 mfd., 600 v., paper
*UCG-0.2	C3	56 mmf., silver mica
		RESISTORS
RRW-042	R10	2300 ohms, 10 w., w.w.
*URD-013	R9	33 ohms ±10%, ½ w., carbon
*URD-045	R13	680 ohms ±10%, ½ w., carbon
*URD-053	R12	1500 ohms ±10%, ½ w., carbon
*URD-065	R2	4700 ohms ±10%, ½ w., carbon
*URD-097	R1	100,000 ohms ±10%, ½ w., carbon
*URD-113	R7	470,000 ohms ±10%, ½ w., carbon
*URD-133	R6, 8, 15	3.3 meg. ±10%, ½ w., carbon
*URD-145	R5	10 meg. ±10%, ½ w., carbon
*URE-061	R11	3300 ohms ±10%, 1 w., carbon
		MISCELLANEOUS ELECTRICAL PARTS
REX-005	SR	RECTIFIER—Selenium rectifier
RJC-022		CONNECTOR—"B" battery connector
RJP-033		PLUG—"A" battery plug
*RJS-100		SOCKET—7 pin miniature tube socket, tan, wax impregnated
*RJS-124		SOCKET—7 pin miniature tube socket, dark brown, unimpregnated
*RJS-125		SOCKET—7 pin miniature tube socket, unimpregnated, dark brown with center shield pin
*RLC-101	T1	TRANSFORMER—Oscillator transformer
RLL-046	L1	ANTENNA—Ferrite antenna
RRC-166	R4, S1A, B	CONTROL—0.5 meg., volume control with ON-OFF switch
*RSW-088	S2A, B, C	SWITCH—Battery-line changeover switch
*RTL-052	T2, 3, C13, 14, 15, 16	TRANSFORMER—1st or 2nd i-f transformer with capacitors molded in base
*RTO-108	T4	TRANSFORMER—Audio output transformer
RWL-005		POWER CORD—A-C line cord and plug
*S400D	L5	SPEAKER—4-inch PM loudspeaker
		MISCELLANEOUS MECHANICAL PARTS
RAD-078		BRACKET—Ferrite antenna mounting bracket
RAX-028		BRACKET—Latch bracket and spring
*RDC-032		DIAL CORD—Fine nylon dial cord, 25 yards bulk
RDP-061		POINTER—Dial pointer

Cat. No.	Symbol	Description
		MISCELLANEOUS MECHANICAL PARTS (Cont'd)
RDS-107		DIAL SCALE
RHB-016		STUD—Chassis cover mounting stud
*RHC-008		CLIP—1 inch electrolytic filter capacitor mounting clip
RHI-017		INSULATOR—Power cord strain relief insulator
*RHM-001		WASHER "C" washer for tuning shaft
*RHM-052		CLIP—Tinnerman speaker mounting clip
RHS-083		SCREW—Round-head Phillips screw for mounting latch clip
RII-060		INSULATOR—Tuning gang mounting insulator (top)
RII-061		INSULATOR—Tuning gang mounting insulator (bottom)
RII-065		INSULATOR—Fiber bushing for mounting handle ends to chassis
RMC-002		CLIP—Oscillator coil mounting clip
*RMC-053		CLIP—Back cover latch clip
*RMS-130		SPRING—Dial cord tension spring
RMX-183		SHAFT—Tuning shaft and bushing
		CABINET PARTS
RAB-163		BACK—Maroon plastic cabinet back for Model 605
RAB-164		BACK—Green plastic cabinet back for Model 606
RAC-095		CABINET—Maroon plastic cabinet less back cover, hinges, etc., for Model 605
RAC-096		CABINET—Green plastic cabinet less back cover, hinges, etc., for Model 606
RAC-097		COVER—Front dial cover, plastic
RAG-044		GRILLE CLOTH—Maroon grille cloth mounted on cardboard
RAG-045		GRILLE CLOTH—Green grille cloth mounted on cardboard
RAI-008		COVER STOP—Black rubber block
RDK-252		KNOB—Green plastic knob with clip
RDK-253		KNOB—Fawn plastic knob with clip
*RHC-036		CLIP—Tinnerman cover mounting clip
*RHE-010		EYELET—For mounting front cover
*RHI-016		HINGE—Back hinge
*RHN-020		POST—Mounts handle bar to handle end
*RHR-013		RIVET—For cabinet back hinge
*RHS-081		SCREW—Mounts handle bar to handle end
RHS-084		SCREW—For mounting cabinet catch
*RHY-034		HANDLE END—Chromium plated end
*RHY-035		HANDLE BAR—Fawn plastic rod for handle
*RHY-036		HANDLE BAR—Green plastic rod for handle
RML-051		LATCH—Front cover release
RMP-031		PIVOT ROD—Brass rod, .062 in. x 1¾ in. long for latch
RMS-244		SPRING—Left spring for front cover
RMS-245		SPRING—Right spring for front cover

RADIO CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

Signal generator	Insulated screwdriver
Output meter	Isolation transformer
.05 mf paper capacitor	A battery*

PROCEDURE:

R-F and Oscillator adjustments can be easily made with the chassis in the cabinet; to make I-F adjustments, remove the chassis from the cabinet, unsolder the AVC wires from the antenna and the tuning capacitor frame, remove the metal shield from the bottom of the chassis, resolder the AVC wires to the antenna and tuning capacifor again before aligning.

With the tuning gang condenser fully closed, slip the dial pointer along the dial string until it points to the small index mark on the dial just below the 550 kc position.

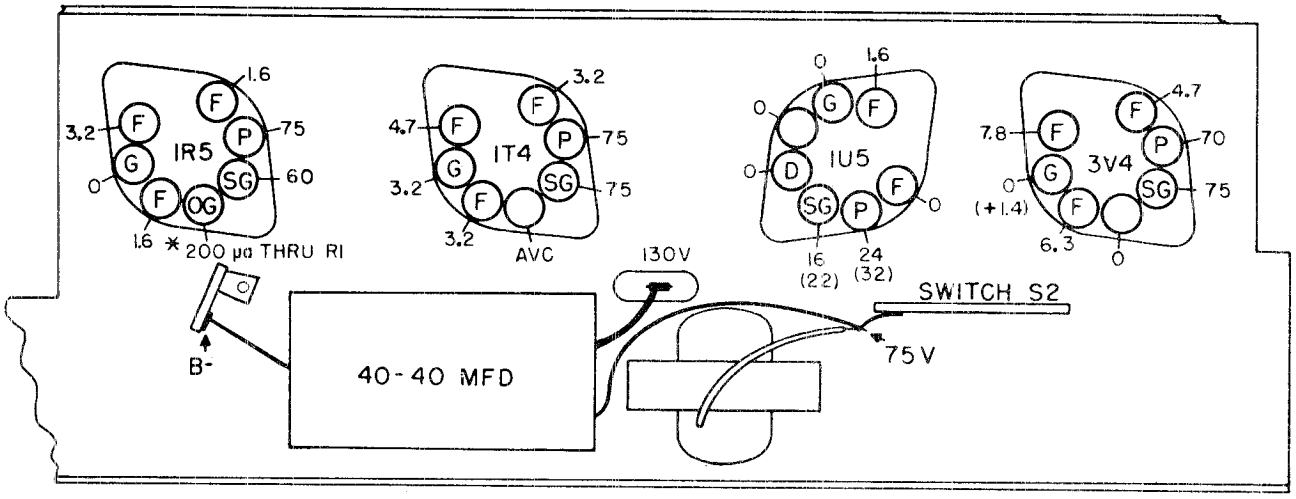
Connect the output meter across the voice coil terminals of the speaker. If the lowest range on your output meter is greater than 3 volts, better peak indications can be had by connecting the output meter to the plate of the output tube (pin 2 of 3S4 tube) through a series .05 capacitor and using the 50-volt scale. Since the bottom shield must be in place for the RF section alignment, connect the .05 capacitor to the tube pin as follows: Slip a piece of spaghetti over one lead of the capacitor, leaving about $\frac{3}{16}$" of bare wire at the end; carefully bend the bare end around pin 2 of the 3S4 in a tight-fitting loop; re-insert the tube in its socket.

During I-F alignment, the ground lead from the signal generator should be connected to B−, and the signal lead to the proper grid through a .05 capacitor. For R-F adjustments the input signal should be inductively coupled to the receiver antenna by connecting a 4-turn, 6-inch diameter loop of bell wire to the signal generator terminals. The loop and the antenna should be spaced about a foot apart, and arranged coaxially: that is, the antenna points through the center of the loop.

The volume control should be at maximum during all adjustments, and the signal generator output should be adjusted so that the output meter never reads more than .4 volt at the speaker, or about 20 volts at the plate of the output tube. Tune all adjustments for maximum output.

* Make the final ANT. trimmer adjustment with the chassis installed in the cabinet and an "A" battery in position and connected, since the battery affects the tuning of the antenna.

MODELS 605, 606



VOLTAGES MEASURED WITH 20,000Ω/VOLT METER TO B-; NO RF OR IF SIGNAL, SET OPERATING FROM 60 ∽ 120 VOLT LINE.
*DIRECT VOLTAGE READING UNRELIABLE. (22) INDICATES VTVM READING.

Fig. 2. Socket Voltages

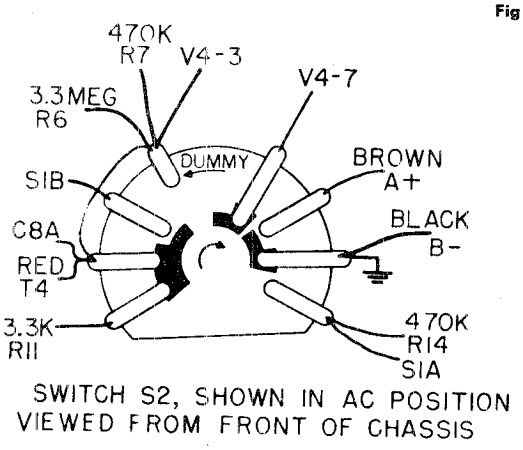


Fig. 3. Battery-line Switch Wiring

ALIGNMENT CHART

Step	Sig. Gen. Connected to	Sig. Gen. Frequency	Dial Setting	Adjust For Max. Output
1	1T4 Grid Pin 6	455 kc	550 kc	Cores of I-F Trans. T3
2	1R5 Grid Pin 6	455 kc	550 kc	Cores of I-F Trans. T2
3	1R5 Grid Pin 6	455 kc	550 kc	Re-adjust T2 and T3
4	Inductively Coupled	1620 kc	1620 kc	Osc. trimmer C2B
5	Inductively Coupled	1500 kc	Tune for maximum	R-F trimmer C1B

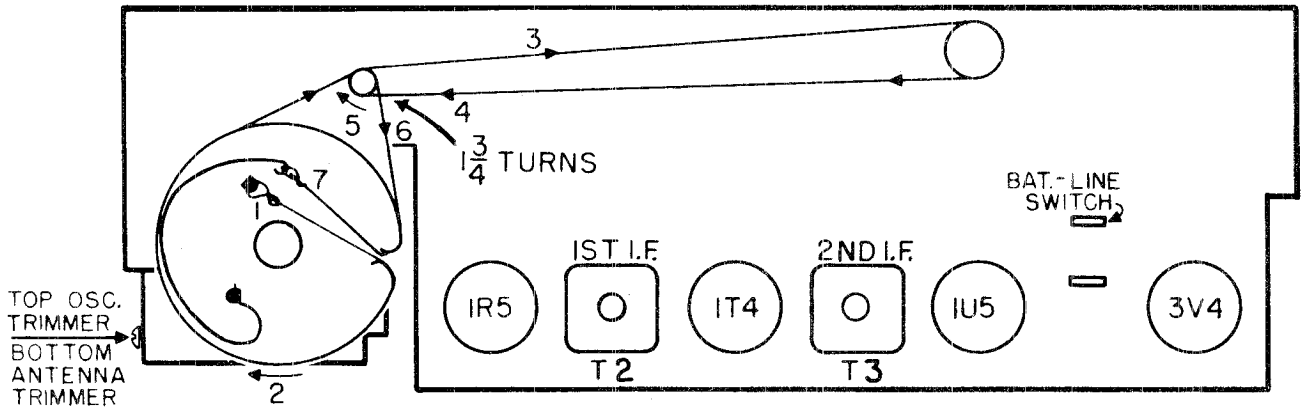
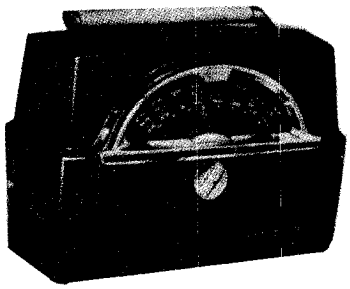


Fig. 4. Dial Stringing and Tube and Trimmer Location

MODELS 610, 611



Model 610 Maroon
Model 611 Green

SPECIFICATIONS

CABINET:	Composition	Plastic
	Height	8 7/8 inches
	Depth	5 7/8 inches
	Width	12 inches
	Weight (with batteries)	11 pounds
POWER SUPPLY:	Battery	Eveready No. 756, or equivalent
	AC or DC operation	105–115 volts
	Frequency (on AC)	60 cycles
	Power Consumption	25 watts
OPERATING FREQUENCIES:	Broadcast Band	540–1600 kc
	I-F Amplifier	455 kc
POWER OUTPUT:	Undistorted	180 milliwatts
	Maximum	250 milliwatts
LOUDSPEAKER:	Type	Alnico PM
	Outside Cone Diameter	4 inches
	Voice Coil Impedance (400 cycles)	3.2 ohms
TUBE COMPLEMENT:	R-F Amplifier	1T4
	Oscillator-Converter	1R5
	I-F Amplifier	1T4
	Detector Audio Amplifier	1U5
	Power Amplifier	3V4
	Dial Lamp	Mazda No. 49

GENERAL INFORMATION

These portable radios are five-tube superheterodyne broadcast receivers with a range of 540 to 1600 kc. The power source may be either 105–115 volts, 50–60 cycles a-c, or d-c, when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electrical power, providing excellent operation in any location where external power is not available.

If the dial light is burnt out or missing, reduced performance will be noted on AC and DC operation. However, battery operation will be normal.

When this receiver is stored for long periods of time, the power plug should be removed from the chassis outlet.

BATTERY—AC OR DC OPERATION.

The center knob turns on the battery, provided that the power plug is well inserted into the socket in the chassis.

For a-c or d-c supply (105–115 volts, 50- to 60-cycle operation), the same knob switches on the power when the power plug is pulled out of its socket in the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter.
3. Paper Capacitor .05 Mf.
4. Insulated Screwdriver.
5. Coupling Loop for Test Oscillator (see text).
6. Isolation Transformer.

PROCEDURE—GENERAL.

1. The Alignment Chart gives the alignment procedure with correct sequence of trimmer adjustments. The chassis must be removed from the cabinet during i-f alignment. The locations of the i-f and r-f adjustments are shown in Figure 2.

2. The "low" side of the test oscillator output should be connected to B minus; the "high" side should be connected as indicated in the alignment chart. The test oscillator output signal should be attenuated so that the output meter reading never exceeds ½ volt. Connect the capacitor listed in column 2 of the alignment chart between the "high" side of the test oscillator and the point of input specified.

PRECAUTION: *Use an isolating transformer between the power supply and the radio receiver input. The use of an isolating capacitor is not recommended, as a-c through the capacitor will introduce hum modulation and/or create the possibility of a burned out signal generator attenuator.*

3. The output meter should be connected across the voice coil terminals of the speaker.

4. During the entire alignment procedure the volume control should be rotated clockwise to its maximum position.

5. For alignment of the antenna trimmer, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator output terminals, and locate the loop about one foot from the radio loop for alignment. The position of the loop with respect to the radio loop should not be changed during any one set of adjustments to prevent possible errors in peak readings.

6. The antenna loop acquires a different inductance when the back is closed. Therefore, the adjustment of the antenna trimmer has to be made with the back closed, through the opening on the right side of the cabinet which normally is closed by a plug button. After adjustments have been completed, the plug button has to be put in place again.

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Setting	Pointer Setting	Adjust for Maximum Output
1	1T4 (V3) I-F grid (pin 6) in series with .05 mfd. and B— bus.	455 KC	550 KC	Iron cores of I-F Transformer T2.
2	1R5 (V2) converter grid (pin 6) in series with .05 mfd. and B— bus.	455 KC	550 KC	Iron cores of I-F Transformer T1.
3	1T4 (V1) R-F amplifier grid (pin 6) in series with .05 mfd. and B— bus.	1670 KC	Gang condenser fully open	C1B oscillator trimmer for maximum.
4		1500 KC	For maximum output	C1C R-F trimmer for maximum.
5		580 KC		Core of T4 for maximum.
6	Repeat steps 4 and 5 to give maximum performance.			
7	Inductively coupled. See note 5.	1500 KC	For maximum output	C1A trimmer for maximum with cabinet back closed. See Note 6.

MODELS 610, 611

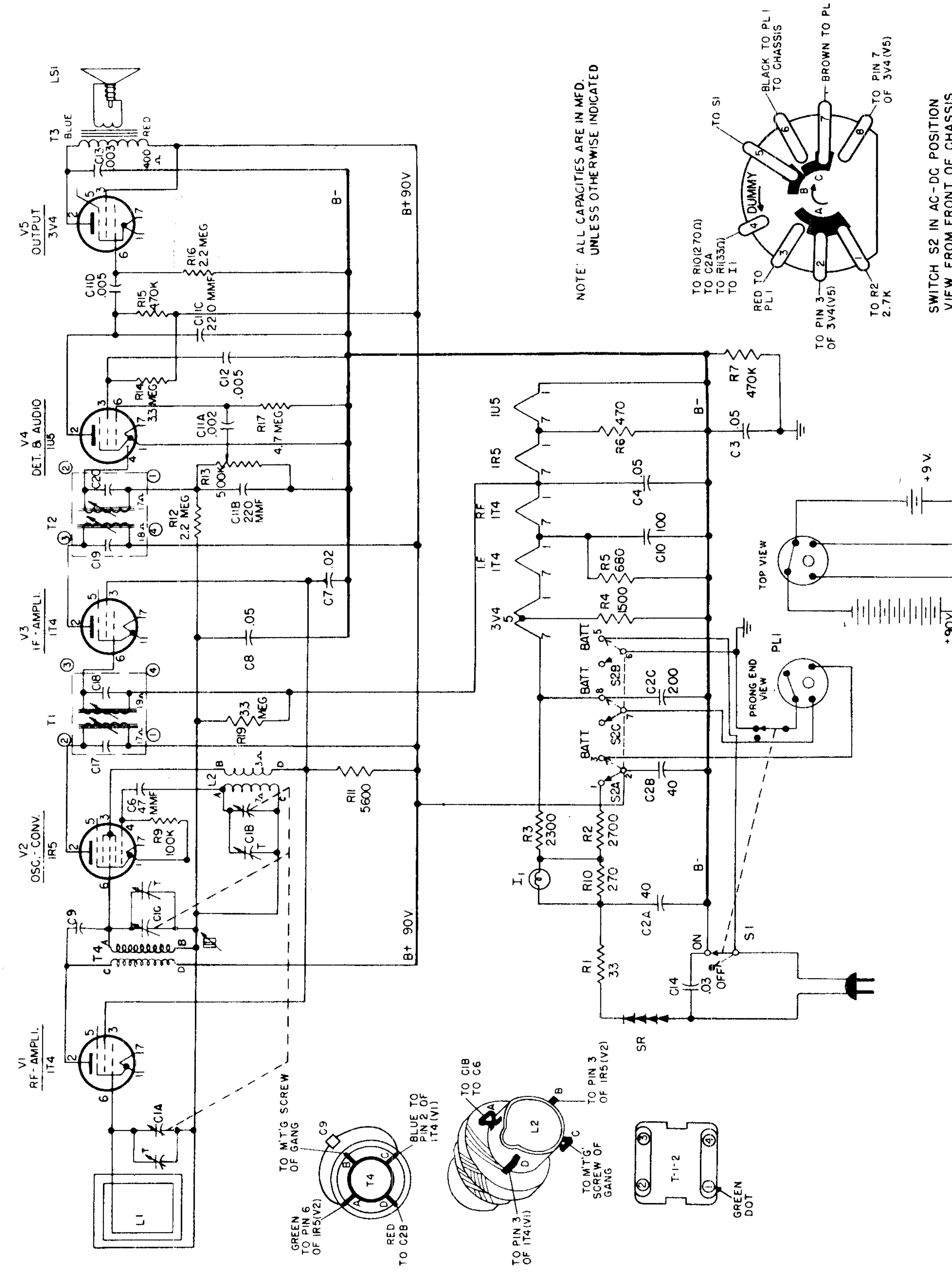


Fig. 1. Schematic Diagram

STAGE GAINS AND VOLTAGE CHECKS

In order to check circuit performance and facilitate trouble shooting, the measurement of stage gain by means of a vacuum voltmeter or similar measuring device is recommended. The gain values listed may have tolerances of 20%. Readings should be taken with low signal input so that the AVC is not effective.

(1) R-F STAGE GAINS.

1T4 R-F Grid (Pin 6) to 1R5 Grid (Pin 6)....12 @ 1000 KC
1R5 Grid (Pin 6) to 1T4 Grid (Pin 6).....18 @ 1000 KC
1T4 Grid (Pin 6) to 1U5 Diode Plate (Pin 4)..45 @ 455 KC

(2) AUDIO GAIN.

.020 volt at 400 cycles across volume control (R13) with control set at maximum will give approximately .05 watts output across speaker voice coil.

(3)

D-C voltage developed across oscillator grid resistor (R9) averages −8 volts at 1000 kc with respect to B−.

(4) SOCKET PIN VOLTAGES.

Figure 4 shows voltages from all tube pins to B−. Voltage readings much lower than those specified may help localize defective components or tubes.

(5) MULTIPLE CERAMIC CAPACITOR.

This multiple capacitor unit is of the ceramic capacitor type and contains five capacitors C11A, B, C, D and C12. This unit, RCW-3015, is illustrated in Figure 2 for lead identification. If during service the ceramic capacitor unit is found to be defective, the entire unit may be replaced by the identical part, RCW-3015, or the defective section may be located and disconnected from the receiver circuit and a single universal capacitor of equivalent electrical value used in its place.

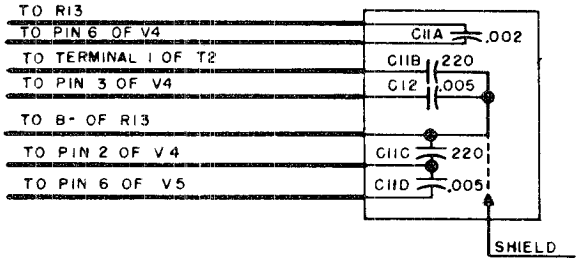


Fig. 2. Connections for Capacitor RCW-3015

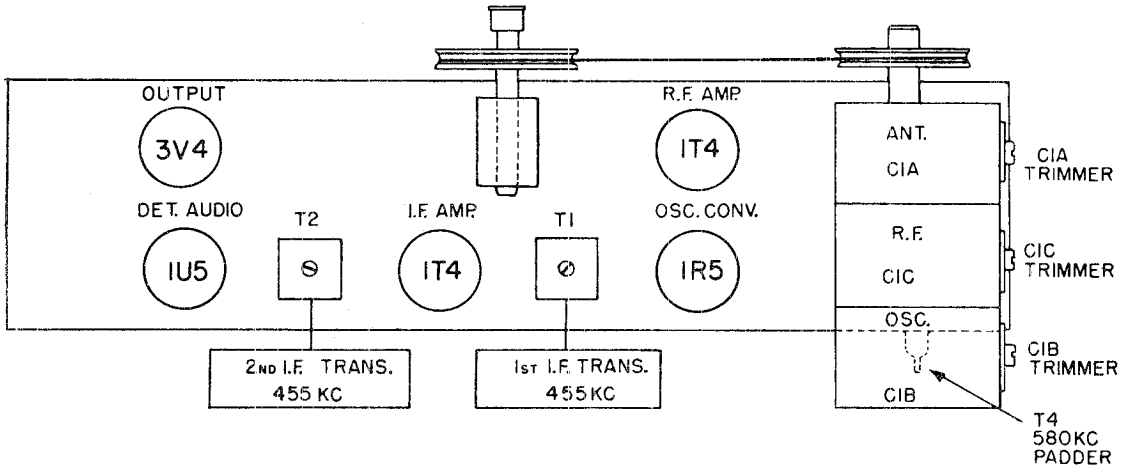


Fig. 3. Tube and Trimmer Location

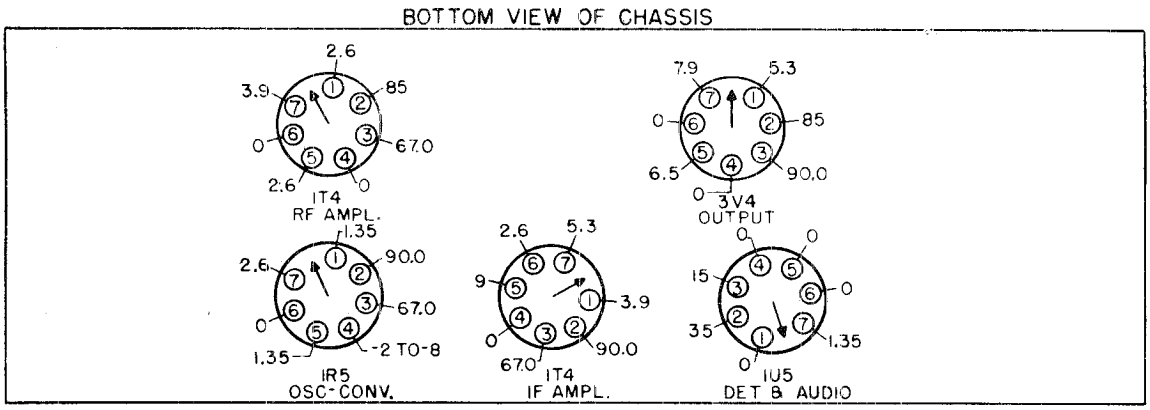
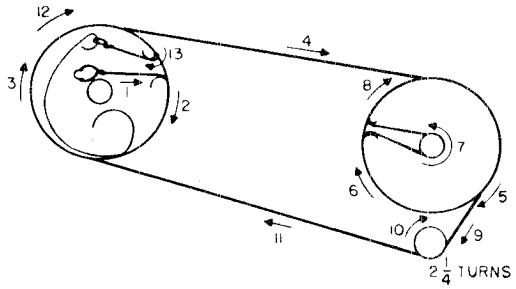


Fig. 4. Socket Voltages

MODELS 610, 611



GANG FULLY OPEN

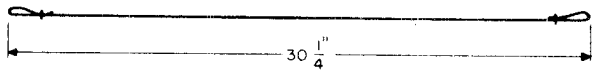


Fig. 5. Dial Stringing

REPLACEMENT PARTS LIST

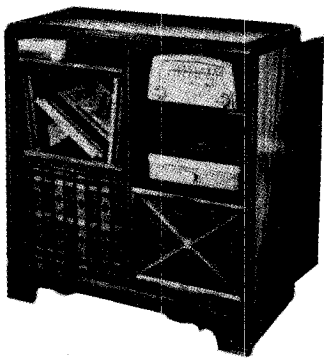
Cat. No.	Symbol	Description
		CAPACITORS
*RCE-095	C2A, B, C	40, 40, 200 mfd., 150, 150; 25 volts, electrolytic
RCE-131	C10	100 mfd., 6 v., electrolytic
RCT-051	C1A, B, C	Tuning capacitor
*RCW-1073	C6	47 mmf., ceramic
RCW-3015	C11A, B, C, C11D, C12	Ceramic
*RCW-3056	C9	4.7 mmf., ceramic
*UCC-037	C13	.003 mf., 600 v., paper
*UCC-041	C7	.02 mf., 600 v., paper
*UCC-042	C14	.03 mf., 600 v., paper
*UCC-045	C3, 4, 8	.05 mfd., 600 v., paper
		RESISTORS
RRC-155	R13, S1A, S1B	VOLUME CONTROL AND SWITCH
*RRW-027	R3	2300 ohms, 10 w., w.w.
*URD-041	R6	470 ohms, ½ w., carbon
*URD-045	R5	680 ohms, ½ w., carbon
*URD-053	R4	1500 ohms, ½ w., carbon
*URD-067	R11	5600 ohms, ½ w., carbon
*URD-097	R9	100,000 ohms, ½ w., carbon
*URD-113	R7, 15	470,000 ohms, ½ w., carbon
*URD-129	R12, 16	2.2 meg., ½ w., carbon
*URD-133	R14, 19	3.3 meg., ½ w., carbon
*URD-137	R17	4.7 meg., ½ w., carbon
*URE-013	R1	33 ohms, 1 w., carbon
*URE-059	R2	2700 ohms, 1 w., carbon
*URF-035	R10	270 ohms, 2 w., carbon
		MISCELLANEOUS ELECTRICAL PARTS
*RER-001	SR	RECTIFIER—Selenium rectifier
*RHS-010		SHIELD—Tube shield for V4
RII-065		INSULATOR—For handle
*RJP-025	PL1	PLUG—Battery plug (male)
*RJS-100		SOCKET—Tube socket for V2
*RJS-124		SOCKET—Tube socket for V4 and V5
*RJS-125		SOCKET—Tube socket for V1, V3
RJX-031		SOCKET—Dial light socket
*RLB-030	T4	TRANSFORMER—RF coupling
*RLC-068	L2	COIL—Oscillator coil
RLL-045	L1	LOOP
RSW-088	S2A, B, C	SWITCH—AC, DC to battery switch
*RTL-052	T1	TRANSFORMER—1st IF transformer
*RTL-079	T2	TRANSFORMER—2nd IF transformer
*RTO-050	T3	TRANSFORMER—Output transformer
*RWL-005		POWER CORD
*S-400C-19		SPEAKER—4-inch speaker
		MISCELLANEOUS MECHANICAL PARTS
RDS-106		DIAL SCALE
RDP-060		DIAL POINTER
RDX-047		DRUM—Pointer drum and shaft assemly, fastened with retaining ring RHM-043
RHB-006		PLUG BUTTON—For 610

Cat. No.	Symbol	Description
		MISCELLANEOUS MECHANICAL PARTS (Cont'd)
RHB-015		PLUG BUTTON—For 611
*RHC-015		CLIP—For oscillator coil
RHE-010		EYELET—For cabinet catch
*RHG-018		GROMMET—For mounting tuning condenser
*RHI-011		STRAIN RELIF—On power cord
RHI-016		HINGE—Cabinet hinge
RHJ-005		SPACER—For mounting gang
*RHM-043		RING—Retaining ring for pointer shaft
RHN-020		POST—Screw post for handle
*RHR-002		RIVET—For cabinet back catch
RHR-013		RIVET—For cabinet hinge
*RHS-005		SPACER—For mounting tuning condenser
RHS-081		SCREW — Handle screw extends through handle
RHS-082		SCREW—Hex-head screw #6 x 5/8 in. long for cabinet back catch
*RJS-024		PLATE—Mounting plate for electrolytic capacitor (C2)
RMC-053		CATCH—For cabinet back
*RMS-120		SPRING—Dial cord tension spring
RMU-074		SHAFT—Tubular shaft for tuning control
		CABINETS AND CABINET PARTS
RAB-161		BACK—Cabinet back (maroon) for 610
RAB-162		BACK—Cabinet back for Model 611
RAC-092		FRONT—Cabinet front (maroon) for 610
RAC-093		FRONT—Cabinet front (green) for Model 611
RAC-094		COVER—Chassis cover
RAD-077		BRACKET—For mounting cabinet handle
RAG-042		GRILLE CLOTH—Maroon, for Model 610
RAG-043		GRILLE CLOTH—Gray, for Model 611
*RDC-032		DIAL CORD
RDE-116		ESCUTCHEON—Cabinet escutcheon for Model 610
RDE-117		ESCUTCHEON—For Model 611
RDK-248		KNOB—ON-OFF-VOLUME for Model 610, fawn color
RDK-249		KNOB — ON-OFF-VOLUME knob for Model 611, green color
RDK-250		KNOB—Tuning knob for Model 610, fawn color
RDK-251		KNOB—Tuning knob for Model 611, green color
RHF-011		FOOT—Cabinet foot button (maroon) for Model 610
RHF-012		FOOT—Cabinet foot button (gray) for Model 611
RHY-034		HANDLE END
RHY-035		HANDLE—Fawn colored for Model 610
RHY-036		HANDLE—Green, for Model 611

*PARTS USED ON PREVIOUS MODELS.

Even if the "A" battery is not connected to the circuit it should be in place in the cabinet for optimum RF pick-up. The loop has been tuned with the battery in place and becomes detuned if the battery is removed.

MODEL 755



SPECIFICATIONS

CABINET:

Model	755
Material	Wood
Color	Mahogany
Height	34⅞ in.
Width	33 3/16 in.
Depth	16 in.

ELECTRICAL RATING:

Voltage	105–125
Frequency	60 cycles
Wattage (Radio only)	85 watts
(With phono)	100 watts

OPERATING FREQUENCIES:

AM Band	540–1600 kc
FM Band	88–108 mc

INTERMEDIATE FREQUENCIES:

AM	455 kc
FM	10.7 mc

AUDIO POWER OUTPUT (120 VOLTS LINE):

Undistorted	6.5 watts
Maximum	8 watts

LOUDSPEAKER:

Type	Alnico PM
Size	12 inches
Voice Coil Impedance at 400 cycles	3.2 ohms

RECORD CHANGER ..... Model P15 (33⅓, 45 and 78 RPM)

PHONOGRAPH PICKUP:

Type	Dual stylus, variable reluctance
DC Resistance	340 ohms

ANTENNA:

AM	Built-in loop
FM	Cabinet antenna or 300-ohm FM ant.

If it is necessary to install an external FM antenna, the brown wire extending from the rear of the cabinet should be disconnected from the antenna terminal strip.

TUBE COMPLEMENT:

(V1) R-F Amplifier	6BA6
(V2) Osc. and FM Converter	12AT7
(V3) AM Converter and 1st FM I-F Amplifier	6BA6
(V4) I-F Amplifier	6BA6
(V5) FM Limiter	6AU6
(V6) FM Discriminator, AM Detector and Audio Amplifier	6T8
(V7) Phono Preamplifier	6AU6
(V8) Phase Inverter	6J5
(V9) and (V10) Power Amplifier	6V6 (2)
(V11) Rectifier	5Y3GT
Dial Lamps	Two Mazda No. 44

RECORD CHANGER SERVICE DATA:

Complete service information for the Model P15 record changer can be found in ER-S-P15.

STAGE GAINS

Stage gain measurements using a vacuum tube voltmeter or oscilloscope with a calibrated signal generator may be used to check circuit performance and isolate trouble. Use small signals to eliminate AVC action. Tolerance ±20%. Signal applied through 3.3 K resistor and 1000 mmfd. capacitor in series.

STAGE	GAIN AM	GAIN FM
Ant. to V1 Grid	.....	1 (98 MC)
V1—V2 Grid	.....	6 (98 MC)
V1—V3 Grid	14 (1000 KC)	.....
V2—V3 Grid	.....	10 (10.7 MC)
V3—V4 Grid	70 (455 KC)	45 (10.7 MC)
V4—V5 Grid	.....	20 (10.7 MC)
V4—V6 Grid	80 (455 KC)	.....

AUDIO GAIN:

0.1 volt at 400 cps across the volume control will give approximately ½ watt (1.25 v. a-c) across the speaker voice coil.

OSCILLATOR GRID BIAS:

D-C voltage developed across R28. Use 100K resistor to isolate meter. Tolerance ±20%.

	VTVM	20K ohms/volt meter
1000 KC	7 volts	4 volts
98 MC	3 volts	2 volts

HUM MEASUREMENT:

Hum measured across the voice coil of the speaker with the volume control set at minimum and band switch in the AM position should not exceed 7 millivolts.

On FM position, ground the limiter grid through a .01 mfd. capacitor. Hum should not exceed 15 millivolts.

MODEL 755

METER ALIGNMENT CHART

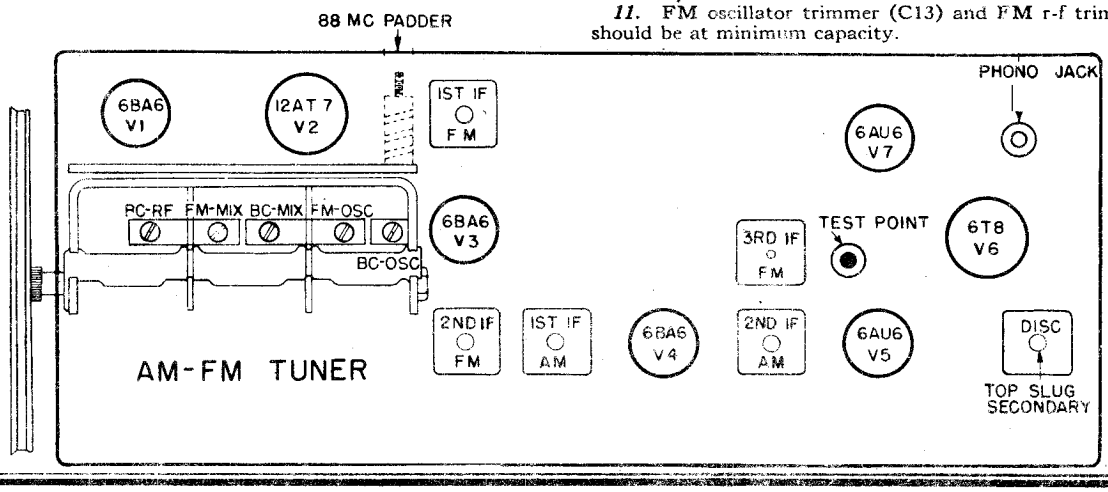
Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM ALIGNMENT			
1	455 KC	Lug on C1E. Conv. tuning condenser	AM	C1 completely open.	Primary and secondary cores of T5 and T2 for maximum.	3, 4
2	1620 KC	Loop Ant. See Note 5.	AM	C1 completely open.	Adjust OSC. C16 for maximum.	3, 4 5, 7, 8
3	1500 KC	Loop Ant. See Note 5.	AM	Rock C1 for max. signal	Adjust RF C25, and ANT. C9 trimmers for maximum.	3, 4 5, 7, 8
			FM ALIGNMENT			
4	10.7 MC AM or FM See Note 9.	6BA6 grid (Pin 1 of V4) thru .01 mfd.	FM	....	T6 secondary (top core) for minimum.	3, 4, 6, 9
5	10.7 MC AM or FM See Note 9.	6BA6 grid (Pin 1 of V4) thru .01 mfd.	FM	....	T6 primary (bottom core) for maximum.	3, 4, 6, 9
6	Retune signal generator for null point obtained in step 4 (10.7 MC).					
7	10.7 MC unmodulated.	6BA6 grid (Pin 1 of V4) thru .01 mfd.	FM	....	Core of L10 for maximum.	1, 2, 10
8	10.7 MC unmodulated.	6BA6 grid (Pin 1 of V3) thru .01 mfd.	FM	....	Primary and secondary cores of T3 for maximum.	1, 2, 10
9	10.7 MC unmodulated.	12AT7 cathode (Pin 8 of V2) thru .01 mfd.	FM	....	Primary and secondary cores of T1 for maximum.	1, 2, 10
10	88 MC unmodulated	Dipole terminals.	FM	88 MC	FM oscillator slug (T9) for maximum.	1, 2, 7, 11
11	108 MC unmodulated	Dipole terminals.	FM	108 MC	Adjust FM oscillator trimmer C13 to 1st peak.	1, 2, 7, 11
12	108 MC unmodulated	Dipole terminals.	FM	108 MC	Adjust FM R-F trimmer (C18) for max. while rocking dial across 108 signal.	1, 2, 7, 11
13	Repeat Steps 10, 11.					

EQUIPMENT REQUIRED

1. Signal Generator, General Electric YGS-3 or equivalent.
2. 20,000 ohm-per-volt meter or vacuum tube voltmeter.
3. Output meter.
4. .01 mfd., paper capacitor.
5. 200,000 ohm resistor.
6. Loop of wire. See Note 5.

ALIGNMENT NOTES

1. Use unmodulated signal.
2. Connect 20,000 ohm-per-volt meter or VTVM from the limiter grid Test Point (J5) near V5 to the chassis. Test voltage will be negative. Use 2.5 volt scale. Keep signal generator output low so that meter indicates not more than 1 volt.
3. Use 400 cycle modulation.
4. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that output meter indicates not more than ½ watt output during alignment (approximately 1.25 volts a-c).
5. For alignment of the AM oscillator and R-F trimmer, the signal should be inductively coupled to the loop antenna by connecting a four turn, six inch diameter loop of wire across the signal generator terminals, located about one foot from the radio loop antenna.
6. When tuning the secondary of T6, two peaks will be obtained. The center null between the two peaks is the correct setting. As the transformer is tuned either side of 10.7 MC, the meter reading should increase.
7. Before adjusting oscillator for proper dial calibration, set pointer at index line near 88 MC mark by slipping along dial string as required. Have tuning gang completely closed.
8. C9 ANT. trimmer to be readjusted after chassis and loop are installed in cabinet. Peak on weak station at approximately 1400 KC.
9. When detuning the signal generator in step 5, two maximum meter readings will be obtained, one on each side of 10.7 MC. The primary of T6 should be aligned to maximum when the signal generator is tuned to the smaller of these two peaks.
10. Make all chassis connections for FM-IF alignment as short as possible.
11. FM oscillator trimmer (C13) and FM r-f trimmer (C9) should be at minimum capacity.



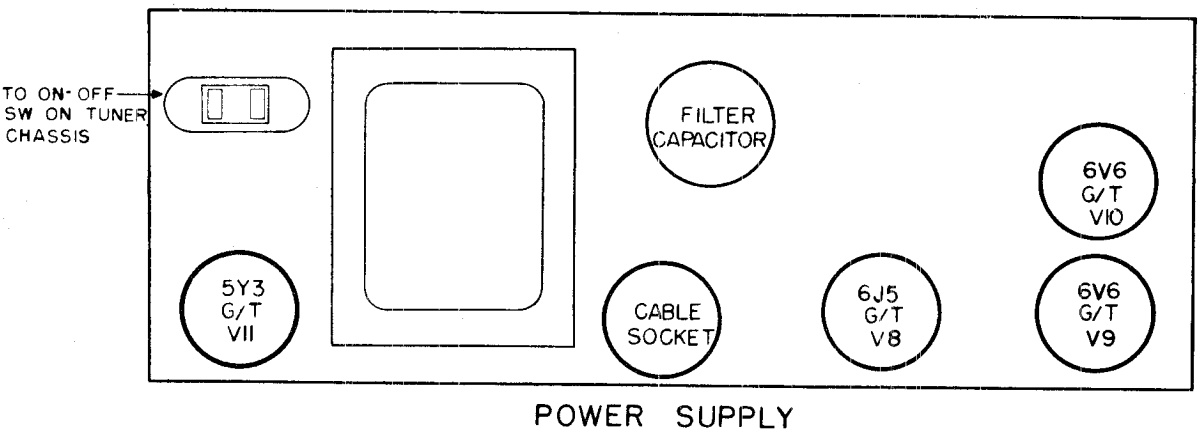


Fig. 1. Tube and trimmer location

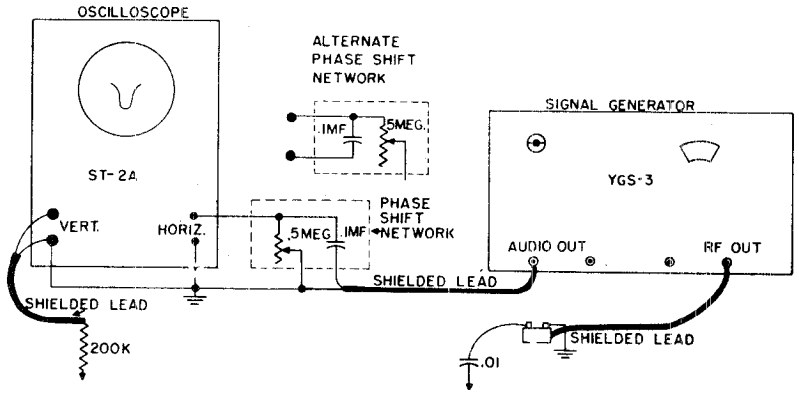


Fig. 2. Visual alignment equipment

PHASE SHIFT NETWORK

Connect 60 cps audio signal from the signal generator to the HORIZONTAL AMPLIFIER terminals on the scope through a phase shift network, as shown in Fig. 2, which permits the double traces on the scope to be joined together. The alternate phase shift network may be required on scopes other than General Electric Model ST-2A.

VISUAL ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM ALIGNMENT			
1	455 kc FM mod. ±20 kc at 60 cps rate	Lug on C1E conv. tuning cond.	AM	. . . .	T2 and T5 for max. amplitude of curve. See Fig. 3A.	3
2	1620 kc AM mod. with 60 cps.	Inductively coupled to antenna loop.		Gang C1 completely open.	C16 (BC-Osc.) for steepest slope of straight line on scope. See Fig. 3-C.	3, 6
3	1500 kc FM mod. ±20 kc at 60 cps rate.			Gang C1 for max. amplitude of curve.	C25 (BC-Mix.) for max. amplitude of curve. See Fig. 3-A.	3, 4, 5, 6

MODEL 775

FM ALIGNMENT

4	10.7 mc FM mod. ± .3 mc at 60 cps rate.	Lug on C1B thru .01 mfd.	FM	....	Cores of T1, T3, and L10 for max. amplitude of curve. See Fig. 3-A.	1
5				....	Secondary of T6 for symmetry of curve of Fig. 3-B.	3
6				....	Primary of T6 for max. amplitude of positive and negative peak.	3
7	Repeat Step 5.					
8	88 mc AM mod. at 60 cps.	FM antenna terminals.		At 88 mc	Core of T9 for steepest slope. See Fig. 3-C.	1, 2
9	108 mc AM mod. at 60 cps.			At 108 mc	C39 (FM-OSC.) for steepest slope of straight line trace on scope. Fig. 3-C.	1, 2, 4
10	108 mc FM mod. ± .3 mc at 60 cps rate.			Rock in C1 for max.	Adjust C18 (FM-MIX) for max. amplitude of response. See Fig. 3-A.	1, 2, 4
11	Repeat Steps 8, 9.					

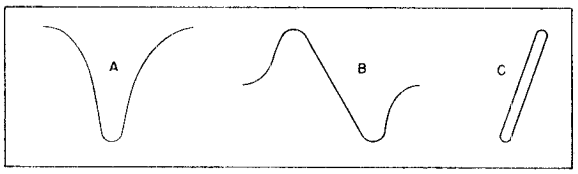


Fig. 3. Alignment curves

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT

1. General Electric YGS-3 or equivalent sweep generator.
2. General Electric ST-2A scope or equivalent.
3. 200 K, ½ watt resistor.
4. ½ meg., potentiometer.
5. One .1 paper capacitor.

NOTES FOR VISUAL ALIGNMENT

1. Connect vertical plates of scope to the grid of the limiter tube (pin 1 of V5) through the Test Point and to chassis. Reduce input from signal generator until "grass" begins to appear on scope.
2. Set pointer at index line near 88 mc mark by slipping pointer along dial string as required. Have tuning gang completely closed.
3. Connect vertical plates of scope at junction of C57 and TONE SW. S2B through 200 K res. Reduce input from signal generator until "grass" begins to appear on scope.
4. In some cases tuning of the converter grid will cause "pulling in" of the oscillator and will change the oscillator frequency. If peaking C9 or C18 as in steps 3 or 10 causes the curve to move off the screen, it is necessary to recalibrate the oscillator as in steps 2 and 9.
5. C9 (BC-RF) trimmer to be adjusted after chassis and loop are installed in cabinet. Peak on weak station at approximately 1400 kc.
6. For alignment of the AM oscillator and r-f trimmers, the signal should be inductively coupled to the loop antenna, by connecting a four-turn, six-inch diameter loop of wire to the signal generator terminals. Locate this loop about one foot from the radio loop antenna.

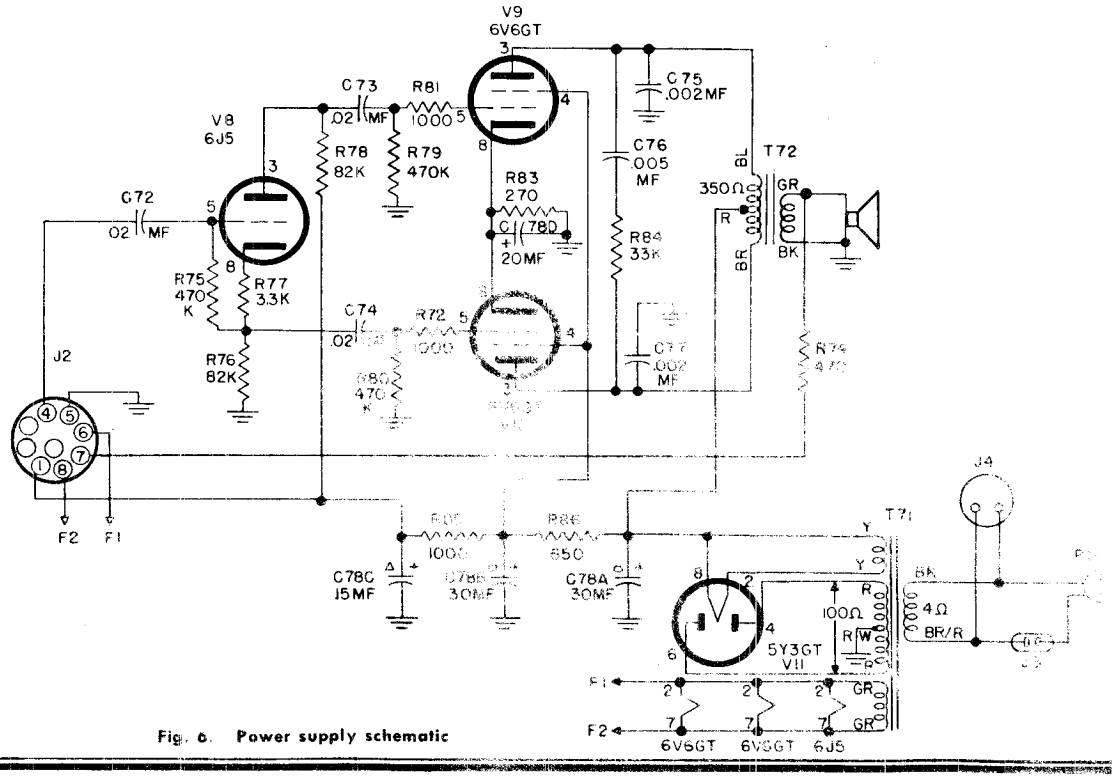
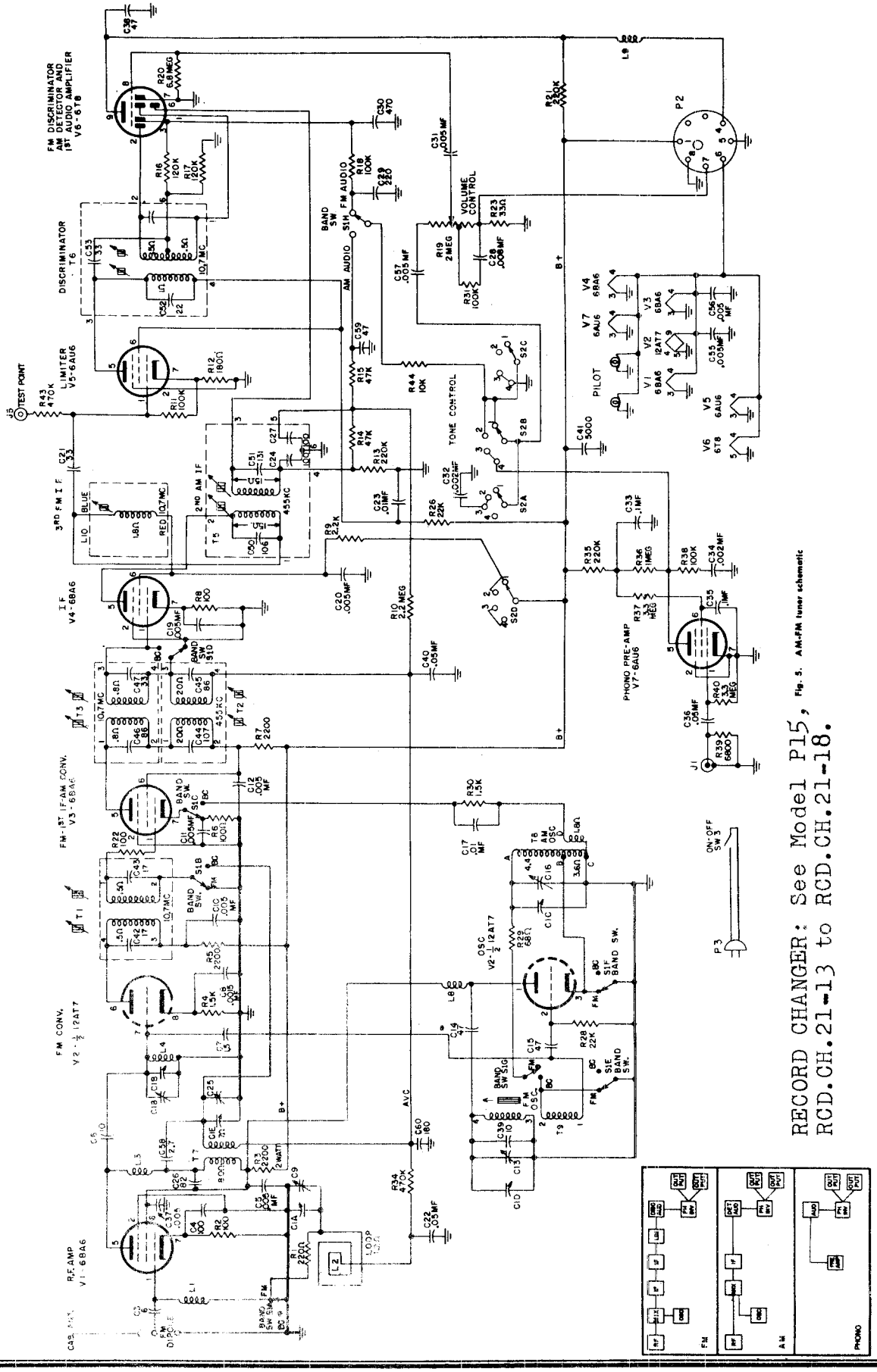


Fig. 6. Power supply schematic

MODEL 755

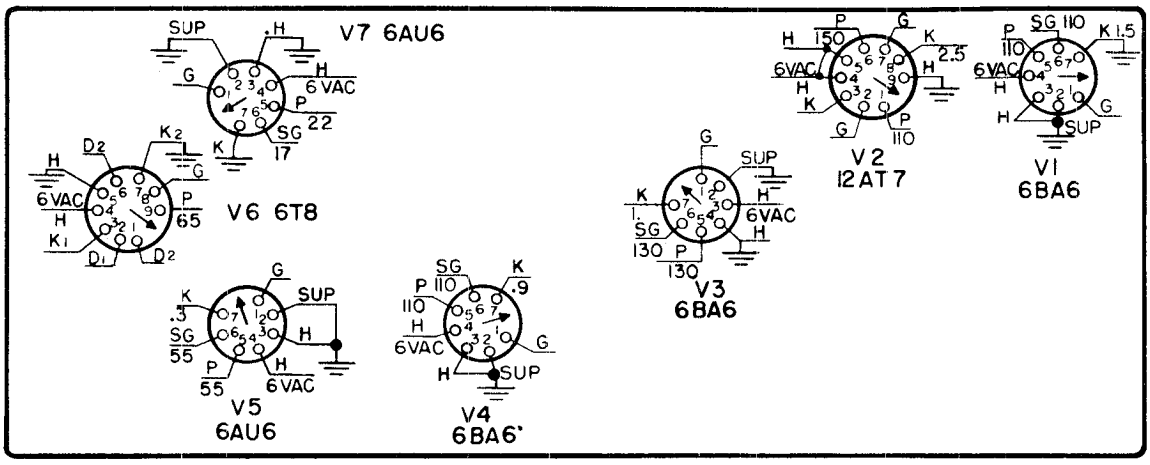


RECORD CHANGER: See Model P15, RCD.CH.21-13 to RCD.CH.21-18.

Fig. 5. AM-FM tuner schematic

Fig. 4. Block diagram

MODEL 755



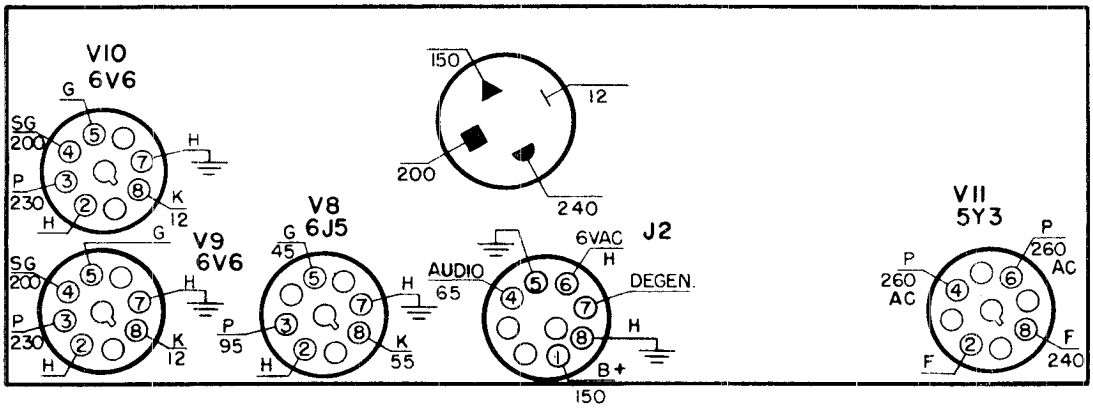


Fig. 7. Socket voltages

SOCKET VOLTAGES—TEST CONDITIONS: Band switch on FM—Tone switch on Radio—117 volts AC line—No signal input—Measured to chassis with 20,000 ohm-per-volt meter, volume control minimum.

NOTE: 6 volt heater circuit actually grounded at Tuner chassis only.

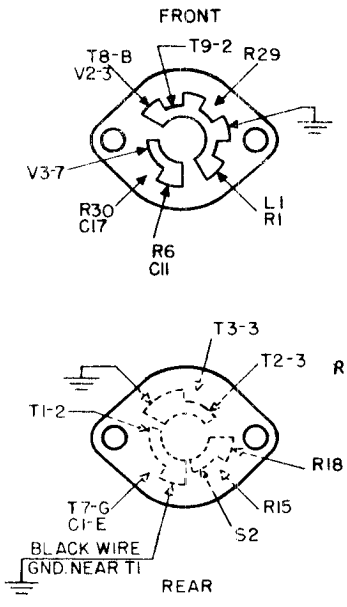


Fig. 8. Band switch

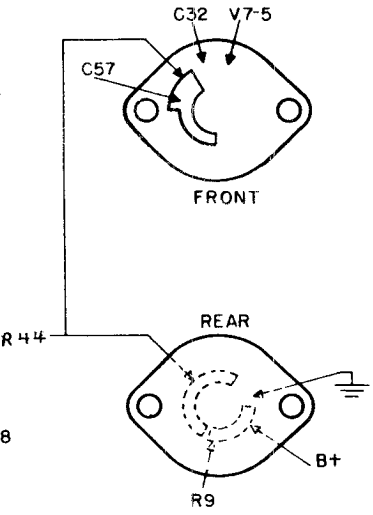


Fig. 9. Tone switch

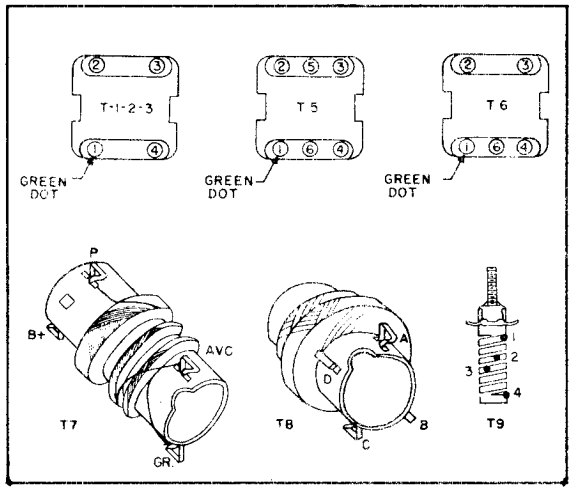


Fig. 10. Transformer connections

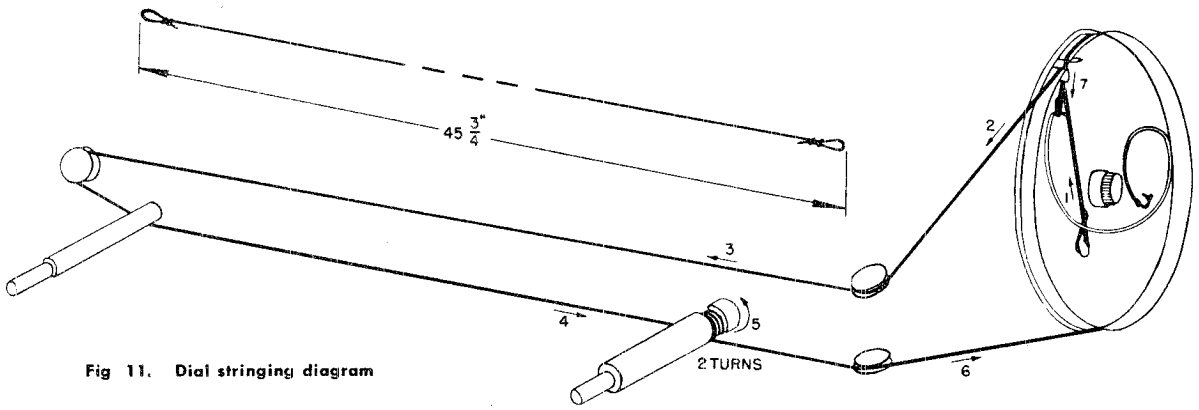


Fig 11. Dial stringing diagram

REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
*RAA-002		ARM—Switch arm (shaft)
*RAA-003		ARM—Switch arm (switch)
RAB-145		BACK—Cabinet back, Model 755
*RAC-084		COVER—Changer pan cover
RAD-057		BRACKET—FM osc. transformer mounting bracket
RAV-142		CABINET—Mahogany, Model 755
*RCE-039	C78	CAPACITOR—Filter, 30-30 mf. @ 350 v., 15 mf. @ 300 v., 20 mf. @ 25 v.
RCN-040	C3	CAPACITOR—6 mmf., silver mica
RCN-048	C7	CAPACITOR—1.5 mmf., ceramic
RCT-047	C1	CAPACITOR—Tuning gang capacitor
*RCW-026	C8	CAPACITOR—.0015 mfd., ceramic
RCW-1058	C37	CAPACITOR—10 mmf., mica
*RCW-3014	C5, 10, 11, 12, 19, 41, 53, 55, 56	CAPACITOR—.005 mfd., ceramic
*RCW-3029	C4	CAPACITOR—100 mmf., ceramic
RCW-3039		CAPACITOR—2.7 mmf., ceramic
*RDC-032		DIAL CORD—25 yds., bulk
RDE-098		ESCUTCHEON—Plastic dial escutcheon, includes dial window
*RDK-212		KNOB—Pull-out knob on phono changer cover
RDK-233		KNOB—Tuning knob
RDK-234		KNOB—Band switch knob (arrow)
RDK-235		KNOB—Volume control knob
RDK-236		KNOB—Tone switch knob (dot)
RDM-025		WIRE—Dial pointer guide wire
RDP-058		POINTER—Dial pointer
*RHC-017		CLIP—Mounting clip for BC oscillator transformer
*RHC-034		CLIP—Mounting clip for IF transformers
*RHC-038		CLIP—Mounting clip for BC RF transformer
*RHG-010		GROMMET—Preamplifier socket mounting grommet
*RHG-015		GROMMET—Tuning gang mounting grommet
*RHG-029		GROMMET—Speaker lead insulator grommet
*RHI-011		INSULATOR—Strain relief insulator for power cord
*RHJ-006		SLEEVE—Tuning gang mounting sleeve
*RHM-001		WASHER—"C" washer for tuning shaft
RHN-015		NUT—Guide wire retaining nut
*RHS-058		SCREW—¾ in. wood screw for bottom of escutcheon
*RHS-064		SCREW—⅞ in. wood screw, for top of escutcheon
*RHS-066		SCREW—Hex head screw for tuning gang mounting
*RJC-002		CONNECTORS—Loop and speaker wire connectors
*RJJ-008	J3	RECEPTACLE—AC power receptacle
*RJP-002	P4	PLUG—AC power plug for phono motor
*RJP-004	P1	PLUG—Phono audio input plug
*RJS-003		SOCKET—Octal wafer socket, for V8, V9, V10, V11
*RJP-010	J1	JACK—Phono audio input jack
*RJS-012		PLATE—Mounting plate for filter condenser
*RJS-040	J4	RECEPTACLE—Phono motor power receptacle
*RJS-094		SOCKET—7 pin socket, for V7
*RJS-118		SOCKET—9 pin socket, for V6
RJS-143		SOCKET—9 pin socket, for V2
*RJS-145		SOCKET—7 pin socket, for V1, V3, V4, V5
*RJS-147		SOCKET—Pilot light socket
RJS-152	J2	SOCKET—Inter-chassis cable socket
RJS-153	P2	PLUG—Inter-chassis cable plug
RJS-154		SHELL—Cable plug shell
*RLC-104	T9	TRANSFORMER—FM oscillator transformer
*RLC-106	T8	TRANSFORMER—BC oscillator transformer
*RLI-122	L8	CHOKE—Oscillator plate choke, molded
*RLI-124	L2, 9	CHOKE—Audio filter choke, RF plate choke, 18 turns
RLI-128	L6	CHOKE—FM mixer grid choke, 6 turns
RLI-129	T7	TRANSFORMER—BC RF transformer
RLI-130	L1	CHOKE—FM antenna choke, 11 turns
RLL-039	L2	LOOP—BC antenna loop
*RMM-151		GASKET—Phono changer rubber mounting gasket
*RMM-153		MOUNT—Phono drawer slide mount
*RMS-119		SPRING—Dial cord spring
*RMS-221		SPRING—Phono mounting spring
RMU-066		SHAFT—Band switch drive shaft
RMU-067		SHAFT—Tuning shaft
*RQB-001		BRUSH—Stylus brush
RRC-152	R19; S2, 3	CONTROL—On-Off switch, tone switch, volume control, 2 meg.
RRW-056	R85,86	RESISTOR—Filter resistor, 650 ohms-10 w.; 1000 ohms-8 w.; w.w.
RSW-085	S1	SWITCH—Band switch
*RTD-010	T6	TRANSFORMER—FM discriminator transformer
RTL-079	T2	TRANSFORMER—1st IF-AM transformer
RTL-100	L10	TRANSFORMER—3rd IF-FM transformer
*RTL-111	T5	TRANSFORMER—2nd IF-AM transformer
*RTL-112	T1	TRANSFORMER—1st IF-FM transformer
*RTL-113	T3	TRANSFORMER—2nd IF-FM transformer
RTO-094	T72	TRANSFORMER—Output transformer
RTP-306	T71	TRANSFORMER—Power transformer
*RWL-004	P3, 5	CORD—Power cord and plug
*S1212-D7		SPEAKER—12-inch PM speaker
*UCC-036	C32, 34	CAPACITOR—.002 mfd., 600 v., paper
*UCC-039	C20, 31	CAPACITOR—.005 mfd., 600 v., paper
*UCC-040	C17	CAPACITOR—.01 mfd., 600 v., paper
*UCC-041	C72, 73, 74	CAPACITOR—.02 mfd., 600 v., paper
*UCC-045	C22, 36, 40	CAPACITOR—.05 mfd., 600 v., paper
*UCC-048	C33, 35	CAPACITOR—.1 mfd., 600 v., paper
*UCC-056	C75, 77	CAPACITOR—.002 mfd., 1000 v., paper
*UCC-059	C76	CAPACITOR—.005 mfd., 1000 v., paper
*UCC-070	C28	CAPACITOR—.05 mfd., 600 v., paper
*UCG-004	C5	CAPACITOR—10 mmf., silver mica
*UCG-016	C21	CAPACITOR—3 mmf., silver mica
*UCG-020	C14, 15, 38, 59	CAPACITOR—47 mmf., silver mica
*UCG-1026	C26	CAPACITOR—82 mmf., silver mica
*UCU-044	C30	CAPACITOR—470 mmf., mica
*UCU-536	C29	CAPACITOR—220 mmf., mica
UCU-1034	C60	CAPACITOR—180 mmf., mica
*URD-013	R23	RESISTOR—33 ohms, ½ w., carbon
*URD-021	R29	RESISTOR—68 ohms, ½ w., carbon
*URD-025	R2, 6, 8, 22	RESISTOR—100 ohms, ½ w., carbon
*URD-031	R12	RESISTOR—180 ohms, ½ w., carbon
*URD-033	R1, 41	RESISTOR—220 ohms, ½ w., carbon
*URD-041	R74	RESISTOR—470 ohms, ½ w., carbon
*URD-049	R72, 81	RESISTOR—1000 ohms, ½ w., carbon
*URD-053	R4, 30	RESISTOR—1500 ohms, ½ w., carbon
*URD-057	R5, 7, 9	RESISTOR—2200 ohms, ½ w., carbon
*URD-061	R77	RESISTOR—3.3K ohms, ½ w., carbon
*URD-069	R39	RESISTOR—6.8K ohms, ½ w., carbon
*URD-081	R28	RESISTOR—22K ohms, ½ w., carbon
*URD-089	R14, 15	RESISTOR—47K ohms, ½ w., carbon
*URD-095	R76, 78	RESISTOR—82K ohms, ½ w., carbon
*URD-097	R11, 18, 31, 38	RESISTOR—100K ohms, ½ w., carbon
*URD-099	R16, 17	RESISTOR—120K ohms, ½ w., carbon
*URD-105	R13, 21, 35	RESISTOR—220K ohms, ½ w., carbon
*URD-113	R34, 43, 75, 79, 80	RESISTOR—470K ohms, ½ w., carbon
*URD-121	R36	RESISTOR—1 meg., ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-133	R37, 40	RESISTOR—3.3 meg., ½ w., carbon
*URD-141	R20	RESISTOR—6.8 meg., ½ w., carbon
*URE-081	R26	RESISTOR—22K ohms, 1 w., carbon
*URE-085	R84	RESISTOR—33K ohms, 1 w., carbon
*URF-035	R83	RESISTOR—270 ohms, 2 w., carbon
*URF-057	R3	RESISTOR—2200 ohms, 2 w., carbon
RDS-105		Dial Scale

*Parts used on previous models.

MODEL 757

SPECIFICATIONS

CABINET:

Material	Wood
Color	Mahogany
Height	34 in.
Width	32 in.
Depth	16 in.

ELECTRICAL RATING:

Voltage	105–125
Frequency	60 cycles
Wattage (Radio only)	85 watts
(With phono)	100 watts

AUDIO POWER OUTPUT (120 VOLTS LINE):

Undistorted	6.5 watts
Maximum	8 watts

OPERATING FREQUENCIES:

AM–RF	540–1600 kc
FM–RF	88–108 mc
AM–IF	455 kc
FM–IF	10.7 mc

LOUDSPEAKER:

Type	Alnico PM
Size	12 inches
Voice Coil Impedance at 400 cycles	3.2 ohms

RECORD CHANGER:

Model P16 ..... 33⅓, 45 and 78 RPM

Complete service information for the Model P16 record changer can be found in ER-S-P16.

PHONOGRAPH PICKUP:

Type	Dual stylus, variable reluctance
DC Resistance	340 ohms

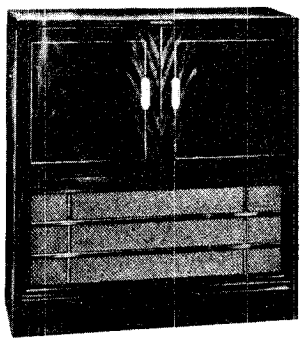
ANTENNA:

AM	Built-in-loop
FM	Cabinet antenna or 300-ohm FM ant.

If it is necessary to install an external FM antenna, the built-in cabinet antenna should be disconnected from the antenna terminas.

TUBE COMPLEMENT:

(V1) R-F Amplifier	6BA6
(V2) Osc. and FM Converter	12AT7
(V3) AM Converter and 1st FM I-F Amplifier	6BA6
(V4) I-F Amplifier	6BA6
(V5) FM Limiter	6AU6
(V6) FM Discriminator, AM Detector and Audio Amplifier	6T8
(V7) Phono Preamplifier	6AU6
(V8) Phase Inverter	6J5
(V9) and (V10) Power Amplifier	6V6 (2)
(V11) Rectifier	5Y3GT
Dial Lamps	Two Mazda No. 47



STAGE GAINS

Stage gain measurements using a vacuum tube voltmeter or oscilloscope with a calibrated signal generator may be used to check circuit performance and isolate trouble. Use small signals to eliminate AVC action. Tolerance 20%. Signal applied through 3.3K resistor and 1000 mmfd. capacitor in series.

STAGE	GAIN AM	GAIN FM
Ant. to V1 Grid	.....	1 (98 MC)
V1—V2 Grid	.....	6 (98 MC)
V1—V3 Grid	14 (1000 KC)	.....
V2—V3 Grid	.....	10 (10.7 MC)
V3—V4 Grid	70 (455 KC)	45 (10.7 MC)
V4—V5 Grid	.....	20 (10.7 MC)
V4—V6 Grid	80 (455 KC)	.....

OSCILLATOR GRID BIAS:

D-C voltage developed across R28. Use 100K resistor to isolate meter. Tolerance 20%.

	VTM	20K ohms/volt meter
1000 KC	7 volts	4 volts
98 MC	3 volts	2 volts

AUDIO GAIN:

0.1 volt at 400 cps across the volume control will give approximately ½ watt (1.25 v. a-c) across the speaker voice coil.

AUIDO POWER:

With a 400-cycle signal driving the 6V6GT output tubes sufficiently to begin to overload the output circuit as shown by distortion of the waveshape on an oscilloscope, an output meter at the speaker terminals should read about 4.5 volts. Maximum possible output is about 5 volts.

HUM MEASUREMENT:

With the volume control at minimum, an oscilloscope connected through a 0.25 mfd. capacitor across C78A shows a 12-volt sawtooth wave; across C78B, 1 volt rounded hump wave. (Both peak-to-peak.)

Hum measured across C78A with a 1000 ohms/volt output meter in series with a 1.0 mf capacitor should not exceed 5 volts RMS; across C78B .2 of a volt.

Hum at the speaker voice coil should not exceed .007 volt RMS.

MODEL 757

METER ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM ALIGNMENT			
1	455 KC	Lug on C1E. Conv. tuning condenser	AM	C1 completely open.	Primary and secondary cores of T5 and T2 for maximum.	3, 4
2	1620 KC	Loop Ant. See Note 5.			Adjust OSC. C16 for maximum.	3, 4 5, 7, 8
3	1500 KC	Loop Ant. See Note 5.		Rock C1 for max. signal	Adjust RF C25, and ANT. C9 trimmers for maximum.	
			FM ALIGNMENT			
4	10.7 MC AM or FM See Note 9.	6BA6 grid (Pin 1 of V4) thru .01 mfd.	FM	....	T6 secondary (top core) for minimum.	3, 4, 6, 9
5				....	T6 primary (bottom core) for maximum.	
6	Retune signal generator for null point obtained in step 4 (10.7 MC).					
7	10.7 MC unmodulated.	6BA6 grid (Pin 1 of V4) thru .01 mfd.	FM	....	Core of L10 for maximum.	1, 2, 10
8		6BA6 grid (Pin 1 of V3) thru .01 mfd.		....	Primary and secondary cores of T3 for maximum.	
9		12AT7 cathode (Pin 8 of V2) thru .01 mfd.		....	Primary and secondary cores of T1 for maximum.	
10	88 MC unmodulated	Dipole terminals.		88 MC	FM oscillator slug (T9) for maximum.	1, 2, 7, 11
11	108 MC unmodulated	Dipole terminals.		108 MC	Adjust FM oscillator trimmer C13 to 1st peak.	
12	108 MC unmodulated	Dipole terminals.		108 MC	Adjust FM R-F trimmer (C18) for max. while rocking dial across 108 signal.	
13	Repeat Steps 10, 11.					

METER ALIGNMENT

EQUIPMENT REQUIRED

1. Signal Generator, General Electric YGS-3 or equivalent.
2. 20,000 ohm-per-volt meter or vacuum tube voltmeter.
3. Output meter.
4. .01 mfd., paper capacitor.
5. 200,000 ohm resistor.
6. Loop of wire. See Note 5.

ALIGNMENT NOTES

1. Use unmodulated signal.
2. Connect 20,000 ohm-per-volt meter or VTVM from the limiter grid Test Point (J5) near V5 to the chassis. Test voltage will be negative. Use 2.5 volt scale. Keep signal generator output low so that meter indicates not more than 1 volt.
3. Use 400 cycle modulation.
4. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that output meter indicates not more than ½ watt output during alignment (approximately 1.25 volts a-c).
5. For alignment of the AM oscillator and R-F trimmer, the signal should be inductively coupled to the loop antenna by connecting a four turn, six inch diameter loop of wire across the signal generator terminals, located about one foot from the radio loop antenna.
6. When tuning the secondary of T6, two peaks will be obtained. The center null between the two peaks is the correct setting. As the transformer is tuned either side of 10.7 MC, the meter reading should increase.
7. Before adjusting oscillator for proper dial calibration, set pointer at index line near 88 MC mark by slipping along dial string as required. Have tuning gang completely closed.
8. C9 ANT. trimmer to be readjusted after chassis and loop are installed in cabinet. Peak on weak station at approximately 1400 KC.
9. When detuning the signal generator in step 5, two maximum meter readings will be obtained, one on each side of 10.7 MC. The primary of T6 should be aligned to maximum when the signal generator is tuned to the smaller of these two peaks.
10. Make all chassis connections for FM-IF alignment as short as possible.
11. FM oscillator trimmer (C13) and FM r-f trimmer (C9) should be at minimum capacity.

MODEL 757

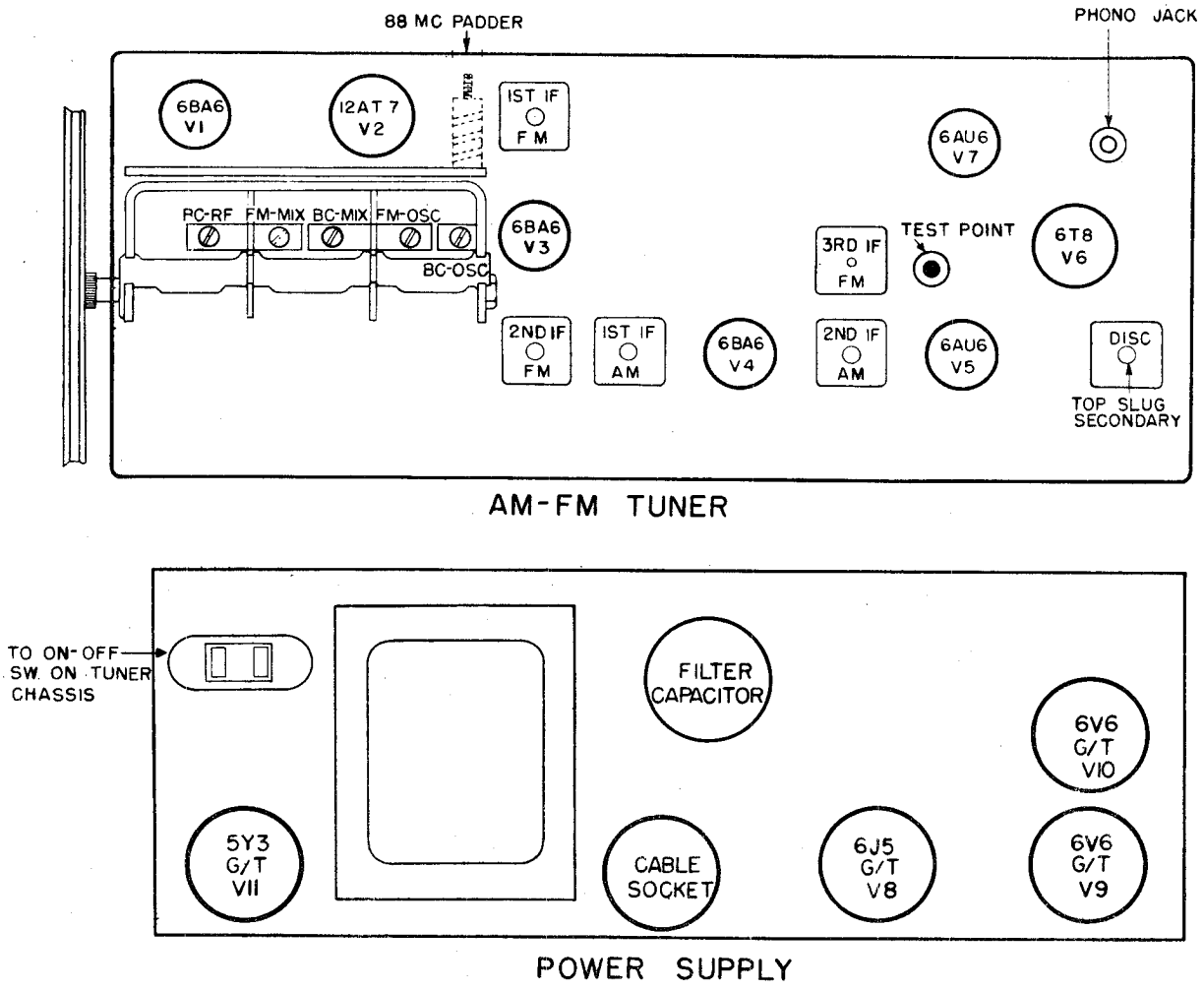


Fig. 1. Tube and Trimmer Location

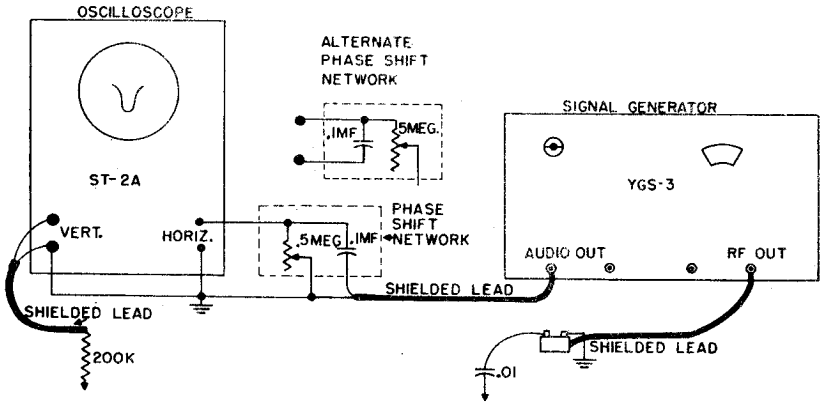


Fig. 2. Visual Alignment Equipment

PHASE SHIFT NETWORK

Connect 60 cps audio signal from the signal generator to the HORIZONTAL AMPLIFIER terminals on the scope through a phase shift network, as shown in Fig. 2, which permits the double traces on the scope to be joined together. The alternate phase shift network may be required on scopes other than General Electric Model ST-2A.

VISUAL ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM ALIGNMENT			
1	455 kc FM mod. ±20 kc at 60 cps rate	Lug on C1E conv. tuning cond.	AM		T2 and T5 for max. amplitude of curve. See Fig. 3A.	3
2	1620 kc AM mod. with 60 cps.	Inductively coupled to antenna loop.		Gang C1 completely open.	C16 (BC-Osc.) for steepest slope of straight line on scope. See Fig. 3-C.	3, 6
3	1500 kc FM mod. ±20 kc at 60 cps rate.			Gang C1 for max. amplitude of curve.	C25 (BC-Mix.) for max. amplitude of curve. See Fig. 3-A.	3, 4, 5, 6
			FM ALIGNMENT			
4	10.7 mc FM mod. ±.3 mc at 60 cps rate.	Lug on C1B thru .01 mfd.	FM	....	Cores of T1, T3, and L10 for max. amplitude of curve. See Fig. 3-A.	1
5				....	Secondary of T6 for symmetry of curve of Fig. 3-B.	3
6				....	Primary of T6 for max. amplitude of positive and negative peak.	3
7	Repeat Step 5.					
8	88 mc AM mod. at 60 cps.	FM antenna terminals.		At 88 mc	Core of T9 for steepest slope. See Fig. 3-C.	1, 2,
9	108 mc AM mod. at 60 cps.			At 108 mc	C39 (FM-OSC.) for steepest slope of straight line trace on scope. Fig. 3-C.	1, 2, 4
10	108 mc FM mod. ±.3 mc at 60 cps rate.			Rock in C1 for max.	Adjust C18 (FM-MIX) for max. amplitude of response. See Fig. 3-A.	1, 2, 4
11	Repeat Steps 8, 9.					

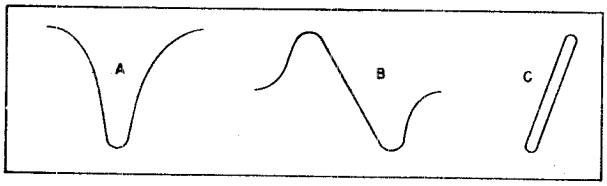


Fig. 3. Alignment Curves

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT

1. General Electric YGS-3 or equivalent sweep generator.
2. General Electric ST-2A scope or equivalent.
3. 200 K, ½ watt resistor.
4. ½ meg., potentiometer.
5. One .1 paper capacitor.

NOTES FOR VISUAL ALIGNMENT

1. Connect vertical plates of scope to the grid of the limiter tube (pin 1 of V5) through the Test Point and to chassis. Reduce input from signal generator until "grass" begins to appear on scope.
2. Set pointer at index line near 88 mc mark by slipping pointer along dial string as required. Have tuning gang completely closed.
3. Connect vertical plates of scope at junction of C57 and TONE SW. S2B through 200 K res. Reduce input from signal generator until "grass" begins to appear on scope.
4. In some cases tuning of the converter grid will cause "pulling in" of the oscillator and will change the oscillator frequency. If peaking C9 or C18 as in steps 3 or 10 causes the curve to move off the screen, it is necessary to recalibrate the oscillator as in steps 2 and 9.
5. C9 (BC-RF) trimmer to be adjusted after chassis and loop are installed in cabinet. Peak on weak station at approximately 1400 kc.
6. For alignment of the AM oscillator and r-f trimmers, the signal should be inductively coupled to the loop antenna, by connecting a four-turn, six-inch diameter loop of wire to the signal generator terminals. Locate this loop about one foot from the radio loop antenna.

MODEL 757

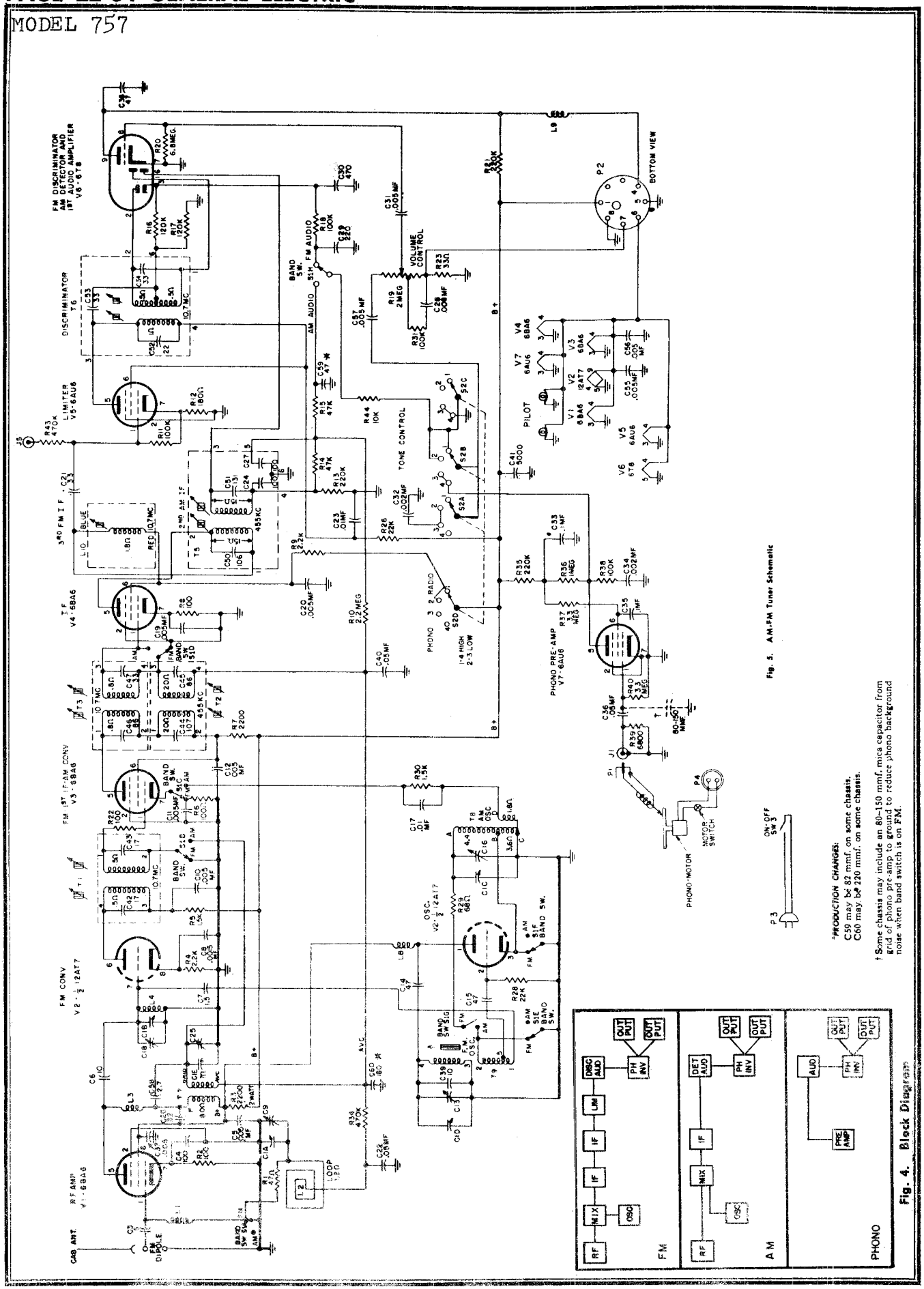


Fig. 4. Block Diagram

Fig. 5. A.M.-F.M. Tuner Schematic

*PRODUCTION CHANGES:
C59 may be 82 mmf. on some chassis.
C60 may be 220 mmf. on some chassis.

†Some chassis may include an 80-150 mmf. mica capacitor from grid of phono pre-amp to ground to reduce phono background noise when band switch is on FM.

MODEL 757

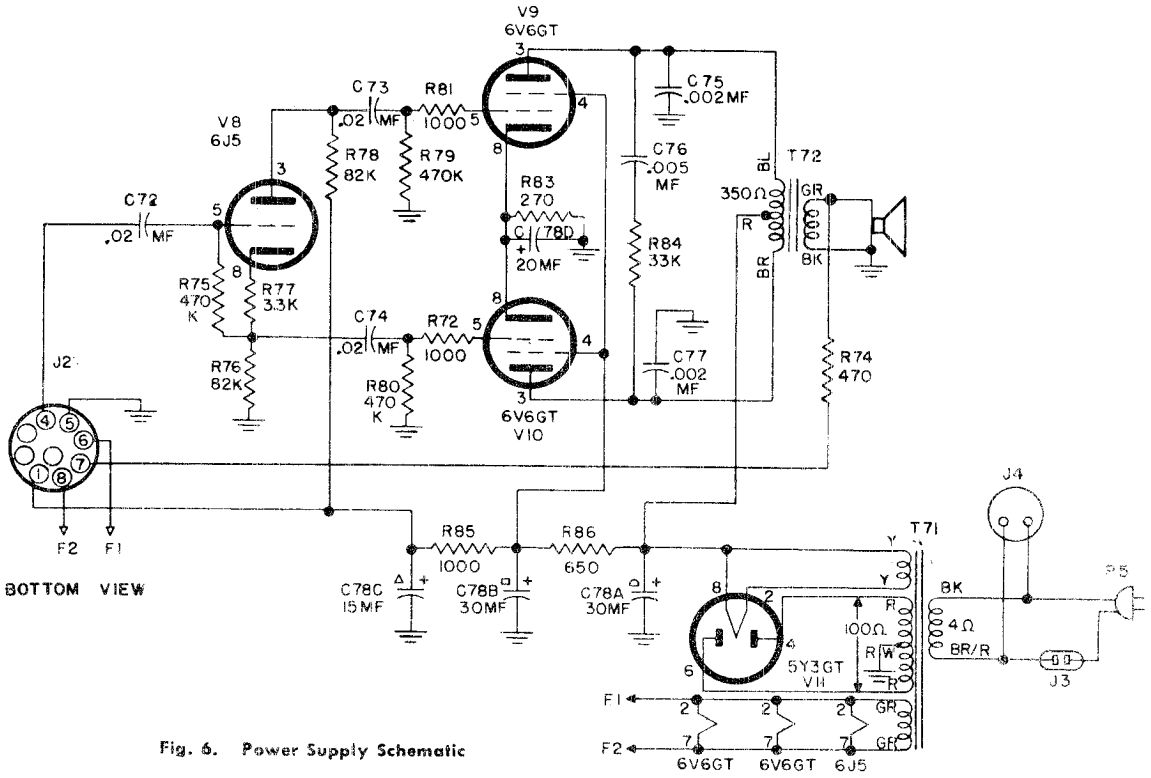
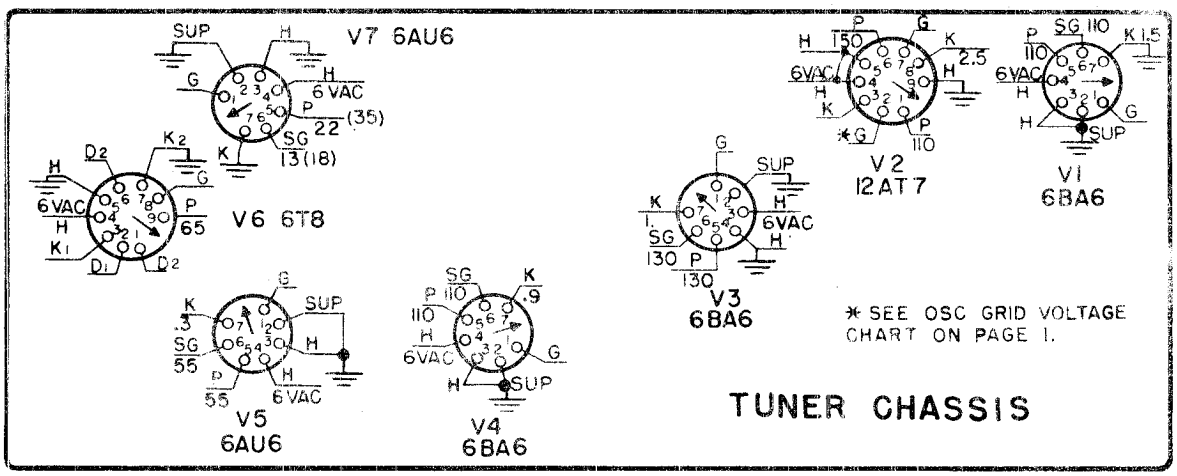


Fig. 6. Power Supply Schematic



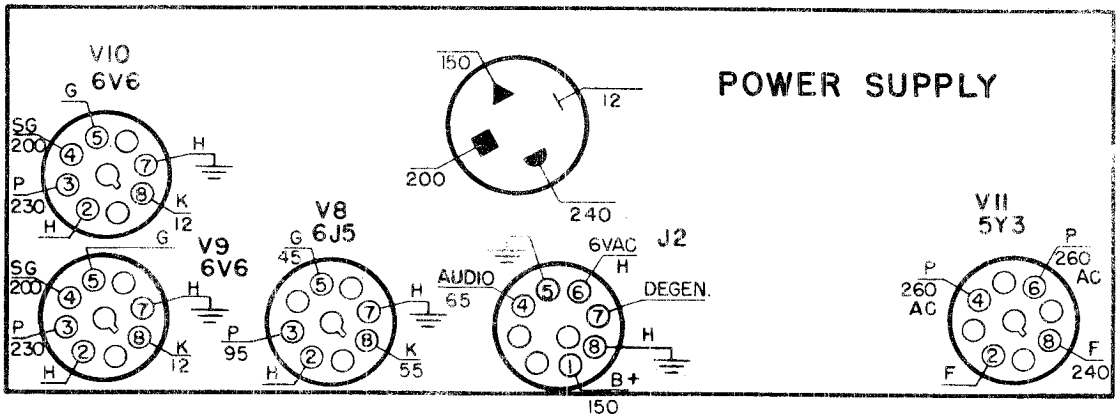


Fig. 7. Socket Voltages

SOCKET VOLTAGES—TEST CONDITIONS: Band switch on FM—Tone switch on Radio—117 volts AC line—No signal input—Measured to chassis with 20,000 ohm-per-volt meter, volume control minimum. (35) indicates VTVM reading.

NOTE: 6 volt heater circuit actually grounded at Tuner chassis only.

MODEL 757

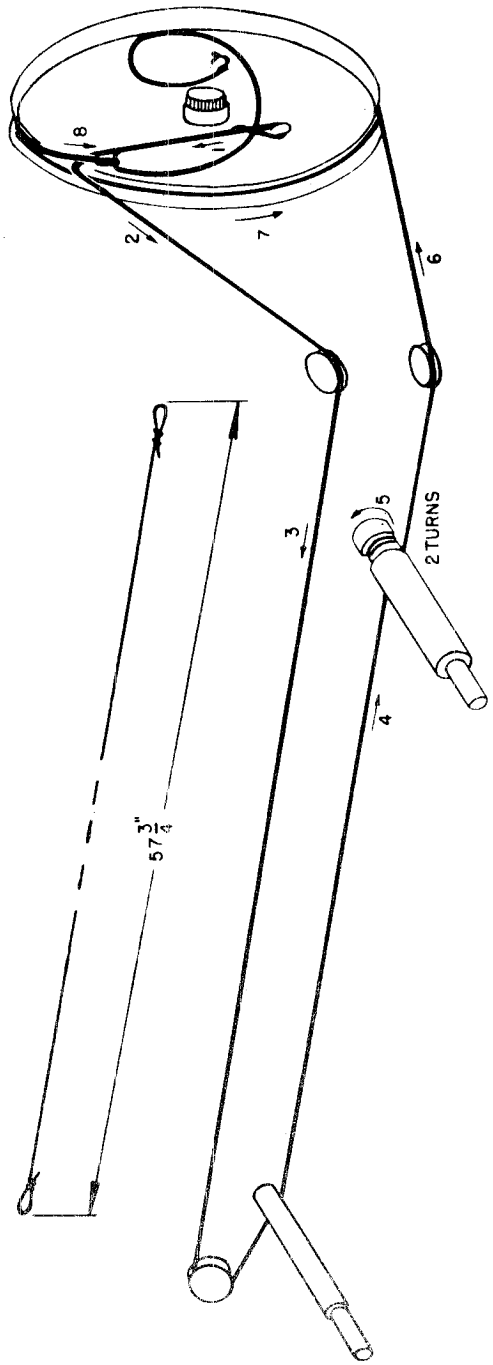


Fig. 11. Dial Stringing Diagram

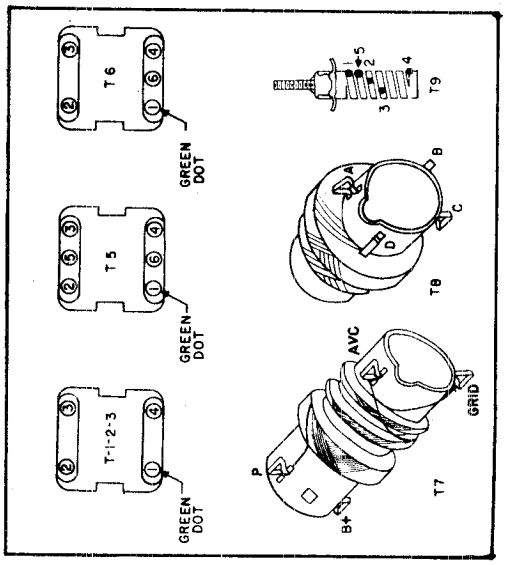


Fig. 10. Transformer Connections

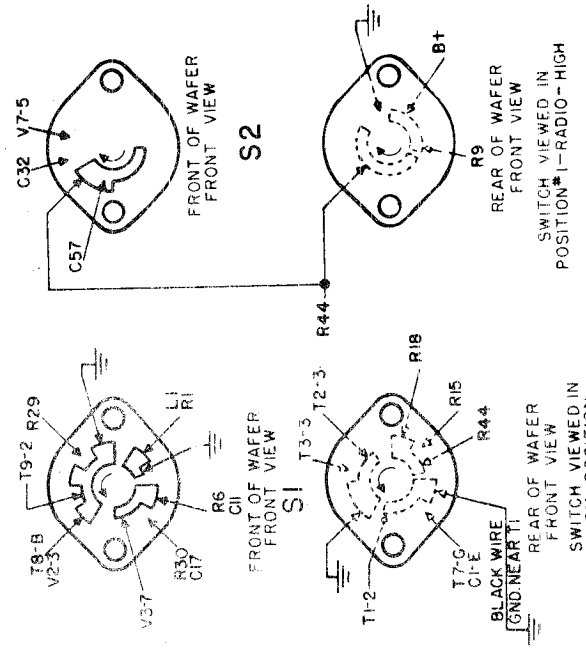


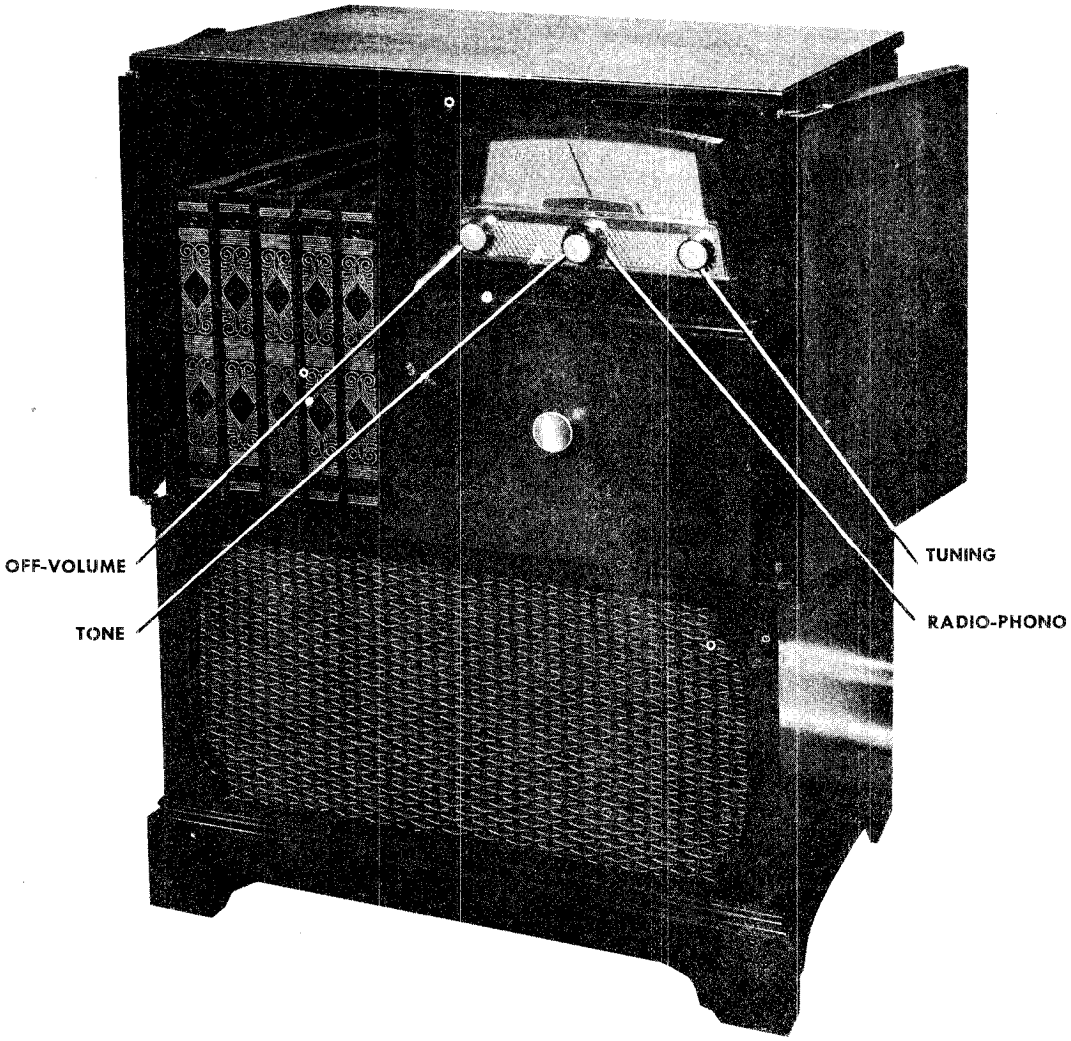
Fig. 8. Single Wafer Band Switch Fig. 9. Single Wafer Tone Switch

MODEL 757
REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		CAPACITORS
		Values are ±10% unless noted
*RCE-039	C78	Filter, 30-30 mfd @ 300 v., 20 mfd. @ 25 v. electrolytic
*RCN-040	C3	6 mmf., silver mica
*RCN-048	C7	1.5 mmf., ceramic
RCT-052	C1	Tuning gang capacitor (insulated shaft)
*RCW-026	C8	.0015 mfd., ceramic
RCW-1058	C37	10 mmf., ceramic
*RCW-3014	C5, 10, 11, 12, 19, 41, 55, 56	.005 mfd., ceramic
*RCW-3029	C4	100 mmf., ceramic
*RCW-3039	C58	2.7 mmf., ceramic
*UCC-036	C32, 34	.002 mfd., 600 v., paper
*UCC-039	C20, 31	.005 mfd., 600 v., paper
*UCC-040	C17	.01 mfd., 600 v., paper
*UCC-041	C72, 73, 74	.02 mfd., 600 v., paper
*UCC-045	C22, 36, 40	.05 mfd., 600 v., paper
*UCC-048	C33, 35	.1 mfd., 600 v., paper
*UCC-056	C75, 77	.002 mfd., 1000 v., paper
*UCC-059	C76	.005 mfd., 1000 v., paper
*UCC-070	C28	.008 mfd., 600 v., paper
*UCG-044	C6	10 mmf., silver mica
*UCG-016	C21	33 mmf., silver mica
*UCG-020	C14, 15, 38, 59	47 mmf., silver mica
*UCG-1026	C26	82 mmf., silver mica
*UCU-044	C30	470 mmf., 500 v., mica
*UCU-536	C29	220 mmf., 500 v., mica
*UCU-1034	C60	180 mmf., mica
		RESISTORS
*RRW-056	R85, 86	Filter resistor, 650 ohms, 10 w., 1000 ohms, 8 w., w. w.
		½ watt, carbon ±10%
*URD-013	R23	33 ohms
*URD-017	R1	47 ohms
*URD-021	R29	68 ohms
*URD-025	R2, 6, 8, 22	100 ohms
*URD-031	R12	180K ohms
*URD-033	R41	220 ohms
*URD-041	R74	470 ohms
*URD-049	R72, 81	1000 ohms
*URD-053	R5, 30	1500 ohms
*URD-057	R4, 7, 9	2200 ohms
*URD-061	R77	3.3K ohms
*URD-069	R39	6.8K ohms
*URD-073	R44	10K ohms
*URD-081	R28	22K ohms
*URD-089	R14, 15	47K ohms
*URD-095	R76, 78	82K ohms
*URD-097	R11, 18, 31, 38	100K ohms
*URD-099	R16, 17	120K ohms
*URD-105	R13, 21, 35	220K ohms
*URD-113	R34, 43, 75, 79, 80	470K ohms
*URD-121	R36	1 meg.
*URD-129	R10	2.2 meg.
*URD-133	R37, 40	3.3 meg.
*URD-141	R20	6.8 meg.
*URE-081	R26	22K ohms—1 watt, carbon, ±10%
*URE-085	R84	33K ohms—1 watt, carbon, ±10%
*URF-035	R83	270 ohms—2 watt, carbon, ±10%
*URF-057	R3	2200 ohms—1 watt, carbon, ±10%
		MISCELLANEOUS ELECTRICAL
*RJC-001		CONNECTOR—Loop wire connector
*RJC-019		CONNECTOR—Speaker wire connector
*RJJ-008	J3	RECEPTACLE—AC power outlet receptacle
*RJP-003	P4	PLUG—AC plug for phono motor
*RJP-004	P1	PLUG—Phono audio input plug
*RJP-031	P2	PLUG—Inter-chassis cable plug
*RJS-003		SOCKET—Octal wafer socket, for V8, V9, V10, V11
*RJS-049	J4	RECEPTACLE—Phono motor power receptacle
*RJS-092		SOCKET—7 pin impregnated wafer socket
*RJS-101		JACK—Phono jack
*RJS-118		SOCKET—9 pin socket for V6
*RJS-143		SOCKET—9-pin socket for V2
*RJS-145		SOCKET—7 pin socket for V1, V3, V4, V5
*RJS-147		SOCKET—Pilot light socket
*RJS-152	J2	SOCKET—Inter-chassis cable socket
*RJS-154		SHELL—Cable plug shell

Cat. No.	Symbol	Description
		MISCELLANEOUS ELECTRICAL (Cont'd)
*RLC-106	T8	TRANSFORMER—BC oscillator transformer
*RLC-111	T9	TRANSFORMER—FM oscillator transformer
*RLI-122	L8	CHOKE—Oscillator plate choke, red, molded, 2.2 uh
*RLI-124	L3, 9	CHOKE—Audio filter choke, RF plate choke, 18 turns
*RLI-128	L4	CHOKE—FM RF grid choke, 6 turns
*RLI-129	T7	TRANSFORMER—BC RF transformer
RLL-047	L2	LOOP—BC Antenna loop
*RRC-152	R19, S2, S3	CONTROL—On-off switch, tone switch, and volume control, 2 meg.
RSW-087	S1	SWITCH—Band switch
*RTD-010	T6, C52, C53, C54	TRANSFORMER—FM discriminator transformer, 10.7 mc, capacitors molded in base
*RTL-079	T2, C44, C45	TRANSFORMER—BC 1st IF transformer, 455 kc, capacitors molded in base
*RTL-111	T5, C24, C27, C50, C51	TRANSFORMER—BC 2nd IF transformer, 455 kc, capacitors molded in base
*RTL-112	T1, C42, C43	TRANSFORMER—FM 1st IF transformer, 10.7 mc, capacitors molded in base
*RTL-113	T3, C46, C47	TRANSFORMER—FM 2nd IF transformer, 10.7 mc, capacitors molded in base
*RTL-124	L10	CHOKE—3rd IF FM choke
*RTO-094	T72	TRANSFORMER—Output transformer
*RTP-306	T71	TRANSFORMER—Power transformer
*RWL-009	P3, 5	CORD—AC line cord and plug
*S-1212D-7		SPEAKER—12 inch PM speaker
		MISCELLANEOUS MECHANICAL
*RAA-002		ARM—Switch arm (for shaft)
*RAA-003		ARM—Switch arm (for switch)
*RAD-057		BRACKET—FM oscillator transformer mounting bracket
*RDC-032		CORD—Nylon dial cord, 25 yds. bulk
*RDM-025		WIRE—Dial pointer guide wire
*RDP-058		POINTER—Dial pointer and slide assembly
RDS-105		SCALE—Dial scale printed on chassis cover plate
*RHC-017		CLIP—Mounting clip for BC oscillator transformer
*RHC-034		CLIP—Mounting clip for I-F transformers
*RHC-038		CLIP—Mounting clip for BC RF trans.
*RHG-010		GROMMET—Preamp. socket mounting grommet
*RHG-015		GROMMET—Tuning gang mounting grommet
*RHG-029		GROMMET—Speaker lead insulating grommet
*RHI-011		INSULATOR—Strain relief insulator for power chassis power cord, .52" diameter
*RHI-017		INSULATOR—Strain relief insulator for tuner chassis power cord, .47" diameter
*RHJ-006		SLEEVE—Tuning gang mounting sleeve
*RHM-001		WASHER—"C" washer for tuning shaft
*RHN-015		NUT—Dial guide wire retaining nut
*RHS-066		SCREW—Hex head screw for tuning gang mounting
*RJS-012		PLATE—Mounting plate for filter capacitor
*RMS-119		SPRING—Dial cord tension spring
*RMS-221		SPRING—Record changer pan slide spring
*RMU-066		SHAFT—Band switch drive shaft
*RMU-067		SHAFT—Tuning shaft
*RQB-001		BRUSH—Stylus brush
		CABINET PARTS
RAB-166		BACK—Cabinet back for Model 757
RAC-098		PAN—Record changer base pan
†RAV-168		CABINET—Mahogany cabinet for Model 757
*RDE-098		ESCUTCHEON—Plastic dial escutcheon, includes dial window
*RDK-212		KNOB—Changer pan pull-out knob
*RDK-233		KNOB—Tuning knob
*RDK-234		KNOB—Band switch knob, with arrow
*RDK-235		KNOB—Volume control knob
*RDK-236		KNOB—Tone switch knob, with dot
*RHS-057		SCREW—Wood screw for cabinet back
*RHS-058		SCREW—7/16 inch brass plated wood screw for top of escutcheon
*RHS-064		SCREW—⅜ inch brass plated wood screw for bottom of escutcheon
*RHS-077		SCREW—Wood screw for mounting loop
*RMM-153		SLIDE—Phono drawer slide

MODEL 741



SPECIFICATIONS

CABINET:

Material	Wood
Height	34 7/8 inches
Width	25 15/16 inches
Depth	16 11/16 inches

ELECTRICAL (INPUT):

Voltage (AC only)	105–120
Frequency	60 cps
Wattage (on Radio)	35
Wattage (on Phono)	55

OPERATING FREQUENCIES:

Broadcast Band	540–1600 kc
I-F Amplifier	455 kc

POWER OUTPUT (117 Volts Line):

Undistorted	1 watt
Maximum	2 watts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	10 inches
Voice Coil Impedance at 400 cps	3.2 ohms

PHONOGRAPH PICKUP:

Type	High Output Variable Reluctance
Cat. No.	RPX-048
Stylus Cat. No.	RPJ-014

RECORD CHANGER:

P16	33 1/3, 45 and 78 RPM

TUBE COMPLEMENT:

V1	RF Amplifier	12SK7
V2	Oscillator Converter	12SA7
V3	IF Amplifier and Phono Preamp	6AU6
V4	Detector-Audio Amplifier	12SQ7
V5	Rectifier	35Z5GT/G
V6	Audio Power Amplifier	50L6GT
I1	Pilot Lamp	GE Mazda No. 47

GENERAL

This receiver is a superheterodyne radio, phonograph combination. The receiver employs five tubes and a rectifier. The I-F amplifier V3 (6AU6) is also used as a phono preamplifier.

This receiver uses a new high output variable reluctance pickup RPX-048. When replacing the pickup it must be replaced with an RPX-048 pickup to insure proper operation of the phonograph. When replacing the dual stylus assembly replace only with an RPJ-014 dual stylus assembly.

CAUTION

One side of the power line is connected to B−. Use an isolation transformer when making service adjustments with the chassis removed from the cabinet.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring device may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20 per cent. Readings are taken with low signal input so that AVC is not effective.

1. I-F Gain

12SA7 Grid to 6AU6 Grid. . . . . .50 @ 455 KC
6AU6 Grid to 12SQ7 Diode Plate. . .50 @ 455 KC

2. Audio Gain

Input of 0.15 volts at 400 cycles across volume control (R22) with control set at maximum will develop approximately ½ watt output across the speaker voice coil terminals.

3. Oscillator Grid Bias

DC voltage developed across the oscillator grid leak (R3) averages 8.5 volts at 1000 kc.

4. Hum Measurement

Hum measured across the voice coil of the speaker with the volume control set at minimum and band switch in the radio position should not exceed 12 millivolts.

PRODUCTION CHANGE

On early production R11 was a 1 meg 20% resistor and R12 was a 470,000 ohm 20% resistor. To improve phono sensitivity R11 was changed to 1.2 megohm 10% (URD-123) and R12 was changed from a 20% to a 10% tolerance resistor. The voltage on phono at the plate pin 5 of V3 should not drop below 13 volts as measured by a vacuum tube voltmeter.

TOUBLE SHOOTING NOTE

A gassy 12SA7 or 12SK7 may cause poor A.V.C. action thereby overloading the R.F. circuits and causing audio distortion at any setting of the volume control.

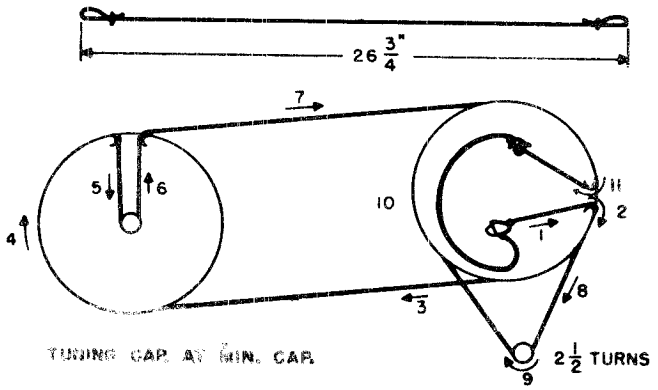


FIG. 1. STRINGING DIAGRAM

ALIGNMENT PROCEDURE

1. The chassis must be removed from the cabinet for I-F oscillator and r-f adjustments, steps 1 through 5. For alignment of the antenna trimmer on the loop, step 6, the chassis and loop should be mounted in position in the cabinet.

Connect an output meter across the speaker leads and make the necessary adjustments for maximum reading on the meter.

2. An isolation transformer should be used for the receiver power source when aligning or servicing these receivers to prevent short circuiting of equipment and shock hazard.

3. The output meter should be connected across the terminals of the loudspeaker voice coil.

4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than ½ watt output at the loudspeaker.

5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to B minus.

6. To align the antenna trimmer, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

7. Switch S2 should be in radio position during alignment.

ALIGNMENT CHART

Step	Connect Test Oscillator Between	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
	I-F ALIGNMENT			
1	V3, 6AU6 grid (Pin 1), in series with .05 mfd and B minus	455 KC		C7 and C8 of second i-f transformer, T3
2	V2, 12SA7 grid (Pin 8) in series with .05 mfd and B minus			C5 and C6 of first i-f transformer, T2
3				Recheck C8, C7, C6, C5 for max.
	R-F ALIGNMENT			
4	V1, 12SK7 grid (Pin 4) in series with .05 mfd and B minus	1620 KC	Minimum capacity	C2B, oscillator trimmer
5	V1, 12SK7 grid (Pin 4) in series with .05 mfd and B minus	1500 KC	Tune for Maximum	C3B, r-f trimmer
6	Inductively coupled to the loop. See Note 6	1500 KC	Tune for Maximum	C1A antenna trimmer on loop

MODEL 741

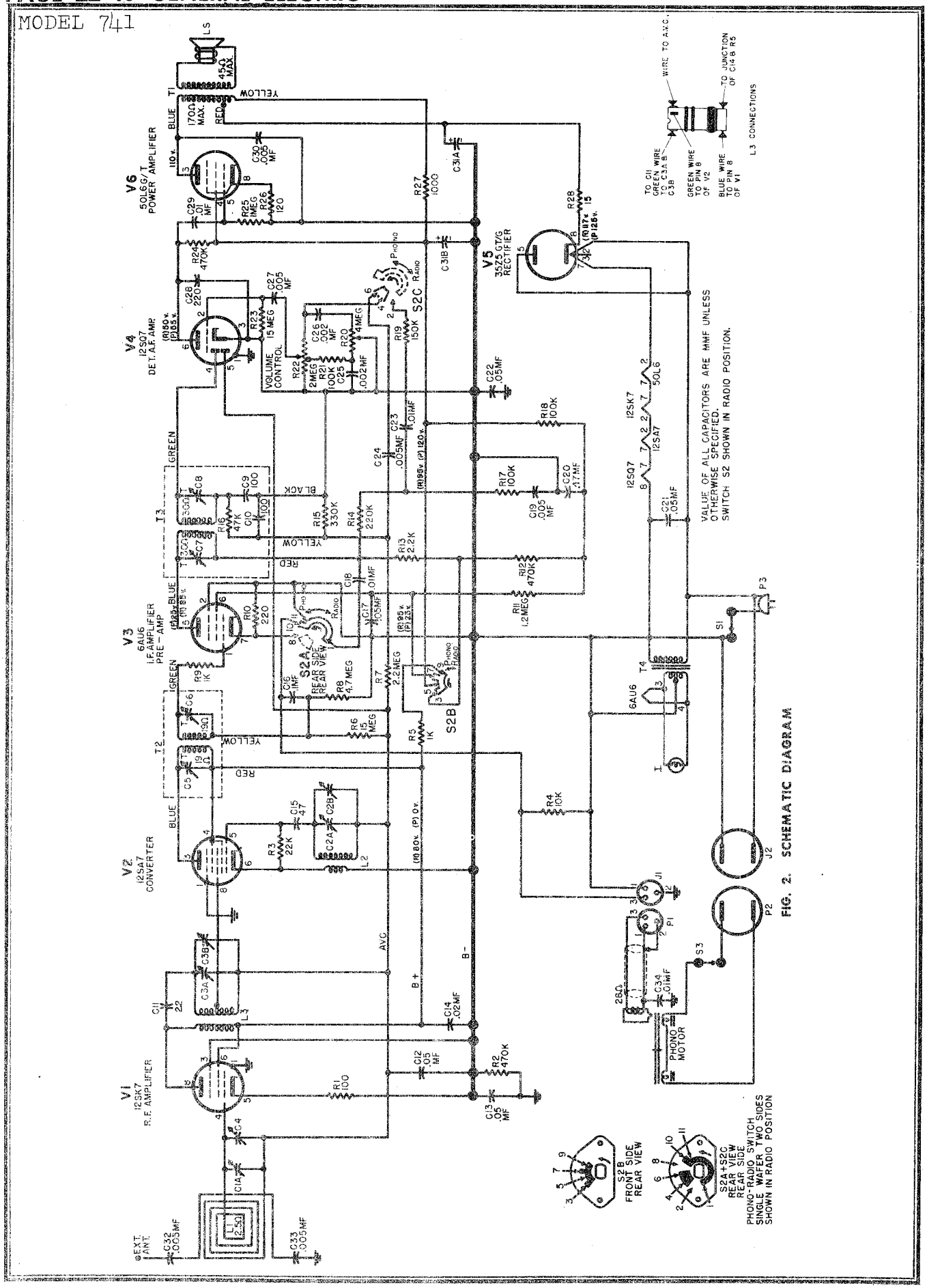


FIG. 2. SCHEMATIC DIAGRAM

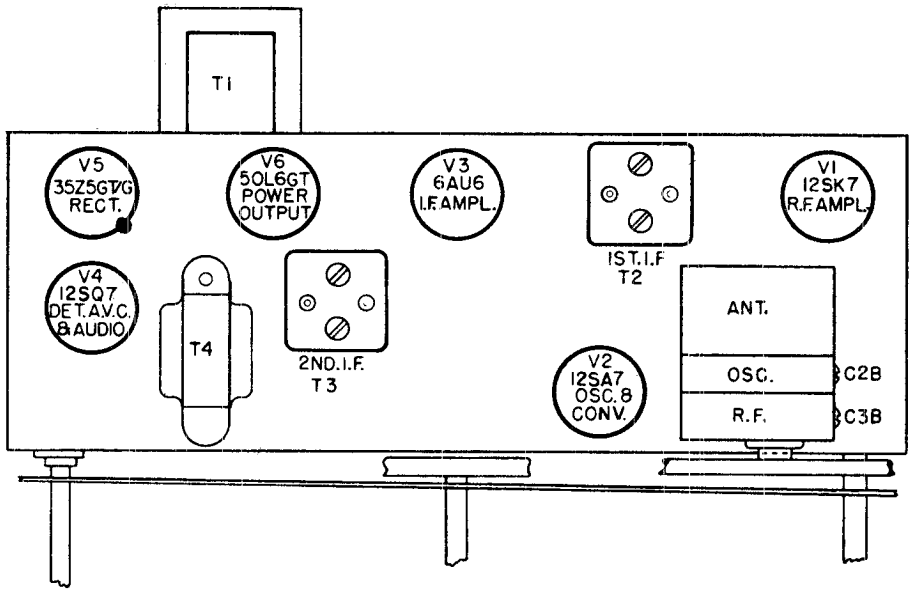
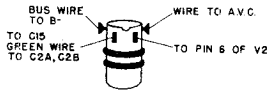


FIG. 3. TUBE AND TRIMMER LOCATION



L2 CONNECTIONS

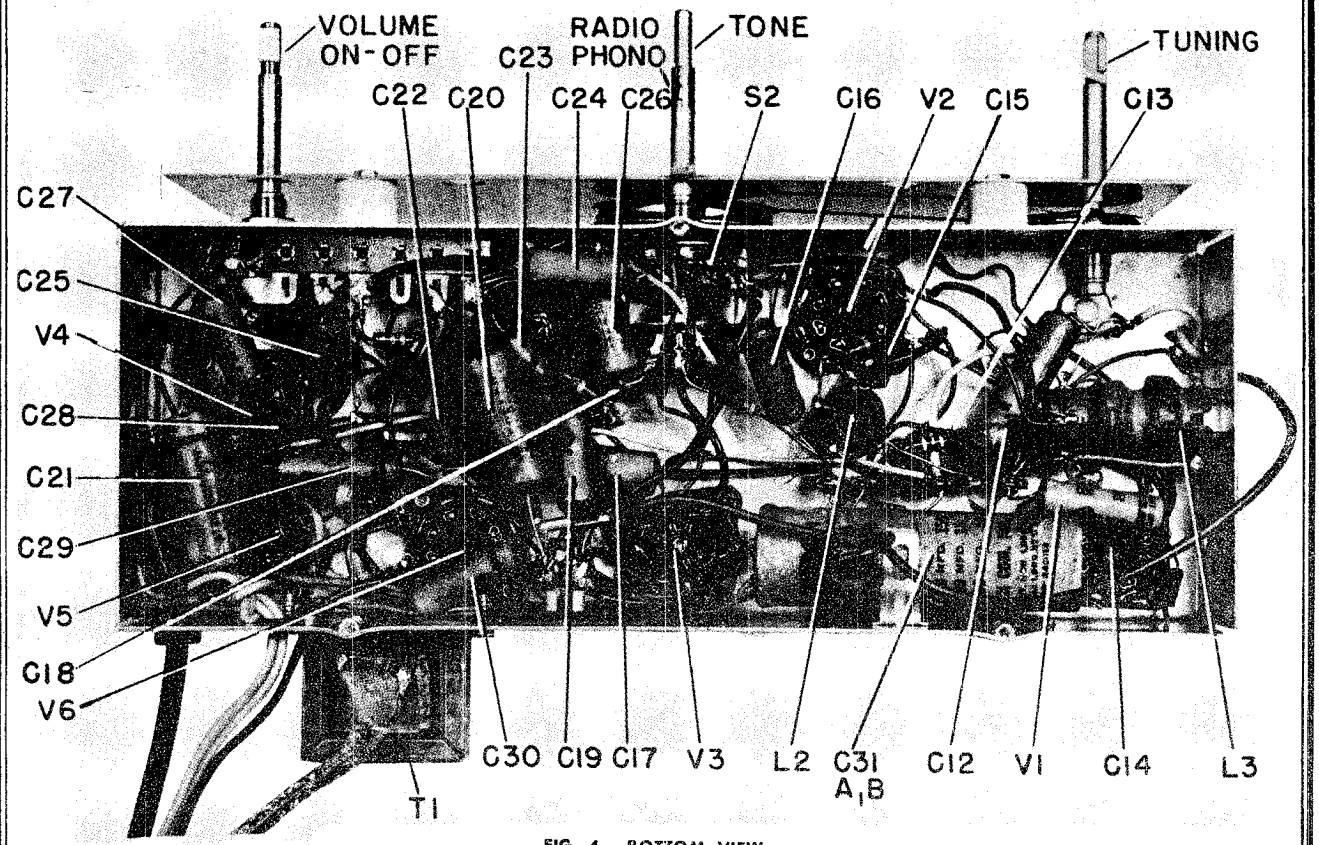
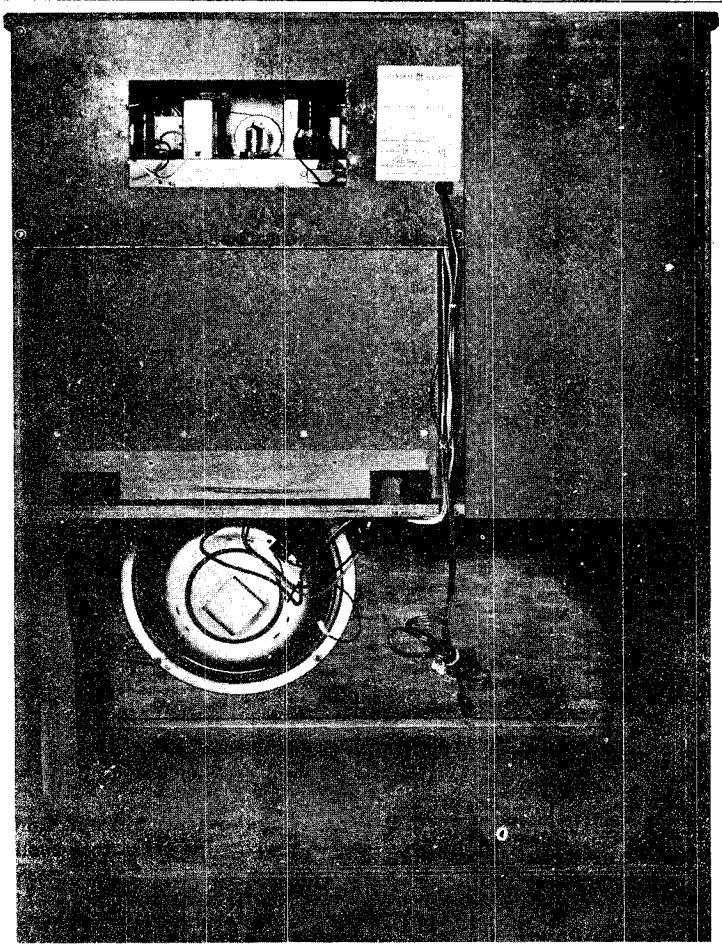


FIG. 4. BOTTOM VIEW

MODEL 741



MODEL 741 REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		CAPACITORS
RCC-110	C15	.1 mfd, 200 v
RCE-135	C31A, B	Electrolytic
*RCM-039	C11	2.2 mmf, silver mica
*RCT-048	C1A, 2A, 2B, 3A, 3B	Tuning gang
*RCY-016	C4	Trimmer
*UCG-020	C15	47 mmf, silver mica
*UCG-1036	C28	220 mmf, silver mica
*UCC-036	C25, 26	.002 mf., 600 v, paper
*UCC-039	C19, 24, 27, 30, 32, 33	.005 mf, 600 v, paper
*UCC-040	C18, 23, 29	.01 mf, 600 v, paper
*UCC-041	C14	.02 mf, 600 v, paper
*UCC-045	C12, 13, 17, 21, 22	.05 mf, 600 v, paper
*UCC-048	C20	.1 mf, 600 v, paper
		RESISTORS
*RRC-151	R22, S1	Volume and switch
RRC-167	R20, S2	Tone and switch
*URD-005	R28	15 ohms, ½ w
*URD-025	R1	100 ohms, ½ w
*URD-037	R36	120 ohms, ½ w
*URD-033	R16	220 ohms, ½ w
*URD-049	R5, 9	1000 ohms, ½ w
*URD-057	R13	2,200 ohms ½ w
*URD-073	R4	10,000 ohms, ½ w
*URD-081	R3	22,000 ohms, ½ w
*URD-097	R17, 18, 21	100,000 ohms, ½ w
*URD-101	R19	150,000 ohms, ½ w
*URD-105	R14	220,000 ohms, ½ w
*URD-109	R15	330,000 ohms, ½ w
*URD-113	R2, 12, 24	470,000 ohms, ½ w
*URD-121	R25	1 meg, ½ w
*URD-123	R11	1.2 meg, ½ w
*URD-129	R7	2.2 meg, ½ w
*URD-137	R8	4.7 meg, ½ w
*URD-149	R6, 23	15 meg, ½ w
*URF-049	R27	1000 ohms, 2 w
		COILS AND TRANSFORMERS
*RLC-105	L2	OSCILLATOR COIL
*RLI-125	L3	R.F. TRANSFORMER
*RTF-001	T4	FILAMENT TRANSFORMER
*RTL-115	T2, C5, C6	1ST I.F. TRANSFORMER
*RTL-116	T3, C7, 8, 9, 10, R16	2ND I.F. TRANSFORMER
RTO-111	T1	OUTPUT TRANSFORMER

Cat. No.	Symbol	Description
		MISCELLANEOUS ELECTRICAL
*RJC-019		PINS—Speaker lead
RJP-003	P2	PLUG—Phono power (male)
*RJS-003		SOCKET—Tube for V1, V2, V4, V5, V6
*RJS-049	J2	SOCKET—Phono power female
*RJS-097	J1	SOCKET—Phono on chassis
*RJS-141		SOCKET—Tube for V3
RJX-007	P1	PLUG—Phono (male)
RJX-031		SOCKET—Pilot lamp
RPJ-014		STYLUS—Dual stylus for pickup RPX-048
RPX-048		PICKUP—High output dual stylus pickup
*RWL-004		CORD—Power
		MISCELLANEOUS MECHANICAL
*RDC-032		DIAL CORD (25 y'ds)
RDP-062		POINTER
RDS-108		BACK PLATE AND DIAL SCALE
*RHC-017		CLIP—For oscillator coil L2
*RHC-038		CLIP—R.F. coil mtg.
*RHC-024		CLIP—Capacitor
*RHG-018		GROMMET—Gang mtg.
*RHG-029		GROMMET—Phono power cord
*RHI-017		STRAIN RELIEF (Power cord)
*RHJ-007		SPACER—Gang mtg.
*RMC-002		CLIP—Osc. coil
*RMS-130		SPRING—Dial cord
RMX-174		DRIVE SHAFT AND BUSHING—For tuning control
*ROP-018		SPEAKER—10 in.
*RQB-001		BRUSH—Record changer
		CABINETS AND CABINET PARTS
RAB-168	L1	LOOP AND BACK ASSEMBLY
RAV-171		CABINET—Model 741
RDE-122		ESCUTCHEON & DIAL WINDOW
RDK-257		KNOB—(Brown) Volume OFF-ON tuning
RDK-258		KNOB—(Brown) for switch
RDK-259		KNOB—(Brown) (Tone)

*Parts used on previous models.

MODEL S-40B

GENERAL

Tubes . . . . . Seven plus rectifier

Speaker . . . . . 5-inch PM

Speaker V.C. Impedance . 3.2 ohms

Headset Output . . . . . Low Impedance

Antenna . . . . . Provision for external antenna

Tuning. . . . . Manual

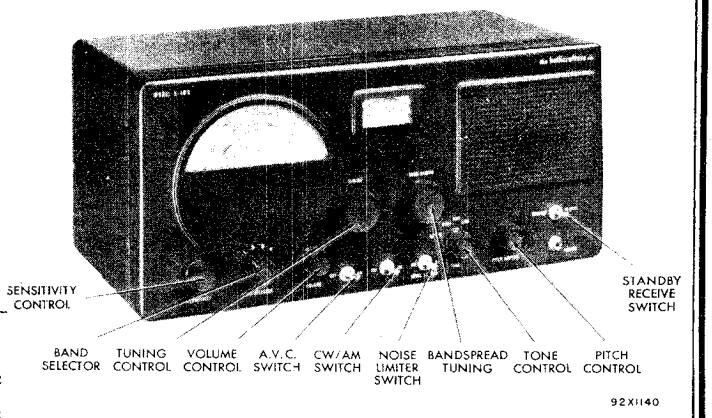
Tuning Range . . . . . Band Selector Position / Frequency Range

Band Selector Position	Frequency Range
1.	540 kc - 1680 kc
2.	1680 kc - 5.4 mc
3.	5.3 mc - 15.5 mc
4.	15.5 mc - 44 mc

Intermediate Frequency . 455 kc.

Power Supply . . . . . Standard Model 105-125 V. 60 cycles AC
Universal Model 105-250 V. 25/135 cycles AC

Power Consumption . . . . 75 Watts



RESTRINGING DIAL CORD

To restring the general coverage tuning dial cord, cut an 18-inch length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Follow the numbers "1" through "4", and at position "4" stretch the tension spring and tie the cord securely.

To restring the band spread tuning dial cord cut a 36-inch length of dial cord and follow the procedure as above, starting at position "A" on the diagram. Note that the tuning drive shafts are wrapped with two and a fraction turns of dial cord for proper traction.

REPLACING LAMPS

Refer to Fig. 7 for the location of the two dial lamps used in the receiver. To gain access to defective lamps, reach in through cabinet cover and unclip the dial lamp sockets. The sockets may then be brought out into the open to change the defective lamp. Replace lamps with 6-8 V. Mazda #44 (Blue bead) lamps or equivalent.

ALIGNMENT PROCEDURE

For I-F amplifier alignment it will be necessary to remove the receiver chassis from the cabinet. The chassis is held in the cabinet by three screws along both the bottom edge of the front panel and the rear of the cabinet, and two screws on either side of the front panel.

NOTE - R-F alignment should be accomplished through the holes provided in the cabinet bottom as the oscillator calibration will be effected slightly by changes in the capacity between the cabinet bottom and the r-f coils and wiring.

Before starting the alignment procedure, check the position of the general coverage dial index marker on the low frequency end of the range and the bandspread dial on zero position. The general coverage condenser should index at max. capacity, and the bandspread condenser at min. capacity.

The standard RMA dummy antenna mentioned in the alignment chart consists of a 200 mmf. condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

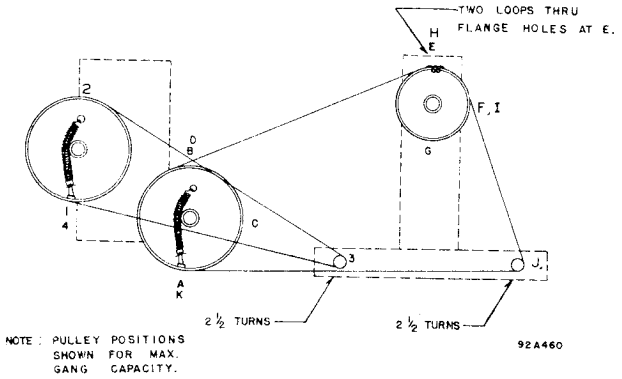


Fig 1. Dial cable stringing procedure

Set the following controls before alignment.

SENSITIVITY . . . . . Set at maximum

VOLUME . . . . . Set at maximum

AVC switch. . . . . Set at OFF

BAND SPREAD . . . . . Set at zero

CW/AM . . . . . Set at AM (See Step 2)

NOISE LIMITER . . . . . Set at OFF

STANDBY RECEIVE . . . . . Set at RECEIVE

TONE SWITCH . . . . . Set at HIGH

For the settings of the remaining controls, see alignment chart.

MODEL S-40B

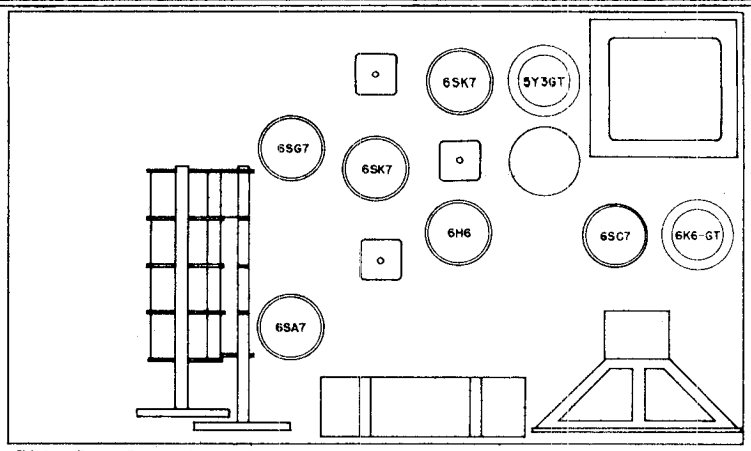


Fig. 7. Top view, location of tubes and dial lamps

92S881-A

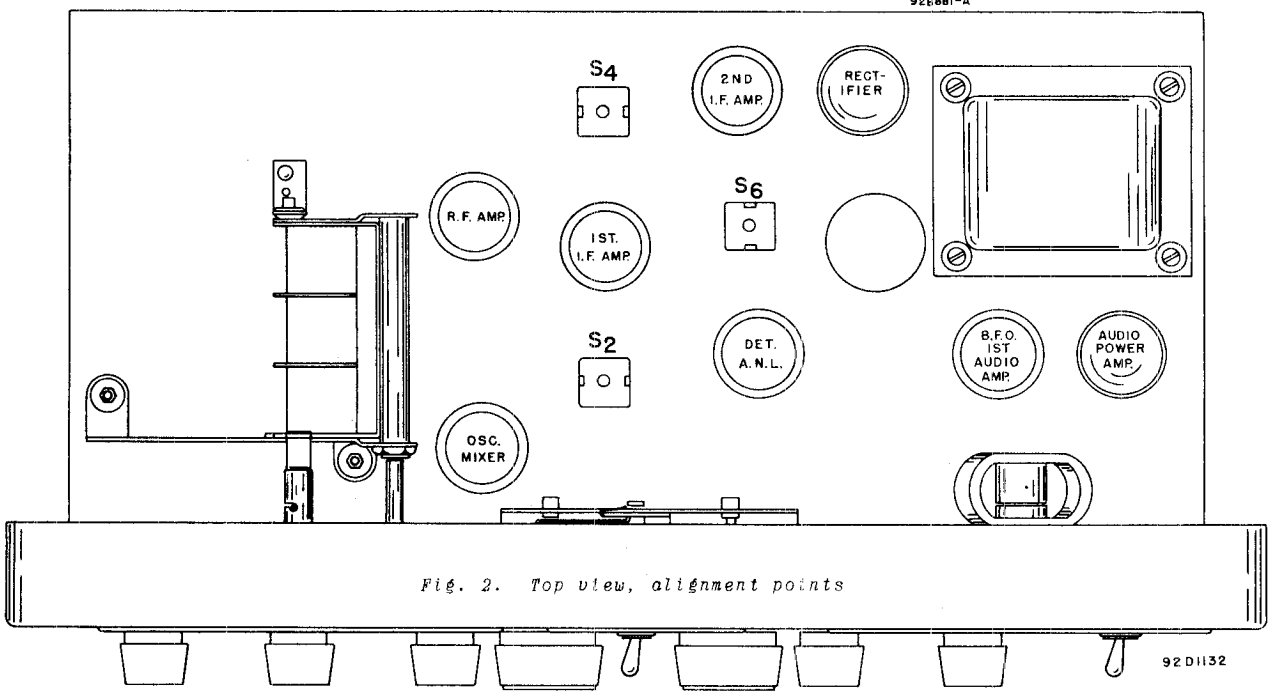


Fig. 2. Top view, alignment points

92D1132

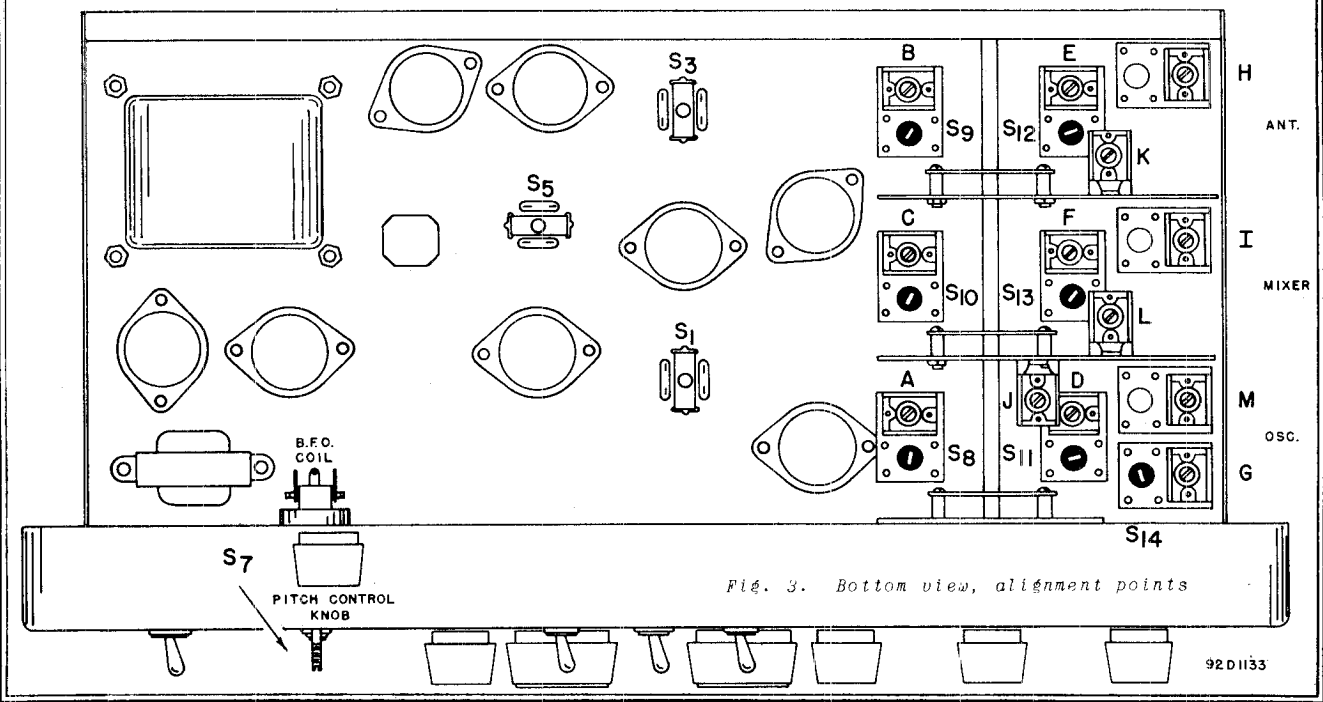


Fig. 3. Bottom view, alignment points

92D1133

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1	None	Stator plates in center section of tuning gang.	455 kc	"1"	1000 kc	S1,S2,S3 S4,S5,S6	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 MW signal level.
2	None	See step 1	455 kc (No modulation)	"1"	1000 kc	S7	With the CW/AM switch set at CW, remove the pitch control knob and adjust S1 for zero beat. Replace the knob with the dot in the center position.
3	Std RMA dummy	"A1" on antenna strip. Jumper connected between "A2" and "G".	36 mc	"4"	36 mc	*A, B, C	Maximum output as in step 1
			18 mc		18 mc	*S8,S9,S10	
4	Std RMA dummy	See step 3	14 mc	"3"	14 mc	*D, E, F	Maximum output as in step 1
			10 mc		10 mc	*S11,S12,S13	
5	Std RMA dummy	See step 3	5 mc	"2"	5 mc	*G, H, I	Maximum output as in step 1
			1.8 mc		1.8 mc	*S14	
6	Std RMA dummy	See step 3	1500 kc	"1"	1500 kc	*J, K, L	Maximum output as in step 1
			600 kc		600 kc	*M	

*Note - Calibration adjustments.

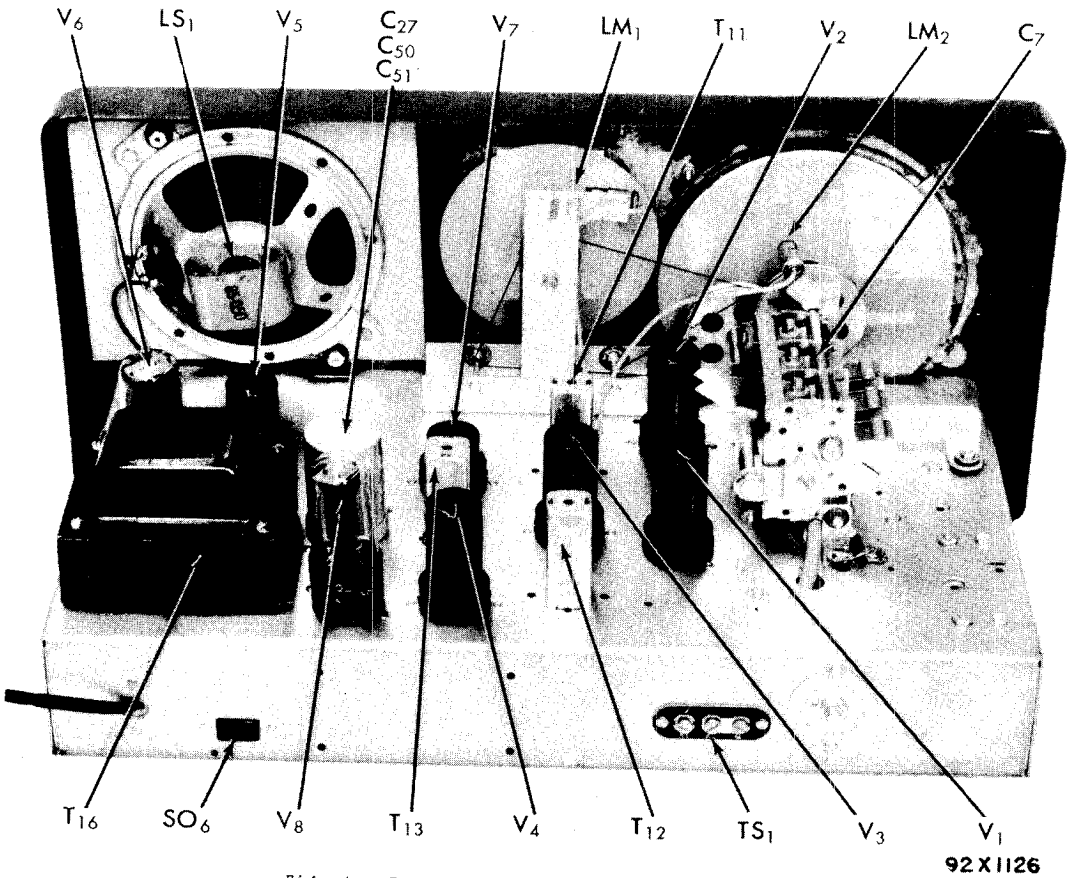


Fig. 4. Top view, component location

MODEL S-40B

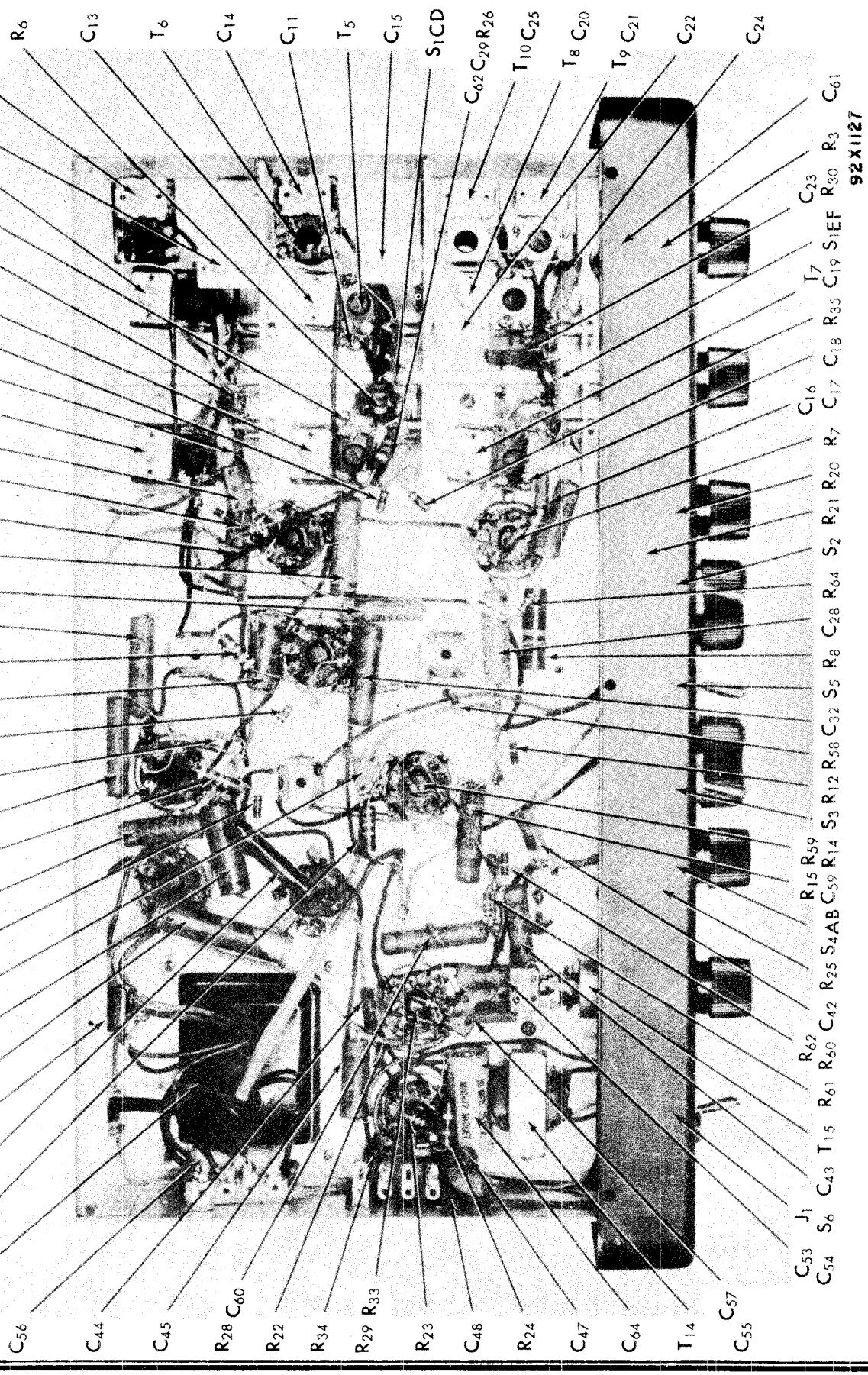


Fig. 5. Bottom view, component location

MODEL S-40B

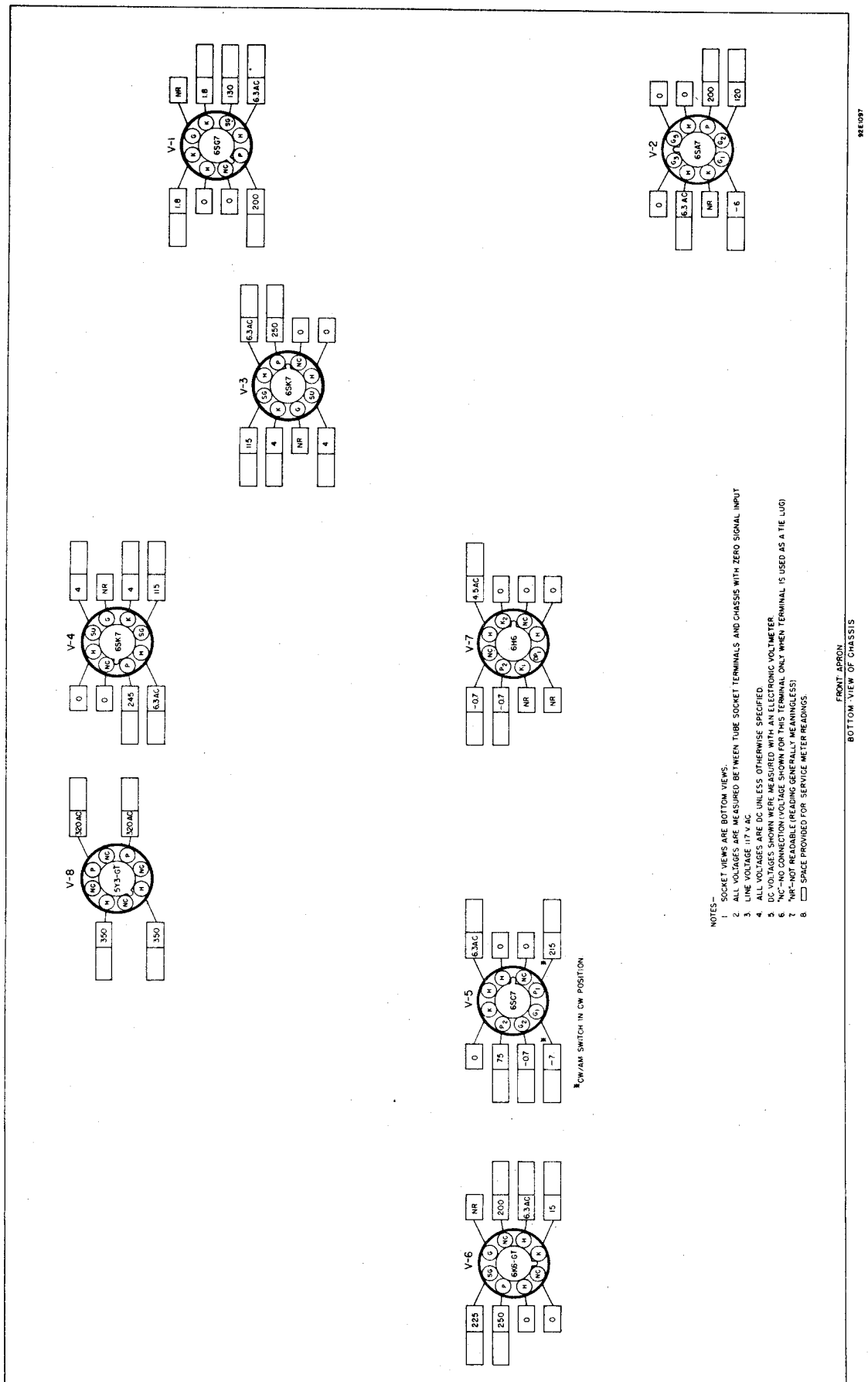


Fig. 6. Tube socket voltage chart

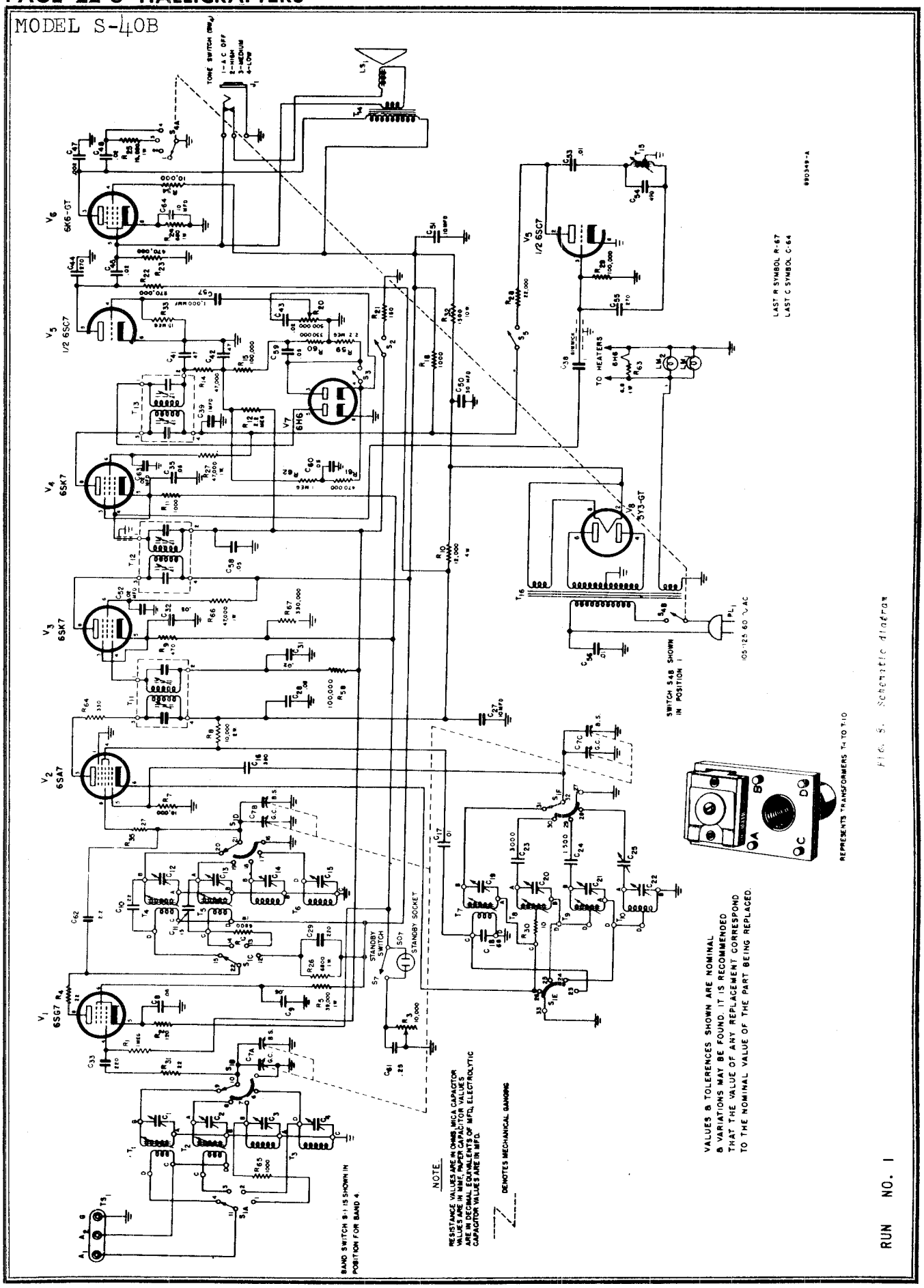


Fig. 5. Schematic diagram

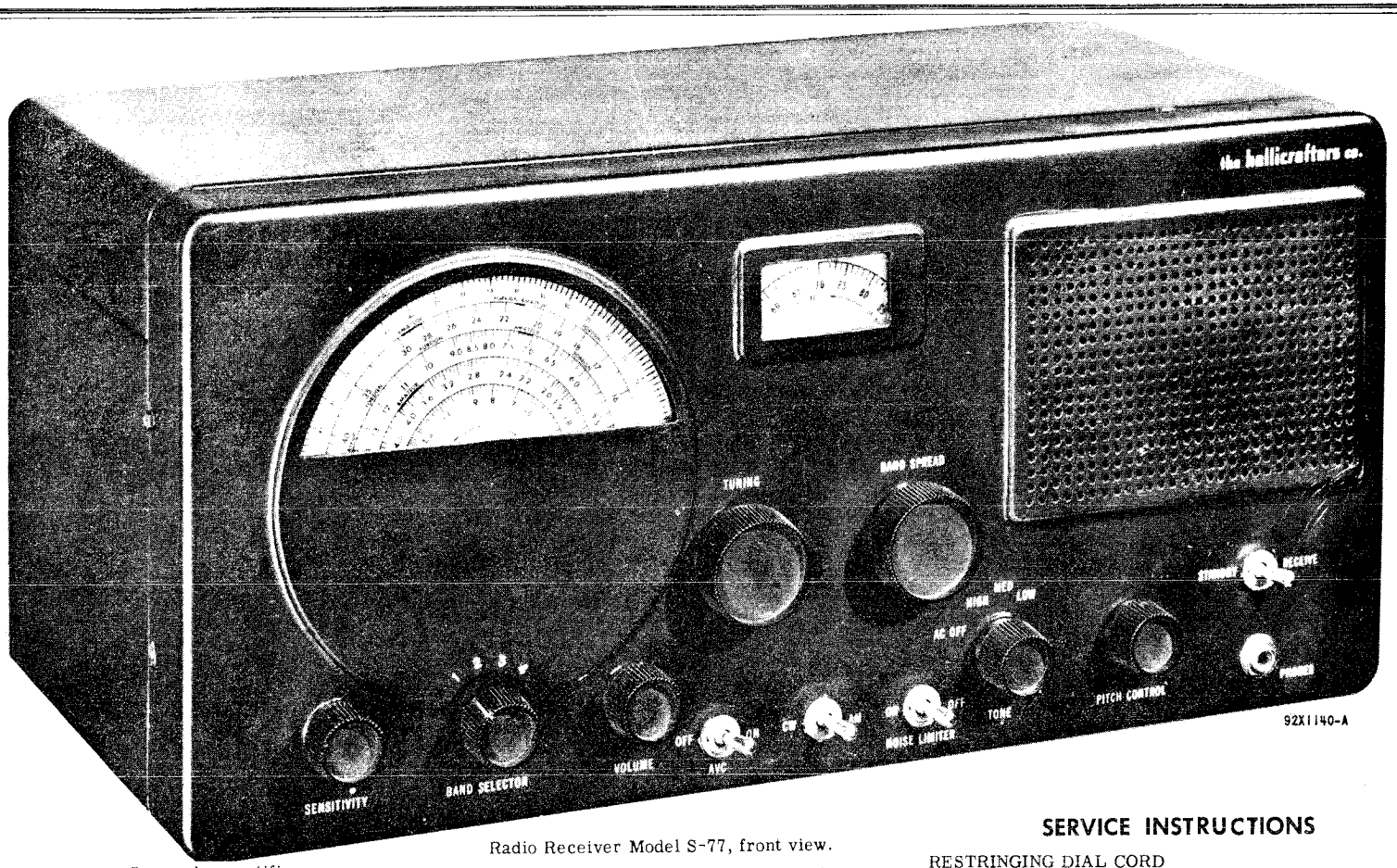
MODEL S-40B

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafters Part Number
	CONDENSERS	
C-1,2,12, 13,19	Trimmer, adjustable, part of transformers T-1,2,4,5 and 7	44A149
C-3	Trimmer, adjustable, part of transformer T-3	44A389
C-4,15,22	Trimmer, adjustable	44A191
C-7	Tuning capacitor, 3 sections ganged	48C240-B
C-8,32,35, 58,59,60	.05 mfd. 200 V., tubular	46AU503J
C-9,28	.05 mfd. 600 V., tubular	46AY503J
C-10	22 mmf. 500 V., ceramic	47X21UK220M
C-11	15 mmf. 500 V., ceramic	47X21UK150M
C-14,21	Trimmer, adjustable, part of transformers T-6 and 9	44A147
C-16	390 mmf. 500 V., mica	47X20B391K
C-17,53	.01 mfd. 600 V., tubular	46AY103J
C-18	68 mmf. 500 V., ceramic	47X25UK680K
C-20	Trimmer, adjustable, part of transformer T-8	44A148
C-25	Padder, adjustable, part of transformer T-10	44A188
C-23	3000 mmf. 500 V., mica	47X30C302K
C-24	1500 mmf. 500 V., mica	47X30C152J
C-27,50,51	30-10-10 mfd. 450 V., electrolytic	45A062
C-29,33	220 mmf. 500 V., mica	47X20B221K
C-31,43	.02 mfd. 200 V., tubular	46AU203J
C-38	2 mmf., twisted wire gimmick	
C-39	.1 mfd. 600 V., tubular	46AY104J
C-41,42	47 mmf. 500 V., mica	47X20B470M
C-44,55	270 mmf. 500 V., mica	47X20B271K
C-45,48,52, 63	.02 mfd. 600 V., tubular	46AY203J
C-47	.002 mfd. 1000 V., tubular	46A104
C-54	470 mmf. 500 V., mica	47X20B471J
C-56	.01 mfd. 600 V., molded paper	46AC103J
C-57	1000 mmf. 500 V., mica	47X25B102M
C-61	.25 mfd. 200 V., tubular	46AT254J
C-62	2.2 mmf. 500 V., bakelite	47A160-4
C-64	10 mfd. 25 V., electrolytic	45A121
	RESISTORS	
R-1,62	1 megohm 1/2 watt, carbon	23X20X105M
R-2	120 ohms 1/2 watt, carbon	23X20X121K
R-3	10,000 ohms, SENSITIVITY control	25B590
R-4,31	22 ohms 1/2 watt, carbon	23X20X220M
R-5	39,000 ohms 1 watt, carbon	23X30X393K
R-6,26	6800 ohms 1 watt, carbon	23X30X682K
R-7	18,000 ohms 1/2 watt, carbon	23X20X183K
R-8	10,000 ohms 2 watts, carbon	23X40X103K
R-9	470 ohms 1/2 watt, carbon	23X20X471K
R-10	12,000 ohms 4 watts, carbon	23X65CE123K
R-11,18,65	1000 ohms 1/2 watt, carbon	23X20X102K
R-12,59	2.2 megohms 1/2 watt, carbon	23X20X225M
R-14	47,000 ohms 1/2 watt, carbon	23X20X473M
R-15,29,58	100,000 ohms 1/2 watt, carbon	23X20X104M
R-20	1/2 megohm , VOLUME control	25A534
R-21	150 ohms 1/2 watt, carbon	23X20X151M
R-22	270,000 ohms 1/2 watt, carbon	23X20X274K
R-23,61	470,000 ohms 1/2 watt, carbon	23X20X474M
R-24	680 ohms 1 watt, carbon	23X30X681K
R-25	15,000 ohms 1 watt, carbon	23X30X153M
R-27,66	47,000 ohms 1 watt, carbon	23X30X473K
R-28	22,000 ohms 1/2 watt, carbon	23X20X223M
R-30	10 ohms 1/4 watt, carbon	23X10X100M
R-32	1500 ohms 10 watts, WW	24BG152E
R-33	15 megohms 1/4 watt, carbon	23X10X156M
R-34	10,000 ohms 1/2 watt, carbon	23X20X103M
R-35	27 ohms 1/4 watt, carbon	23X10X270K
R-60,67	330,000 ohms 1/2 watt, carbon	23X20X334K
R-63	6.8 ohms 1 watt, carbon	23X30X068K
R-64	330 ohms 1/2 watt, carbon	23X20X331K

Ref. No.	Description	Hallicrafters Part Number
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, band 4	51B783
T-2	Transformer, antenna stage, band 3	51B782
T-3	Transformer, antenna stage, band 1 and 2	51B1241
T-4	Transformer, mixer stage, band 4	51B787
T-5	Transformer, mixer stage, band 3	51B786
T-6	Transformer, mixer stage, band 1 and 2	51B1240
T-7	Transformer, oscillator stage, band 4	51B791
T-8	Transformer, oscillator stage, band 3	51B913
T-9	Transformer, oscillator stage, band 2	51B789
T-10	Transformer, oscillator stage, band 1	51B912
T-11,12	Transformer, 1st and 2nd IF stages	50C243
T-13	Transformer, detector stage	50C242
T-14	Transformer, audio output	55B093
T-15	Transformer, BFO	54B044
T-16	Transformer, power	52A209
*T-16	Transformer, power (Universal)	52C210
	SWITCHES	
S-1	Bandswitch, wafer, antenna stage	60B389
	Bandswitch, wafer, mixer stage	62B039
	Bandswitch, wafer, oscillator stage	62B044
	Bandswitch, shaft	60B392
S-2,3, 5,6	Switch, toggle, S.P.S.T., A.V.C., A.N.L., CW-AM, and STANDBY-RECEIVE	60A138
S-4	Switch, PWR-TONE control	60A225
	PLUGS AND SOCKETS	
J-1	Jack, headset	36A002
PL-1	Line cord	87B1573
SO-6	Socket, standby	10A015
	Socket, octal (tube)	6A035
	Socket, dial light, general coverage dial	86A070
	Socket, dial light, bandspread dial	86B049
	TUBES, RECTIFIERS AND LAMPS	
V-1	Type 6SG7, r-f amplifier	90X6SG7
V-2	Type 6SA7, mixer	90X6SA7
V-3,4	Type 6SK7, 1st and 2nd i-f amplifiers	90X6SK7
V-5	Type 6SC7, B.F.O. and audio amplifier	90X6SC7
V-6	Type 6K6GT, audio power amplifier	90X6K6GT
V-7	Type 6H6, A.N.L. and detector	90X6H6
V-8	Type 5Y3GT, rectifier	90X5Y3GT
LM-1,2	Lamp, dial light, Mazda #44	39A003
	MISCELLANEOUS	
TS-1	Terminal strip, antenna	88A032
	Lock, line cord	76A397
	Spring, retainer (Bandspread, and main tuning drive shaft)	75A062
	Dial cord	38A001
	Spring, dial cord	75A012
	Dial, bandspread	83B372
	Dial, general coverage	83C240
	Glass, general coverage dial	22B199
	Window, bandspread	22A307
LS-1	Speaker, P.M. (5-inch)	85B050
	Knob, PITCH CONTROL	12A058
	Knob, SENSITIVITY, VOLUME and TONE	15A049
	Knob, TUNING and BANDSPREAD	15A047
	Knob, BAND SELECTOR	15A266
	Foot, rubber	16A007

* Used on Universal Model S-40BU only.



Radio Receiver Model S-77, front view.

Tubes	Seven plus rectifier
Speaker	5-inch PM
Speaker V.C. Impedance	3.2 ohms
Headset Output	Low Impedance
Antenna	Provision for external antenna
Tuning	Manual
Intermediate Frequency	455 kc
Power Supply	105-125 V. DC/60 cycles AC (using 117 V. ballast tube, R-38) or 210-250 V. DC/60 cycles AC (using 220 V. ballast tube, R-39)
Power consumption	40 Watts

TUNING RANGE

Band Selector Position	Frequency Range
1.	540 kc - 1680 kc
2.	1680 kc - 5.4 mc
3.	5.3 mc - 15.5 mc
4.	15.5 mc - 44 mc

SERVICE INSTRUCTIONS

RESTRINGING DIAL CORD

To restring the main tuning dial cord, cut a 15-inch length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Follow the numbers "1" through "4", and at position "4" stretch the tension spring and tie the cord securely.

To restring the band spread tuning dial cord cut a 22-inch length of dial cord and follow the procedure as above, starting at position "A" on the diagram. Note that the tuning drive shafts are wrapped with two and a fraction turns of dial cord for proper traction.

REPLACING LAMPS

Refer to Fig. 7 for the location of the two dial lamps used in the receiver. To gain access to defective lamps, reach in through cabinet cover and unclip the dial lamp sockets. The sockets may then be brought out into the open to change the defective lamp. Replace lamps with 6-8 V. G.E. #47 (brown bead) lamps or equivalent.

ALIGNMENT PROCEDURE

For I-F amplifier alignment it will be necessary to remove the receiver chassis from the cabinet. The chassis is held in the cabinet by three screws along both the bottom edge of the front panel and the rear of the cabinet, and two screws on either side of the front panel.

NOTE - R-F alignment should be accomplished through the holes provided in the cabinet bottom as the oscillator calibration will be effected slightly by changes in the capacity between the cabinet bottom and the r-f coils and wiring.

Before starting the alignment procedure, check the position of the main tuning index marker on the low frequency end of the range and set the bandspread dial on zero position. The main tuning condenser should index at max. capacity, and the bandspread condenser at min. capacity.

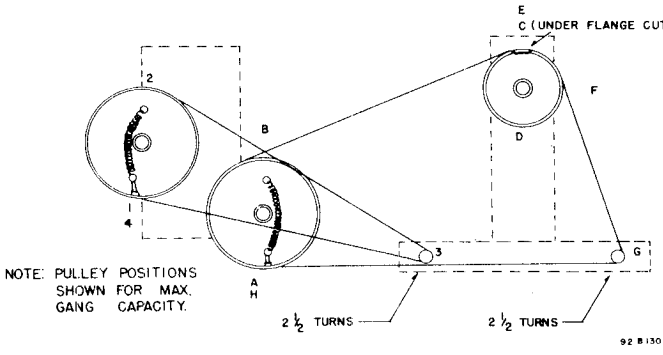


FIG. 1. DIAL CABLE STRINGING PROCEDURE

The standard RMA dummy antenna mentioned in the alignment chart consists of a 200 mmf. condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf. condenser in series with a 400 ohm carbon resistor.

Set the following controls before alignment

SENSITIVITY . . . . . Set at maximum

VOLUME . . . . . Set at maximum

AVC switch. . . . . Set at OFF

BAND SPREAD . . . . . Set at zero

CW/AM . . . . . Set at AM (See Step 2)

NOISE LIMITER . . . . . Set at OFF

STANDBY/RECEIVE . . . . . Set at RECEIVE

TONE SWITCH . . . . . Set at HIGH

For the settings of the remaining controls, see alignment chart.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1	None	Stator plates in center section of tuning gang.	455 kc	"1"	1000 kc	A,B,C, D,E,F	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 MW signal level.
2	None	See step 1	455 kc (No modulation)	"1"	1000 kc	G	With the CW/AM switch set at CW, remove the pitch control knob and adjust "G" for zero beat. Replace the knob with the dot on the center position.
3	Std RMA dummy	"A1" on antenna strip. Jumper connected between "A2" and "G".	36 mc	"4"	36 mc	*H,I,J	Maximum output as in step 1.
			18 mc		18 mc	*K,L,M	
4	Std RMA dummy	See step 3	14 mc	"3"	14 mc	*N,O,P	Maximum output as in step 1.
			10 mc		10 mc	*Q,R,S	
5	Std RMA dummy	See step 3	5 mc	"2"	5 mc	*T,U,V	Maximum output as in step 1.
			1.8 mc		1.8 mc	*W	
6	Std RMA dummy	See step 3	1500 kc	"1"	1500 kc	*X,Y,Z	Maximum output as in step 1.
			600 kc		600 kc	*Z'	

*Note - Calibration adjustments.

MODEL S-77

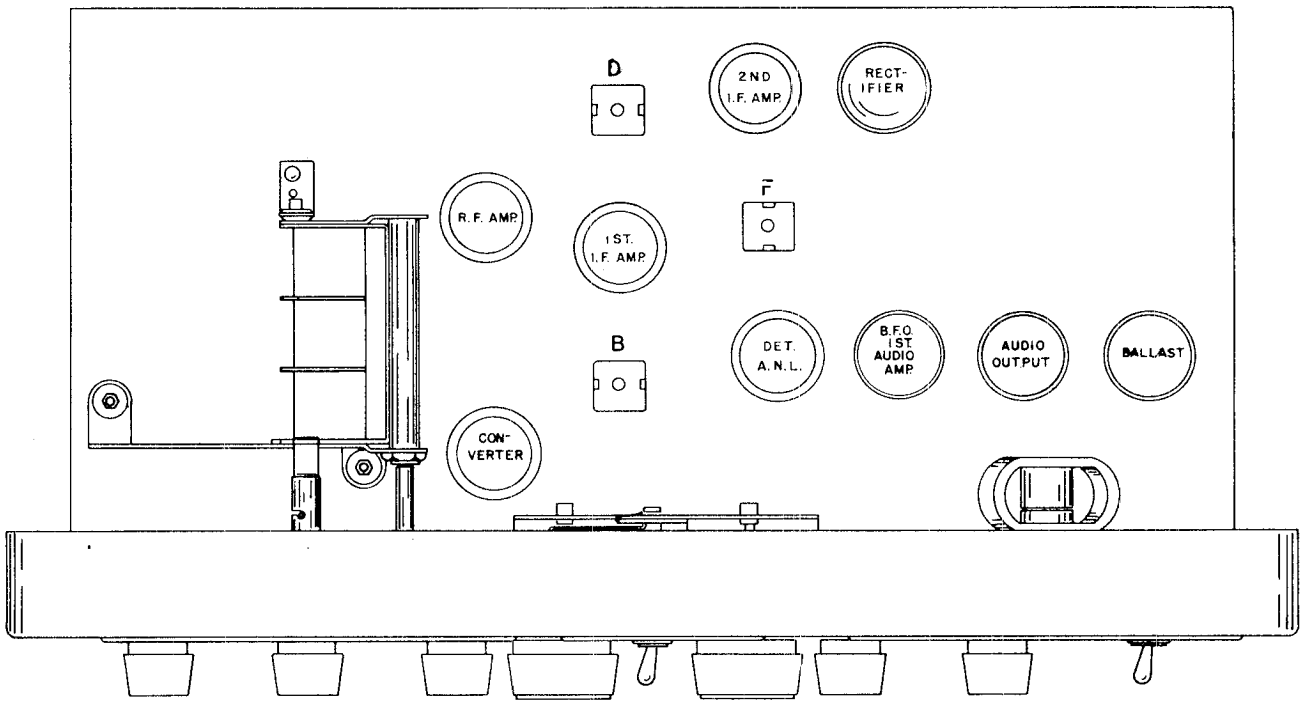


FIG. 2. TOP VIEW, ALIGNMENT POINTS

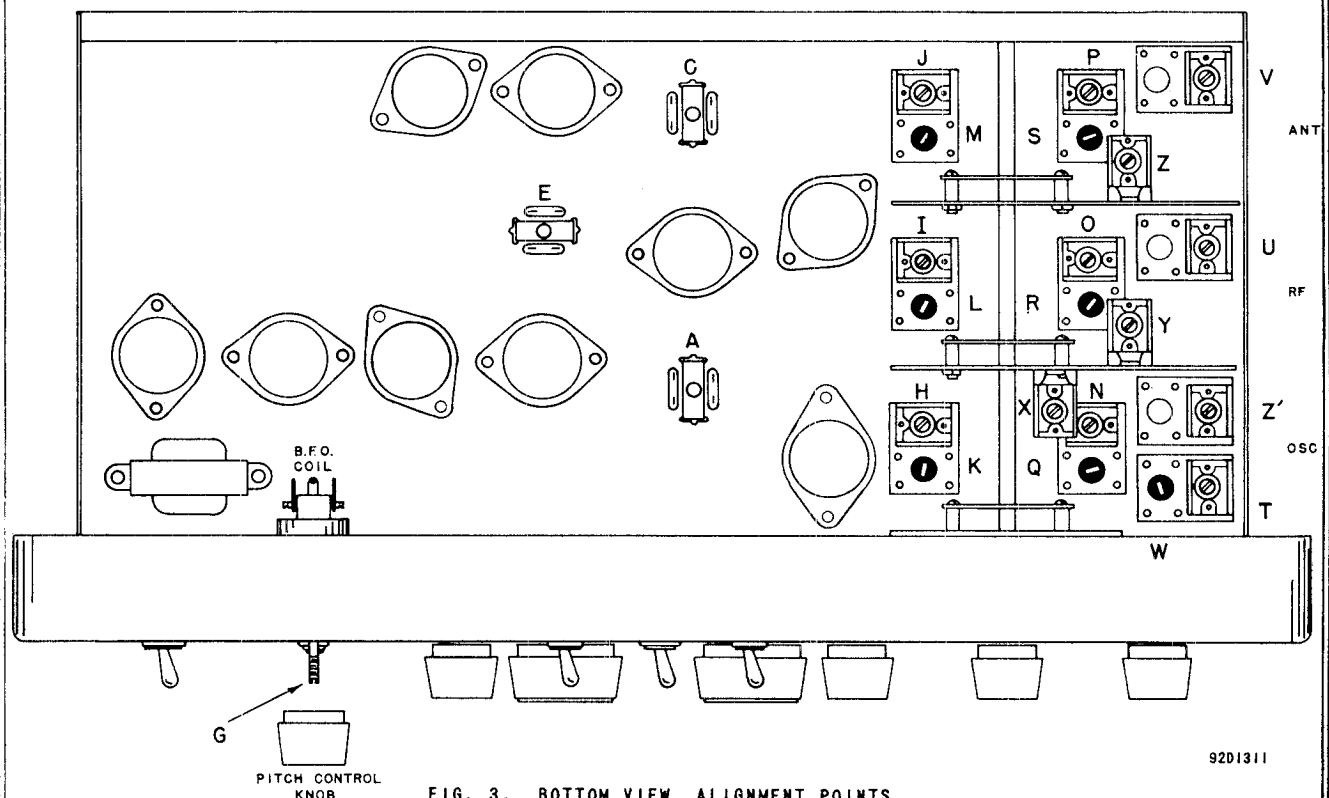


FIG. 3. BOTTOM VIEW, ALIGNMENT POINTS

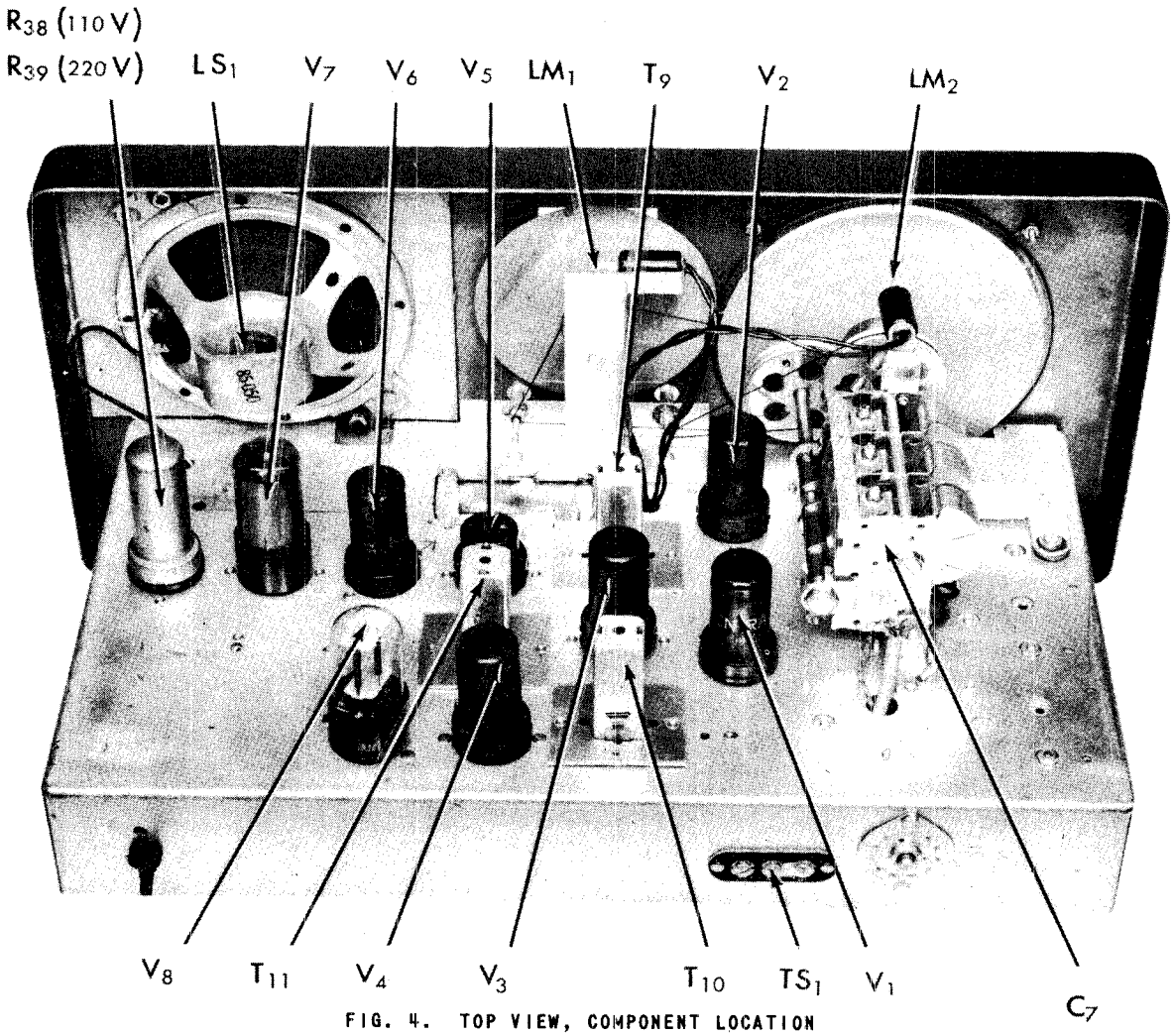


FIG. 4. TOP VIEW, COMPONENT LOCATION

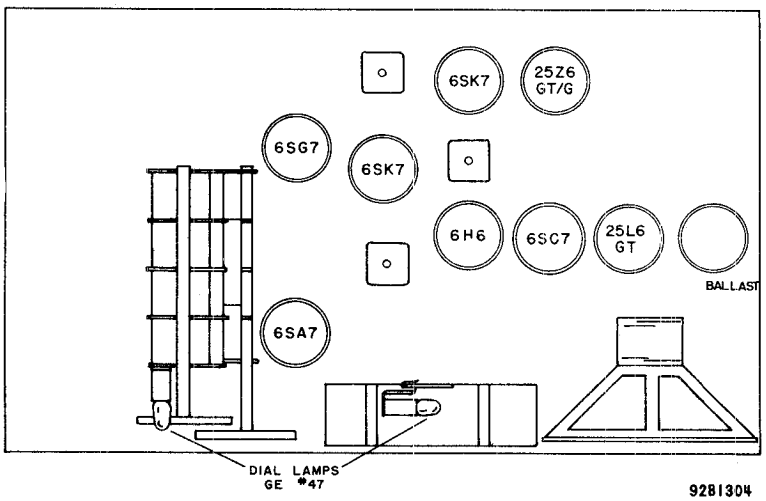


FIG. 7. TOP VIEW, LOCATION OF TUBES AND DIAL LAMPS

MODEL S-77

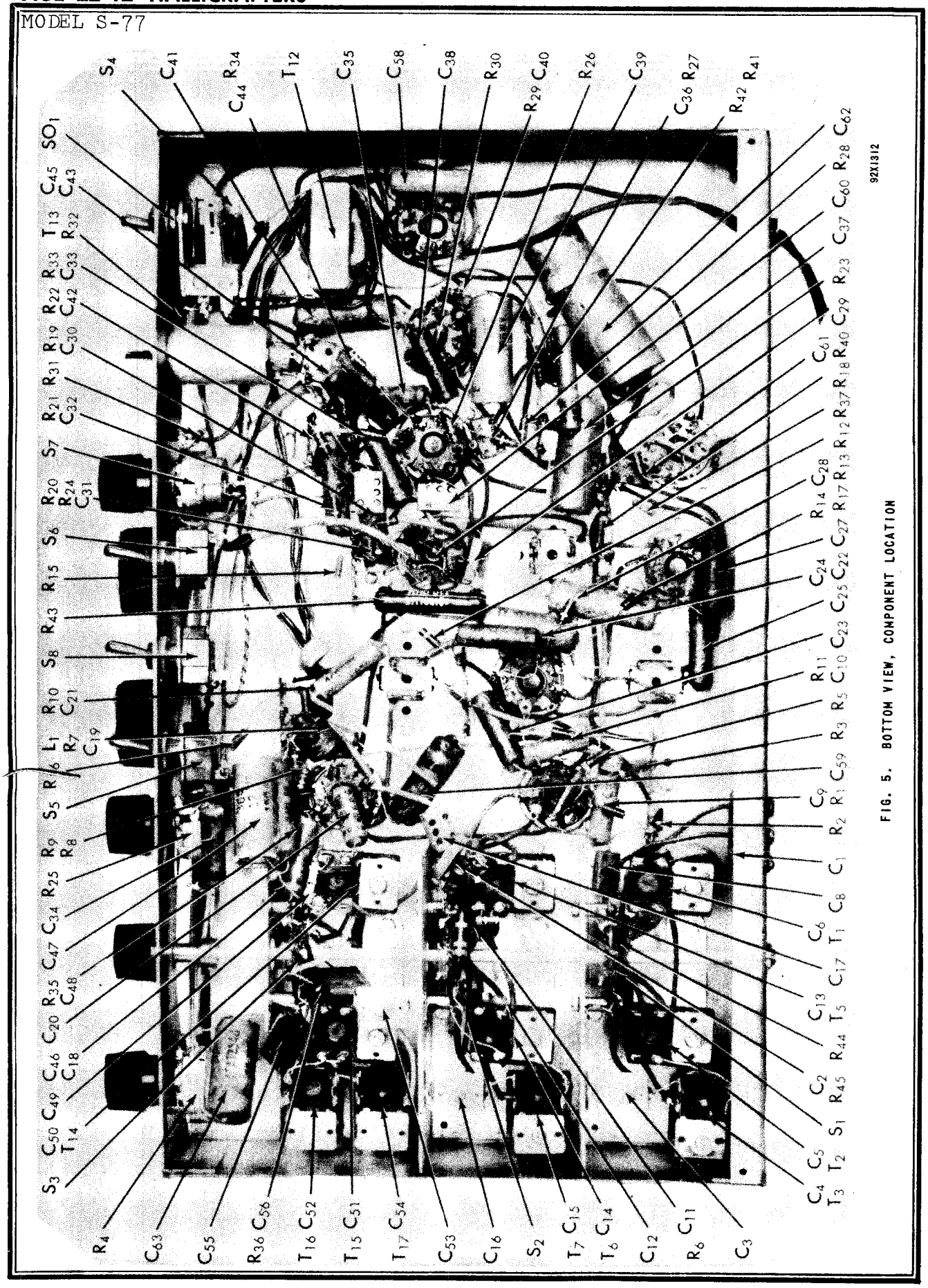


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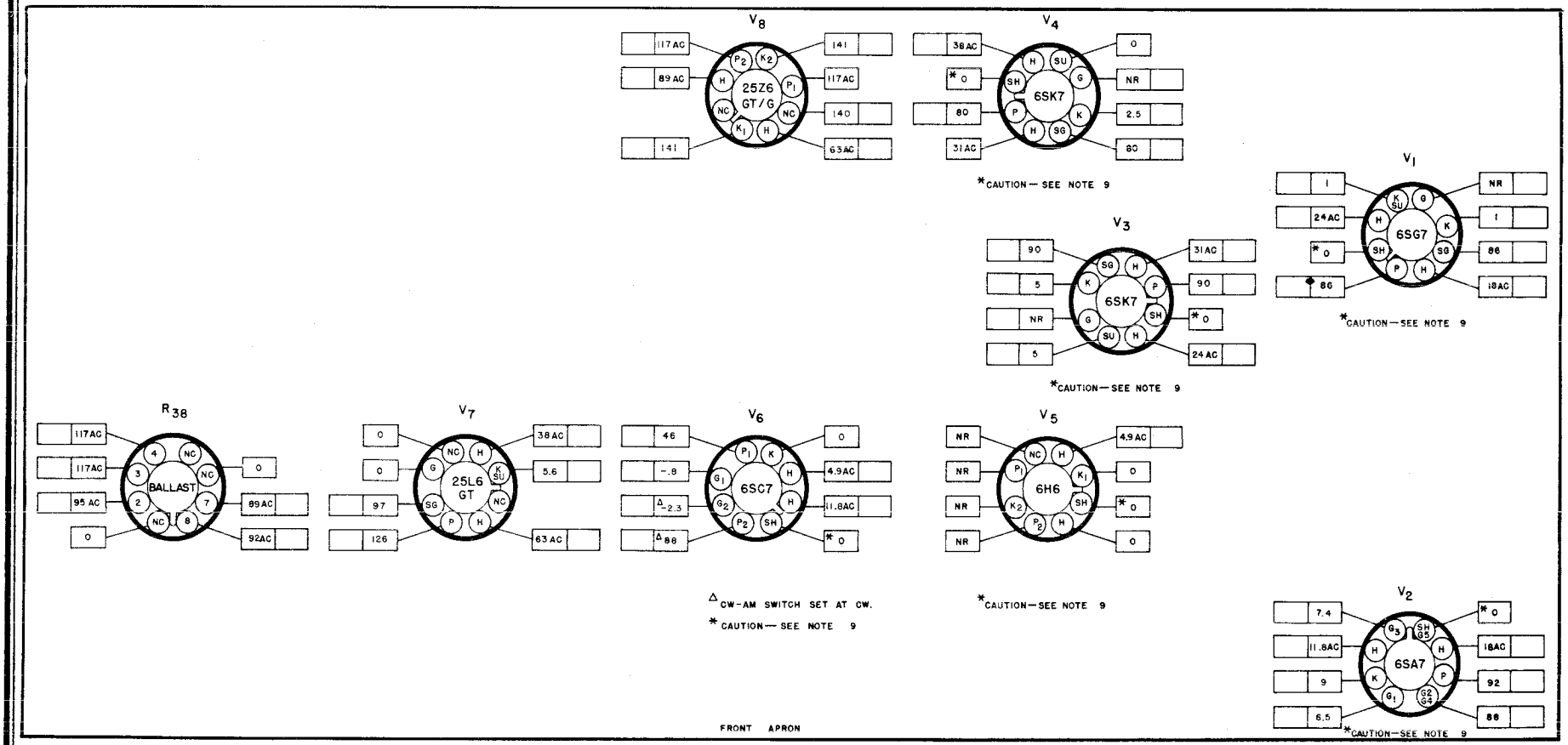
FIG. 5. BOTTOM VIEW, COMPONENT LOCATION



NOTES—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND THE ELECTRICAL GROUND BUSS (NOT CHASSIS) WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC. AC VOLTAGES WILL BE DC VOLTAGES WHEN OPERATING FROM A DC SOURCE.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC"—NO CONNECTION. (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "NR"—NOT READABLE (READING GENERALLY MEANINGLESS).
8. [ ] SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT SAME POTENTIAL WITH THE CHASSIS GROUNDED.

CONTROL	SETTING
SENSITIVITY	FULL CLOCKWISE
BAND SELECTOR	BAND 4
AVC	ON
CW/AM	AM
NOISE LIMITER	OFF
STANDBY/RECEIVE	RECEIVE

9201309

FIG. 6. TUBE SOCKET VOLTAGE CHART

MODEL S-77

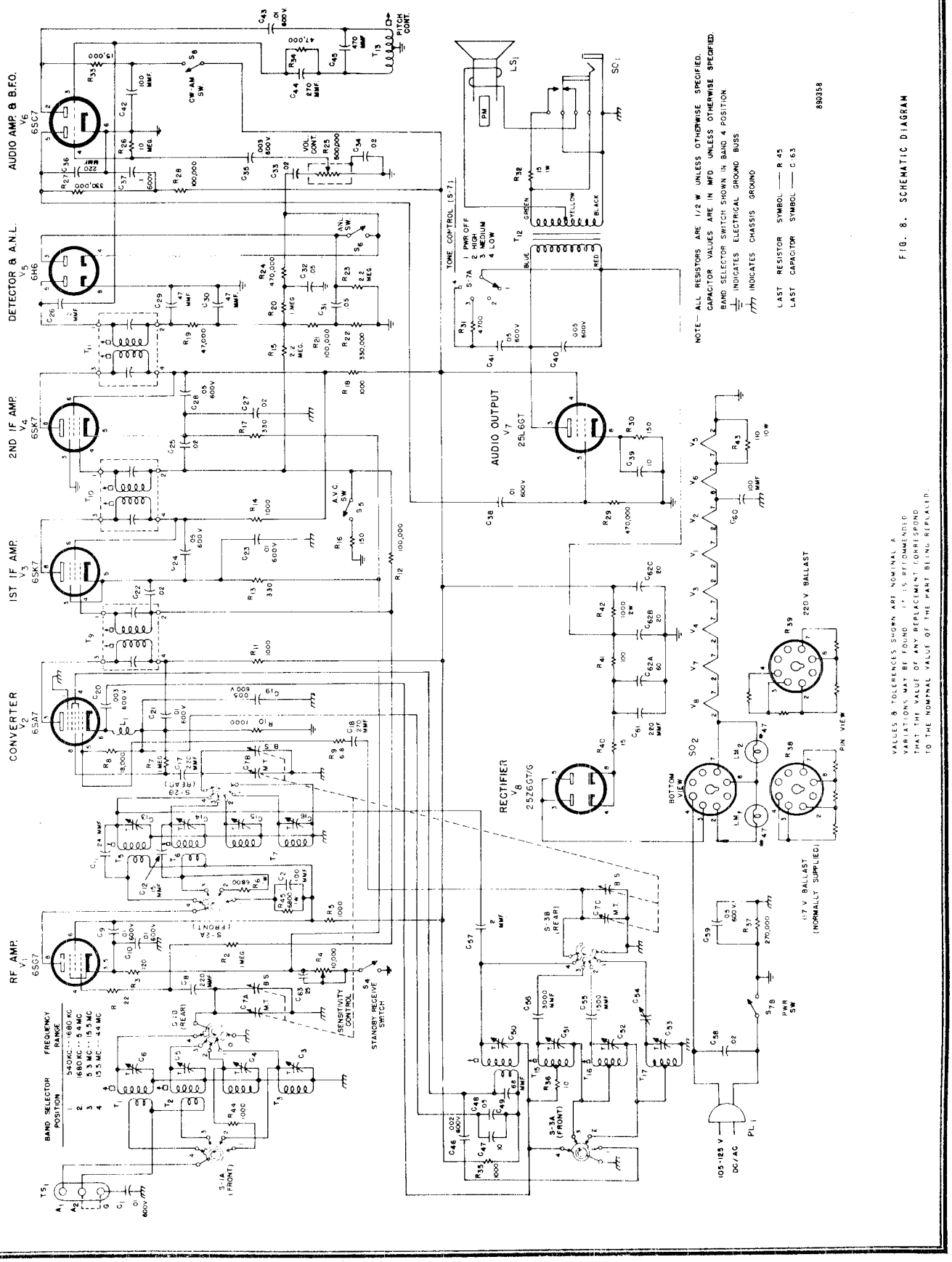


FIG. 8. SCHEMATIC DIAGRAM

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafters Part Number
	CAPACITORS	
C-1,9,10,21, 23,38,43	.01 mfd. 600V., tubular paper	46AZ103J
C-2,42,60	100 mmf. 500V., mica	47X20B101K
C-3,16,53	Trimmer, 2-20 mmf.	44A191
C-4	Trimmer (part of coil T-3)	
C-5	Trimmer (part of coil T-2)	
C-6	Trimmer (part of coil T-1)	
C-7	Tuning capacitor, 3 section; ganged	48C240-B
C-8,17,36, 61	220 mmf. 500V., mica	47X20B221K
C-11	24 mmf., ceramic	47X25UK240M
C-12	15 mmf., ceramic	47X21UK150M
C-13	Trimmer (part of coil T-5)	
C-14	Trimmer (part of coil T-6)	
C-15	Trimmer (part of coil T-7)	
C-18,44	270 mmf. 500V., mica	47X20B271K
C-19,40	.005 mfd. 600V., tubular paper	46AZ502J
C-20,35	.003 mfd. 600V., tubular paper	46AY302J
C-22,25,27, 33,34	.02 mfd. 200V., tubular paper	46AU203J
C-24,28,41	.05 mfd. 600V., tubular paper	46AY503J
C-26,57	2 mmf., wire gimmick	
C-29,30	47 mmf. 500V., mica	47X20B470K
C-31,32,48	.05 mfd. 200V., tubular paper	46AU503J
C-37	.1 mfd. 600V., tubular paper	46AY104J
C-39	10 mfd. 25V., electrolytic	45A121
C-45	470 mmf. 500V., mica	47X20B471J
C-46	.002 mfd. 600V., tubular paper	46AZ202J
C-47	10 mfd. 150V., electrolytic	45A097
C-49	68 mmf., ceramic	47X25UK680K
C-50	Trimmer (part of coil T-14)	
C-51	Trimmer (part of coil T-15)	
C-52	Trimmer (part of coil T-16)	
C-54	Padder (part of coil T-17)	
C-55	1500 mmf. 500V., mica	47X35C152J
C-56	3000 mmf. 500V., mica	47X35B302K
C-58	.02 mfd. 600V., molded tubular paper	46BR203L6
C-59	Resonant capacitor (.05 mfd. 600V.)	46A150
C-62	60-20-20 mfd. 150V., electrolytic	45B128-C
C-63	.25 mfd. 200V., tubular paper	46AT254J
	RESISTORS	
R-1	22 ohms 1/2 watt, carbon	23X20X220K
R-2,7,20	1 megohm 1/2 watt, carbon	23X20X105M
R-3	120 ohms 1/2 watt, carbon	23X20X121K
R-4	10,000 ohms; SENSITIVITY control	25B590
R-5,10,11, 14,18,35, 44	1000 ohms 1/2 watt, carbon	23X20X102K
R-6,45	6800 ohms 1 watt, carbon	23X30X682K
R-8	18,000 ohms 1/2 watt, carbon	23X20X183K
R-9	6.8 ohms 1/2 watt, carbon	23X20X068K
R-12,21,28	100,000 ohms 1/2 watt, carbon	23X20X104M
R-13,17	330 ohms 1/2 watt, carbon	23X20X331K
R-15,23	2.2 megohms 1/2 watt, carbon	23X20X225M
R-16,30	150 ohms 1/2 watt, carbon	23X20X151K
R-19,34	47,000 ohms 1/2 watt, carbon	23X20X473K
R-22,27	330,000 ohms 1/2 watt, carbon	23X20X334M
R-24,29	470,000 ohms 1/2 watt, carbon	23X20X474M
R-25	500,000 ohms; VOLUME control	25B586
R-26	10 megohms 1/2 watt, carbon	23X20X106M
R-31	4700 ohms 1/2 watt, carbon	23X20X472K
R-32	15 ohms 1 watt, carbon	23X30X150M
R-33	15,000 ohms 1/2 watt, carbon	23X20X153K
R-36	10 ohms 1/2 watt, carbon	23X20X100K
R-37	270,000 ohms 1/2 watt, carbon	23X20X274M
R-38	Ballast tube (117V.)	24B875
R-39	Ballast tube (220V.)	24B874
R-40	15 ohms 1/2 watt, carbon	23X20X150K
R-41	100 ohms 1/2 watt, carbon	23X20X101K
R-42	1000 ohms 2 watts, carbon	23X40X102K
R-43	110 ohms 10 watts, WW	24BG111E

Ref. No.	Description	Hallicrafters Part Number
	TRANSFORMERS AND COILS	
L-1	Choke, RF	53A138
T-1	Coil, antenna; band 4	51B783
T-2	Coil, antenna; band 3	51B782
T-3	Coil, antenna; bands 1 and 2	51B1241
T-5	Coil, RF; band 4	51B787
T-6	Coil, RF; band 3	51B786
T-7	Coil, RF; bands 1 and 2	51B1240
T-9,10	Transformer, 1st and 2nd IF	50C243
T-11	Transformer, IF (detector stage)	50C242
T-12	Transformer, audio output	55B110
T-13	Coil, PITCH CONTROL	54B044
T-14	Coil, oscillator; band 4	51B791
T-15	Coil, oscillator; band 3	51B913
T-16	Coil, oscillator; band 2	51B789
T-17	Coil, oscillator; band 1	51B912
	SWITCHES	
S-1	Wafer, bandswitch; antenna stage	60B389
S-2	Wafer, bandswitch; RF stage	62B039
S-3	Wafer, bandswitch; oscillator stage	62B044
S-4,5,6,8,	Switch, toggle (SPST); STANDBY-RECEIVE, A.V.C., A.N.L., and CW-AM	60A138
S-7	Switch, PWR-TONE	60A225
	PLUGS AND SOCKETS	
PL-1	Line cord and plug	87B1573
SO-1	Jack, PHONES	36B004
SO-2	Socket, octal; ballast tube	6A250
	Socket, octal; tube	6A250
	Socket, dial lamp (main tuning dial)	86B101
	Socket, dial lamp (bandspread dial)	68B068
	TUBES, RECTIFIERS AND DIAL LAMPS	
V-1	Type 6SG7, RF amplifier	90X6SG7
V-2	Type 6SA7, converter	90X6SA7
V-3,4	Type 6SK7, 1st and 2nd IF amplifiers	90X6SK7
V-5	Type 6H6, detector and A.N.L.	90X6H6
V-6	Type 6SC7, audio amp. and B.F.O.	90X6SC7
V-7	Type 25L6GT, audio output	90X25L6GT
V-8	Type 25Z6GT/G, rectifier	90X25Z6GT/G
LM-1,2	Lamp, dial; GE #47	39A004
	MISCELLANEOUS	
	Bandswitch and shaft	60B392
	Cabinet (lower section)	66E359
	Cabinet front panel	68D160
	Cabinet top	66D616
	Dial, bandspread	83B372
	Dial, main tuning	83C240
	Dial cord	38A001
	Foot, rubber	16A007
	Glass, bandspread tuning dial	22A307
	Glass, main tuning dial	22B199
	Knob, BAND SELECTOR	15A266
	Knob, PITCH CONTROL	15A058
	Knob, TUNING and BANDSPREAD	15A047
	Knob, SENSITIVITY, VOLUME and TONE	15A049
	Lock, line cord	76A397
	Screw, Allen head (6-32 x 3/16)	3A1122
	Slug, adjustable tuning	77A068
LS-1	Speaker, PM; 5 inch	85B050
	Spring, dial cord	75A012
	Spring, retainer	75A062
TS-1	Terminal strip, antenna	88A032

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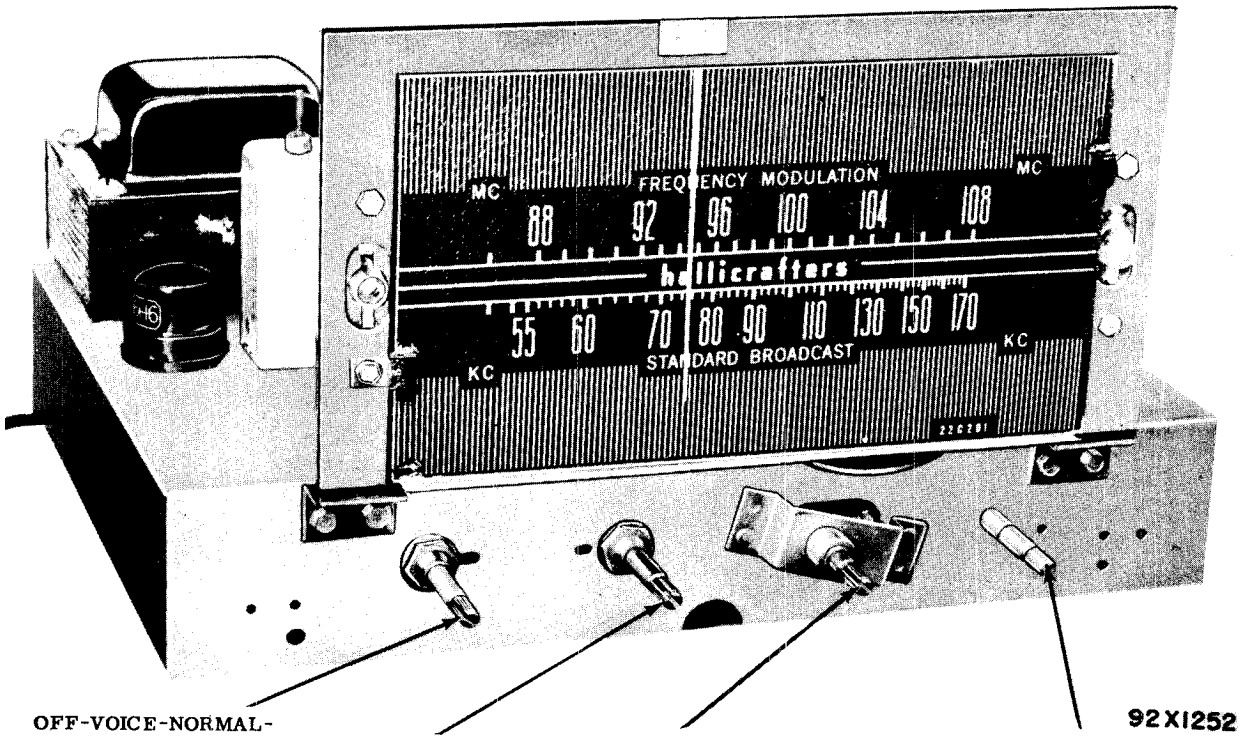
USE OF OPERATING CONTROLS



OFF-VOICE-NORMAL-BASS-HI-FI

This is a combination power switch and tone control. In position one the receiver is completely turned off. To turn the receiver on, set this control at any of the four remaining positions, depending upon the tone qualities desired. Illumination of the dial indicates that the receiver is obtaining power from the wall outlet and ready for use. The tone control settings generally used are VOICE and NORMAL for speech and BASS and HI FI for musical entertainment.

VOLUME

Turn this control clockwise to increase volume and counter clockwise to decrease volume.

FM-BROADCAST-PHONO

This is the combination range and operation switch. In the FM (Frequency Modulation) position, the receiver tunes the 88 to 108 megacycle FM band; and in the BROADCAST position, the receiver operates as a standard broadcast receiver tuning the frequency range 540 to 1750 kilocycles. To use the receiver as a record player, set this switch at PHO and operate the volume and tone controls as for normal radio reception.

TUNING

The tuning control "tunes in" either BC or FM stations depending upon the setting of the range switch. The standard broadcast band dial is calibrated so that a zero must be added to the number appearing on the dial to obtain the station frequency in kilocycles. The frequencies of the FM stations are shown directly in megacycles. The frequencies of local stations are generally listed in local newspapers, BC stations in kilocycles and FM stations in megacycles. When tuning for the station, tune carefully and obtain top performance from your receiver.

GENERAL SPECIFICATIONS

Tubes	Ten plus rectifier
Speaker Output	3.2 and 500 ohms.
Speaker Connection	Std. 5 pin socket.
Antenna	Provisions for external antennas
Tuning	Manual
Tuning Range	Broadcast 540 kc - 1750 kc Frequency Modulation 88 mc - 108 mc
Intermediate Frequency	455 kc/10.7 mc.
Power Supply	105-125 V. 50/60 cycles AC
Power Consumption	90 Watts

INSTALLATION

When locating the receiver, avoid excessively warm locations such as are found near radiators or hot air registers. When placing the receiver with its back to the wall, leave about an inch or two of clearance between the back of the cabinet and the wall for proper ventilation.

There are three basic connections to be made, antenna, speaker, and power, to completely set up the receiver. All connections are located on the rear apron of the chassis.

ANTENNA - Terminals are provided for separate AM broadcast (BC) and FM broadcast (FM) antennas. The BC band antenna terminals are marked "A" and "G" and the FM band antenna terminals are identified by "D-D".

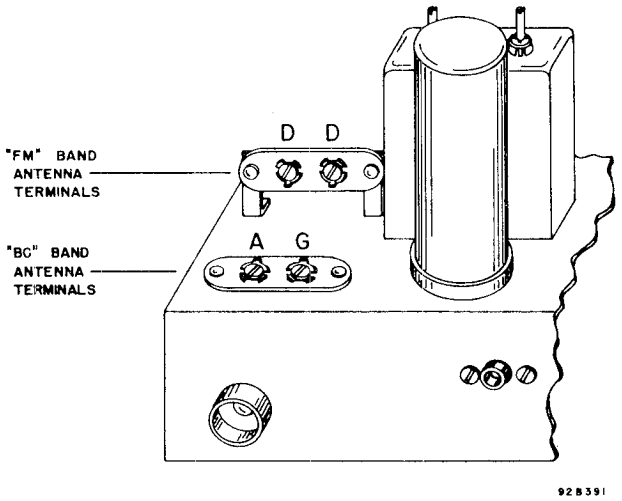


Fig. 2. Antenna terminal strip connections

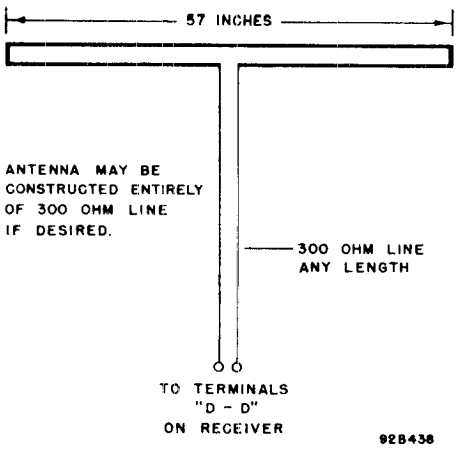


Fig. 3. Folded doublet antenna details.

BC Antenna - The standard broadcast band antenna may consist of any single length of wire from approximately ten feet to fifty feet depending upon the local receiving conditions. Attach the wire to the "A" terminal of the antenna terminal strip. Erect outdoor antenna installations as high and as free from surrounding objects as possible. Erecting this type of antenna at right angles to local "man made" sources of static, (street car lines, power lines, etc.) is recommended for best results. An excessively long antenna will not necessarily be the most desirable antenna. Use the length that will provide adequate signal pick up.

For some installations it will be found desirable to connect a ground wire to the "G" terminal of the terminal strip. A radiator or water pipe will generally serve as a good ground connection.

FM Antenna - The antenna for FM reception may consist of any type of antenna that operates with a 300-ohm transmission line. If a commercial antenna is installed, be sure it uses a 300-ohm transmission line. The transmission line from the antenna is connected to terminals "D-D" on the receiver.

The simplest antenna which will provide satisfactory results, mounted either on the back of a console cabinet or outside the building, is the folded doublet. This antenna may be constructed from 300-ohm transmission line as shown in Fig. 3. Keep in mind that the doublet antenna response favors signals broadside to its length and should be erected with its length at right angles to the direction of reception. This is especially important where receiving conditions are poor and maximum antenna pickup is required.

POWER SOURCE - The receiver operates from a 105-125 V. 60 cycle AC source only. The receiver will not operate from a 115 V. direct current source or 25 cycle AC source directly. If in doubt as to the voltage and frequency rating of your power source, contact the local power company representative and avoid costly repairs. The nominal power consumption for this receiver is 90 watts.

DIAL LAMP REPLACEMENT

Refer to Fig. 6 for the location of the two dial lamps used in the receiver. To gain access to defective lamps, unclip the dial lamp socket by compressing the side springs. The socket may then be brought out into the open to change the defective lamp.

SPEAKER CONNECTIONS

The speaker connector is located on the rear apron of the receiver. Connection is to be made through a standard 5 pin tube socket. The receiver is designed to operate into either a 3.2 ohm or a 500 ohm speaker load. For detailed information on making connections for either load refer to the schematic diagram. If a matching transformer is used in connection with the speaker load it should be capable of handling approximately 10 watts of audio power.

RECORD PLAYER CONNECTION

A shielded type receptacle is provided at the rear chassis apron to accommodate a record player pickup cable connector. Any record player employing a crystal cartridge or high level magnetic pickup in its tone arm may be used with the receiver. A utility receptacle is provided at the rear apron of the receiver to accommodate the power plug of the record player. The use of this receptacle will permit the record player to be turned off with the receiver.

TUBE REPLACEMENT

The types of tubes required and their relative position in the receiver are shown in the illustration. Fig. 6. When installing a replacement tube, insert the center guide pin into the center hole of the tube socket; rotate the tube until the key on the guide pin drops into the notch in the socket hole; and push down until the base of the tube rests firmly on the socket. A slightly different technique must be used on the miniature tubes. They have seven small pins which have to be lined up with the socket holes before pushing into place. Handle with care as all tubes are considered fragile and do not tolerate much mechanical abuse.

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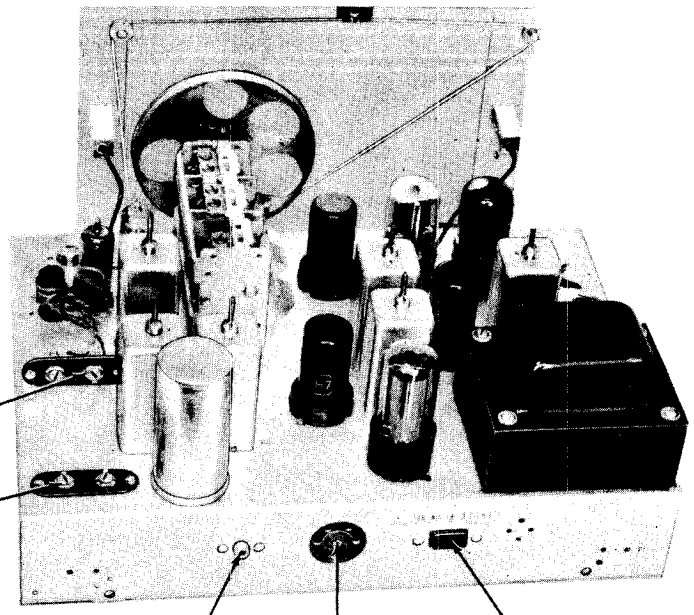

Fig. 4. Component location, rear view

ALIGNMENT PROCEDURE

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the FM band to compensate for oscillator drift and improve the tuning function on the FM band. The correction factor is approximately 5 times: AFC takes hold 250 kc before the station frequency is reached and releases before tuning 500 kc beyond the station frequency when receiving a 1000 microvolt signal.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

When making the alignment adjustments set the tone control at NORMAL and the volume control at maximum volume. Use just enough signal generator output to obtain the results indicated on the chart.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Adjust	Remarks
1	0.01 mfd. cap	To high cap. stator of center section.	455 kc	"BC"	1000 kc	A,B,C,D, E	Adjust for max. audio output. Keep audio output below 500 MW to avoid AVC action.
2	0.01 mfd. cap. in series with a 4700 ohm carbon resistor.	To low cap. stator of center section.	10.7 mc	"FM"	90 mc	F,G,H,I, J,K	Adjust for max. voltage as measured between pin #3 of 6H6 and ground with an electronic volt meter. Adjust signal generator output for approx. 2 volts DC at this point.
3	0.01 mfd cap.	See step 2.	10.7 mc	"FM"	90 mc	L	Adjust for zero voltage as measured between the junction of R27 and R28 and ground with an electronic volt meter.
4.	Std RMA dummy	To terminals "A" and "G" on terminal strip TS-2.	1500 kc	"BC"	1500 kc	*M,N,O	Adjust for max. output as in step 1.
5.	Two 150 ohm carbon resistors	To terminals "D-D" on terminal strip TS-1.	105 mc	"FM"	105 MC	*P,Q	Adjust for max. voltage as measured across R54 with an electronic volt meter. Adjust signal generator output for approx. 1 volt DC at this point.

*NOTE - Calibration adjustments.

RESTRINGING DIAL CORD

Restring the dial drive with 30 lb. test dial cord. Tie one end to the tension spring and follow the sequence outlined in Fig. 5. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the pointer to the string and line it up with the left hand index mark on the dial scale.

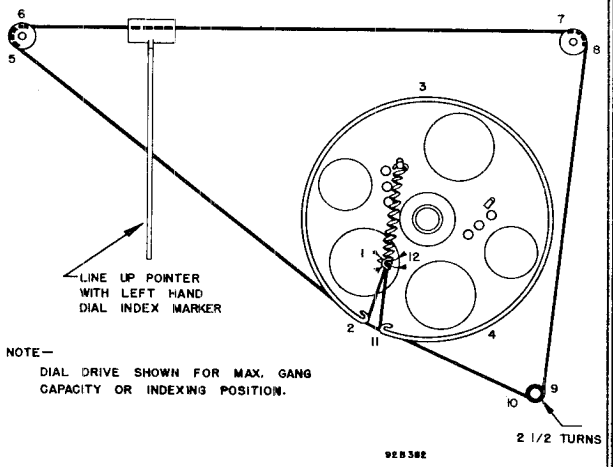

Fig. 5. Dial cable stringing procedure.

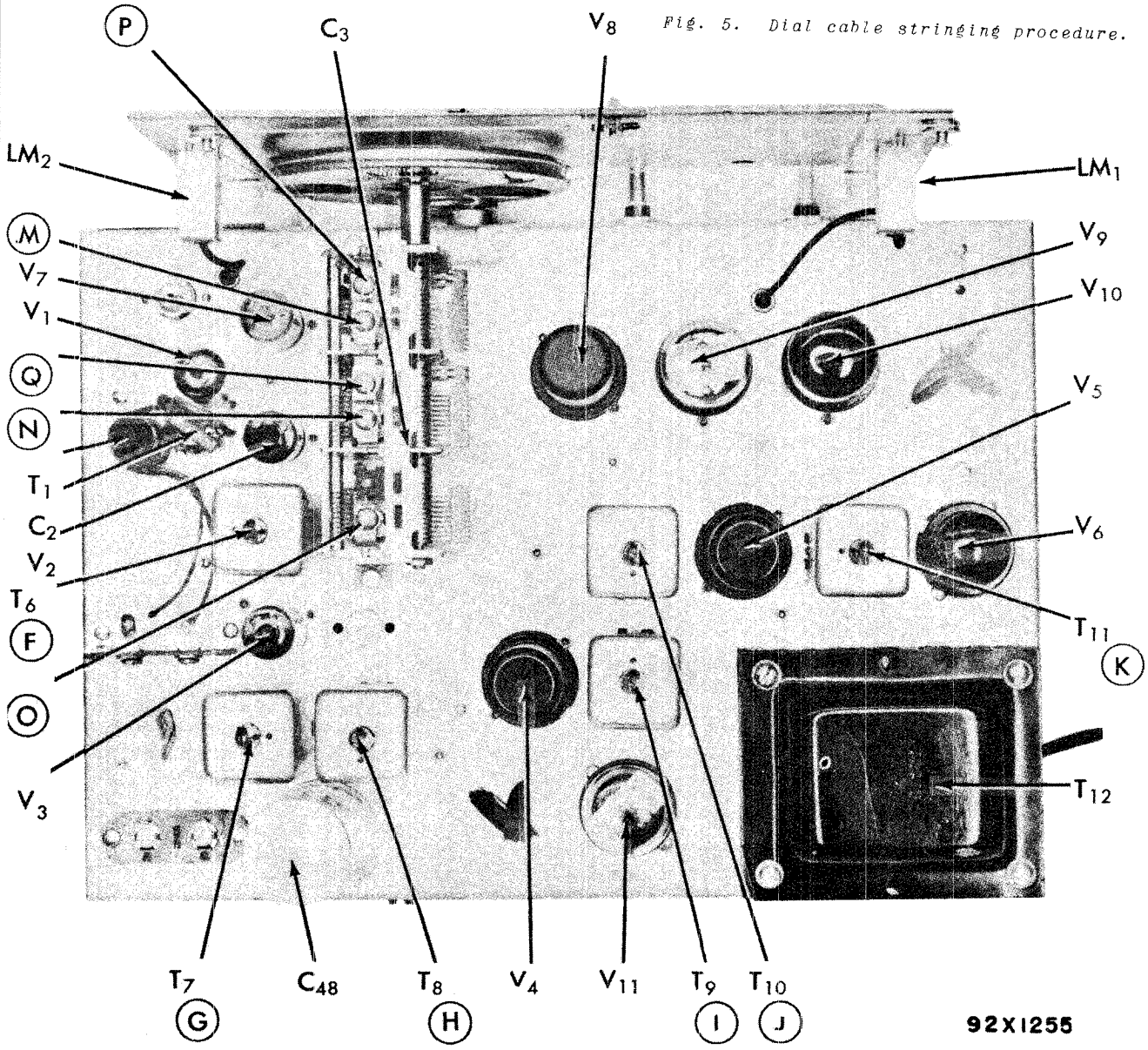

Fig. 6. Top view alignment points & component locations

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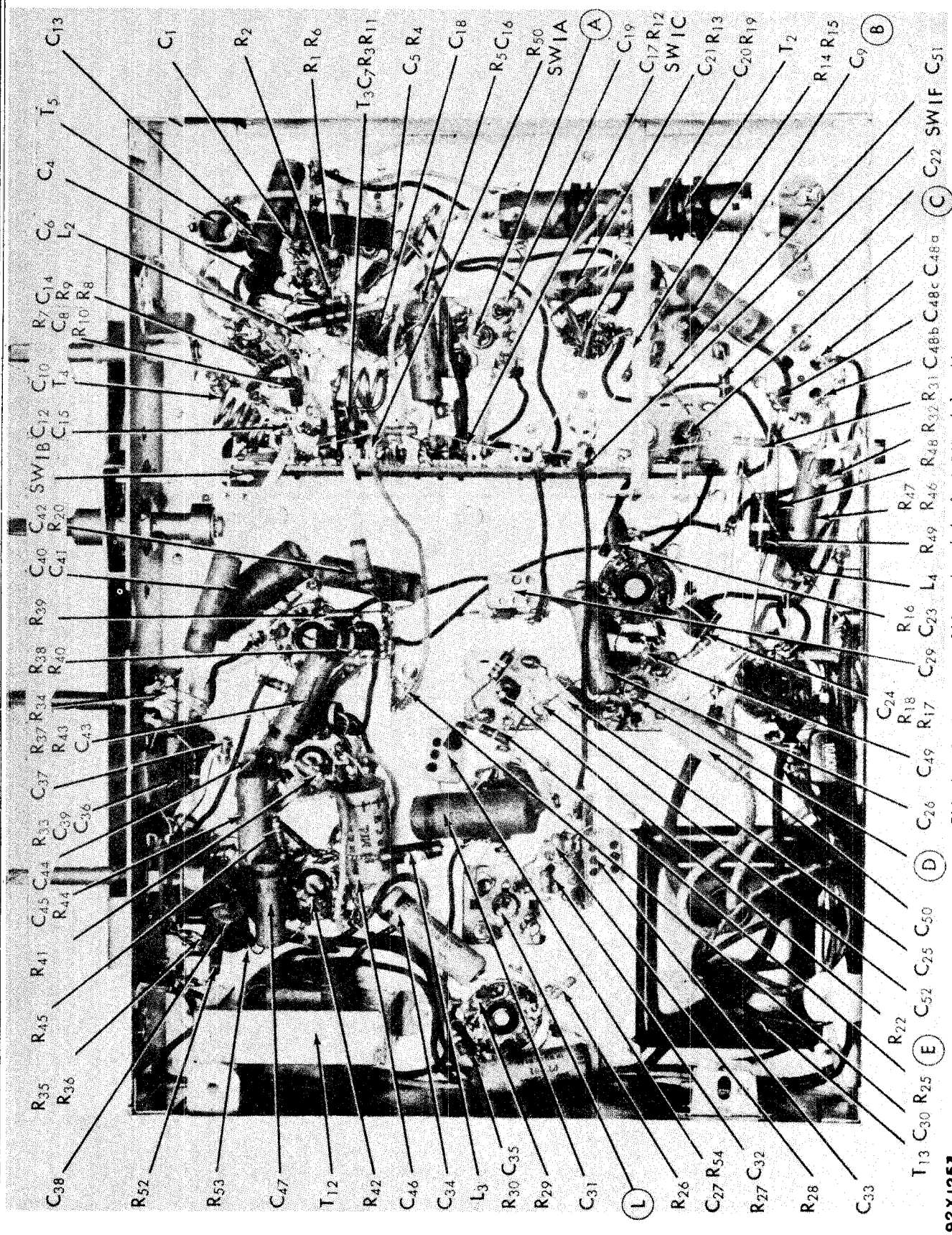

Fig. 7. Bottom view alignment points & component locations

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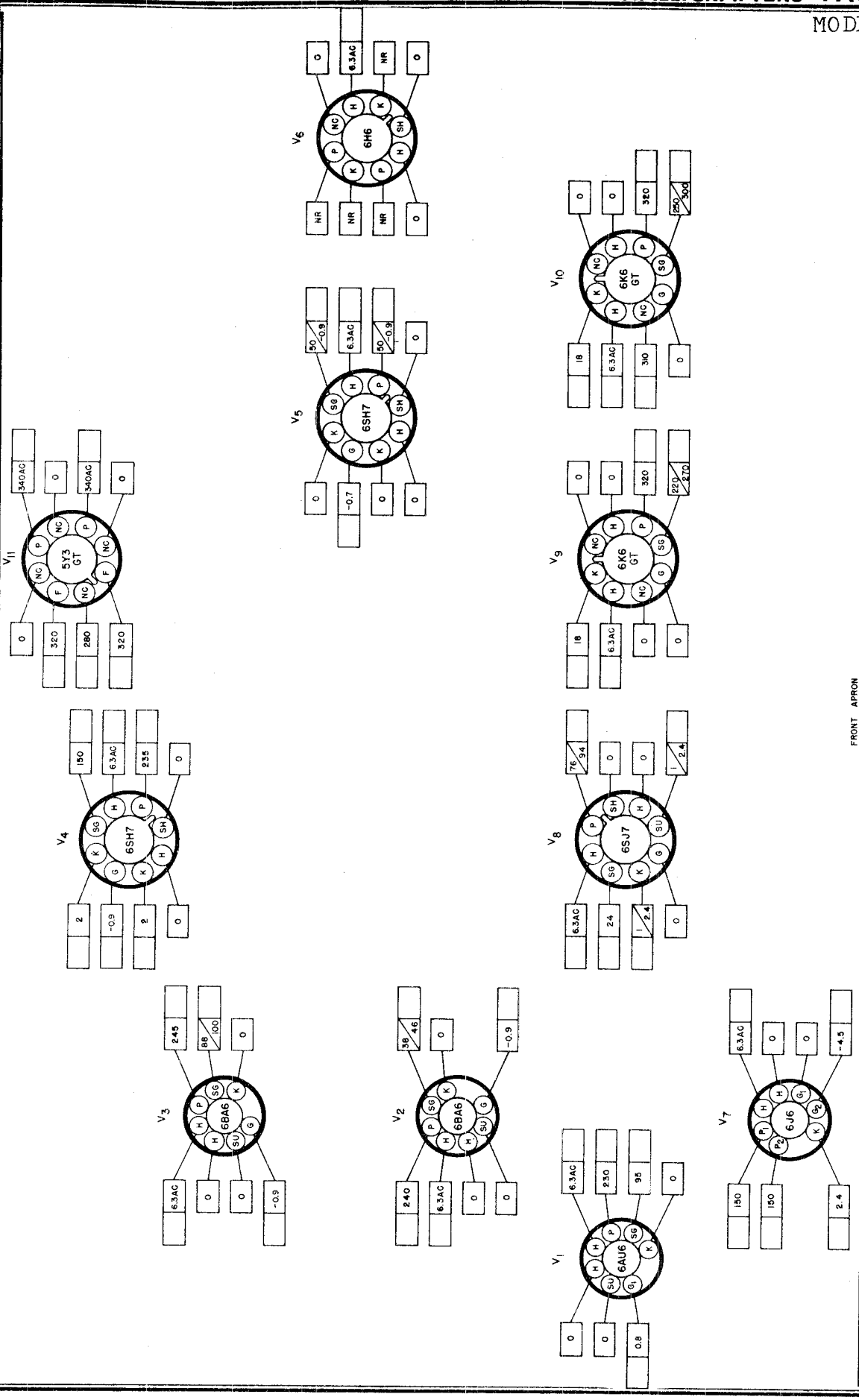
Fig. 8. Tube socket voltage chart



NOTES—
1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
3. LINE VOLTAGE 117 V. AC.
4. ALL VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLTMETER AND AT ZERO SIGNAL.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
6. "NC"—NO CONNECTION.
7. ☐ THE BLANK SPACES ARE PROVIDED FOR THE SERVICEMAN. FILL IN THE ACTUAL READING AS TAKEN WITH YOUR OWN EQUIPMENT. A NORMAL OPERATING RADIO SHOULD BE USED FOR THESE MEASUREMENTS.
8. FM/AM WHERE TUBE SOCKET VOLTAGES CHANGE FROM FM TO AM RECEPTION TWO READINGS ARE SHOWN, UPPER LEFT SHOWS FM READINGS—LOWER RIGHT SHOWS AM READINGS.
9. "NR"—NOT READABLE.

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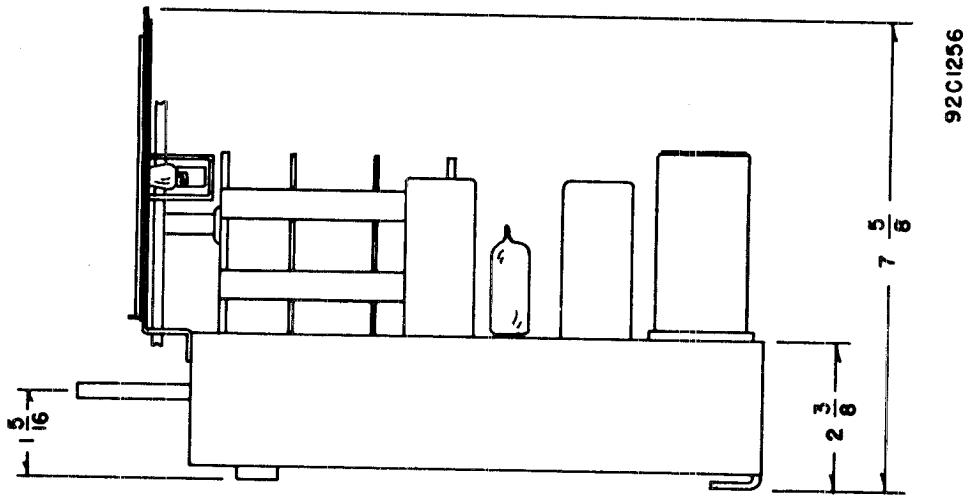

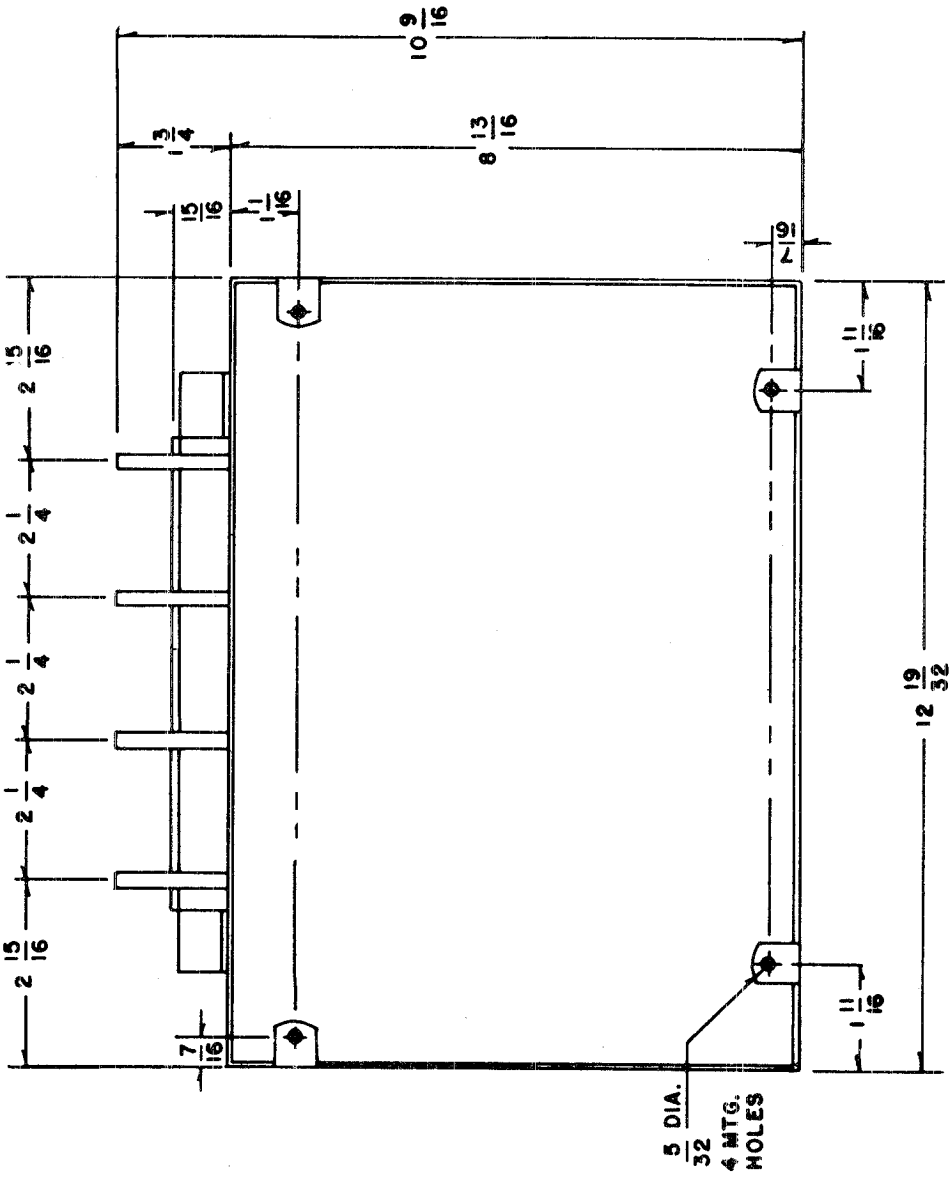

Fig. 9. Mounting dimensions.

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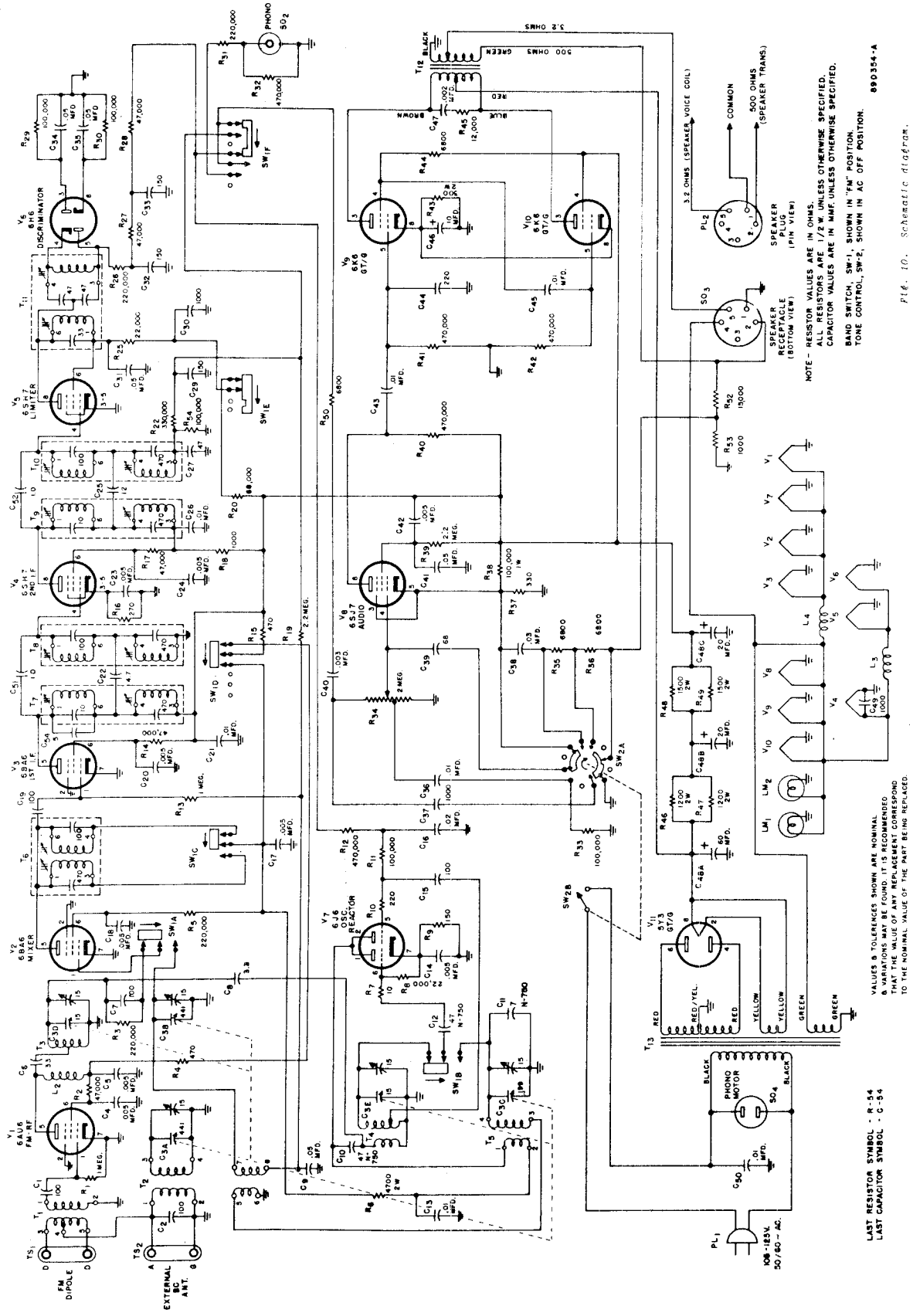

Fig. 10. Schematic diagram.

NOTE - RESISTOR VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE SPECIFIED.
CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.
BAND SWITCH, SW-1, SHOWN IN "FM" POSITION.
TONE CONTROL, SW-2, SHOWN IN AC OFF POSITION.
890354-A

VALUES & TOLERANCES SHOWN ARE NOMINAL
& VARIATIONS MAY BE FOUND. IT IS RECOMMENDED
THAT THE VALUE OF ANY REPLACEMENT CORRESPOND
TO THE NOMINAL VALUE OF THE PART BEING REPLACED.

LAST RESISTOR SYMBOL - R-54
LAST CAPACITOR SYMBOL - C-54

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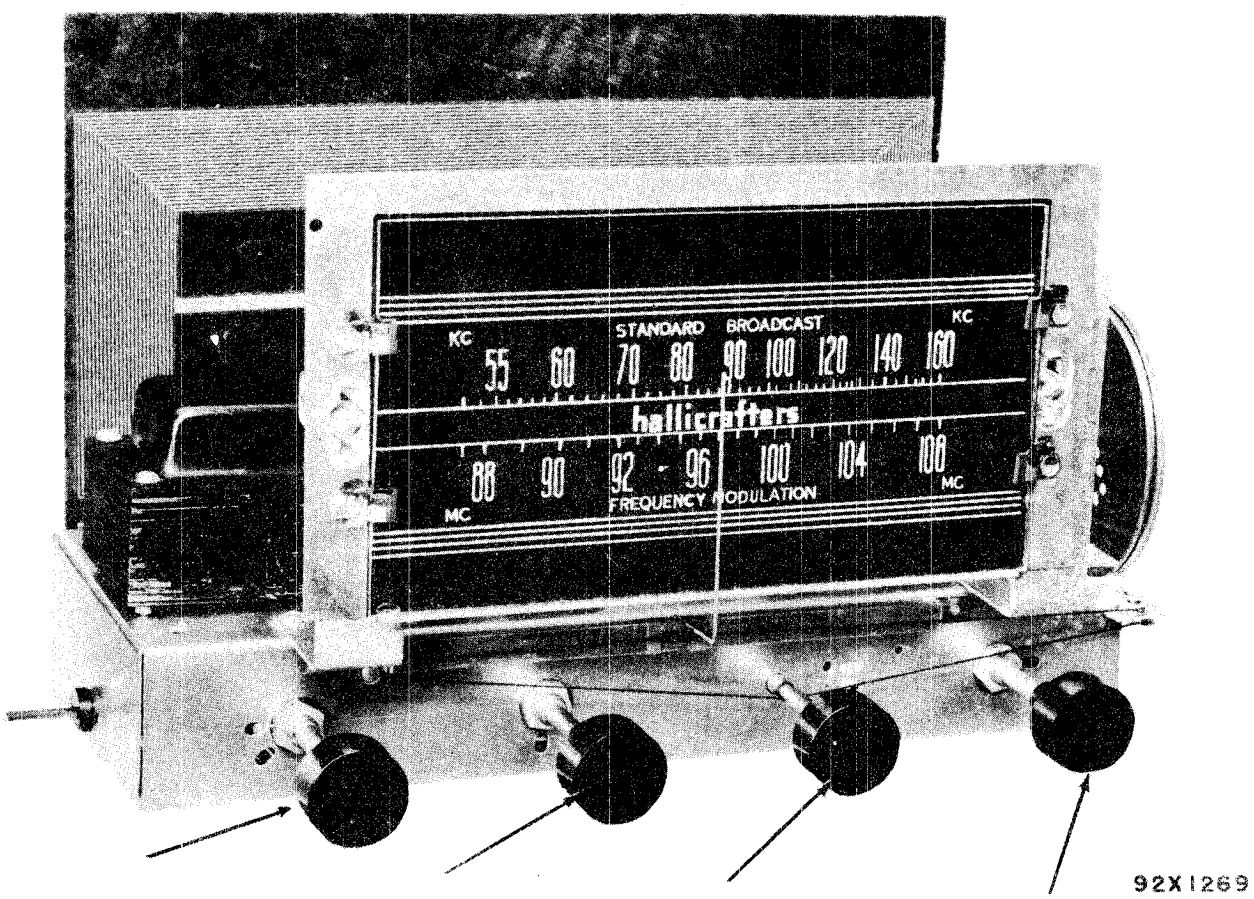
SERVICE PARTS LIST

Ref. No.	Description	Hallicrafter's Part Number
	CONDENSERS	
C-1,7,15,19	100 mmf. 500 V., ceramic	47B20101M5
C-2	100 mmf. 500 V., mica	CM20A101M
C-3	Tuning condenser, 5 sections	48C196
C-4,5,14,17, 18,20,23,24	.005 mfd. 450 V., ceramic	47A168
C-6	33 mmf. 500 V., ceramic	CC20UK330K
C-8	3.3 mmf. 500 V., bakelite	47A160-5
C-9,34,35	.05 mfd. 200 V., tubular paper	46AU503J
C-10,12	47 mmf. 500 V., ceramic	CC20UK470M
C-11	7 mmf. 500 V., ceramic	CC20UK070K
C-13,21,26, 36,43,45	.01 mfd. 600 V., tubular paper	46AZ103F
C-16	.02 mfd. 200 V., tubular paper	46AU203J
C-22	4.7 mmf. 500 V., bakelite	47A160-6
C-25	12 mmf. 500 V., mica	CM20A120K
C-27	47mmf. 500 V., mica	CM20A470M
C-29,32, 33	150 mmf. 500 V., mica	CM20A151M
C-30,37,49	1000 mmf. 500 V., ceramic	47B20102M5
C-31,41	.05 mfd. 600 V., tubular paper	46AY503J
C-38	.03 mfd. 200 V., tubular paper	46AU303J
C-39	68 mmf. 500 V., mica	CM20A680M
C-40	.003 mfd. 600 V., tubular paper	46AZ302J
C-42	.005 mfd. 600 V., tubular paper	46AZ502J
C-44	220 mmf. 500 V., mica	CM20A221M
C-46	10 mfd. 25 V., electrolytic	45A121
C-47	.002 mfd. 600 V., tubular paper	46AZ202J
C-48	60-20-20 mfd. 450 V., electrolytic	45B113
C-50	.01 mfd 600 V., molded paper	46AG103J
C-51,52	1 mmf. 500 V., bakelite	47A160-2
	RESISTORS	
R-1,13	1 megohm ½ watt, carbon	RC20AE105M
R-2,14,17, 27,28	47,000 ohms ½ watt, carbon	RC20AE473M
R-3,5,26,31	220,000 ohms ½ watt, carbon	RC20AE224M
R-4,15	470 ohms ½ watt, carbon	RC20AE471M
R-6	4700 ohms 2 watts, carbon	RC40AE472M
R-7	10 ohms ½ watt, carbon	RC20AE100M
R-8,25	22,000 ohms ½ watt, carbon	RC20AE223M
R-9	150 ohms ½ watt, carbon	RC20AE151M
R-10	220 ohms ½ watt, carbon	RC20AE221M
R-11,33,54	100,000 ohms ½ watt, carbon	RC20AE104M
R-12,32,40, 41,42	470,000 ohms ½ watt, carbon	RC20AE474M
R-16	270 ohms ½ watt, carbon	RC20AE271K
R-18,53	1000 ohms ½ watt, carbon	RC20AE102M
R-19,39	2.2 megohms ½ watt, carbon	RC20AE225M
R-20	68,000 ohms ½ watt, carbon	RC20AE683M
R-22	330,000 ohms ½ watt, carbon	RC20AE334M
R-29,30	100,000 ohms ½ watt, carbon	RC20AE104K
R-34	Volume control, 2 megohms (tapped)	25B623
R-35,36, 44,50	6800 ohms ½ watt, carbon	RC20AE682M
R-37	330 ohms ½ watt, carbon	RC20AE331K
R-38	100,000 ohms 1 watt, carbon	RC30AE104K
R-43	300 ohms 2 watt, carbon	RC40AE301J
R-45	12,000 ohms ½ watt, carbon	RC20AE123K
R-46,47	1200 ohms 2 watt, carbon	RC40AE122K
R-48,49	1500 ohms 2 watt, carbon	RC40AE152K
R-52	15,000 ohms 1/2 watt carbon	RC20AE153K
	TRANSFORMERS AND COILS	
T-1	Transformer, FM, antenna stage	51B1021
T-2	Transformer, BC, mixer stage	51B1059
T-3	Transformer, FM, mixer stage	51B1022
T-4	Transformer, FM, osc. stage	51B1073
T-5	Transformer, BC, osc. stage	51B1020
T-6	Transformer, 1st I.F.	50B409
T-7,9	Transformer, 2nd I.F. and AM Detector & FM limiter	50B407

SERVICE PARTS LIST (Cont.)

Ref. No.	Description	Hallicrafter's Part Number
	TRANSFORMERS AND COILS (Cont.)	
T-8,10	Transformer, 2nd I.F. and AM Detector & FM limiter	50B408
T-11	Transformer, FM, detector stage	50B410
T-12	Transformer, audio output	55B158
T-13	Transformer, power	52C152
L-2	Plate choke for tube V1	53B124
L-3	Filament choke for tubes V5 & 6	53B123
L-4	Filament choke for tubes V1,2,3, & 7	53A136
	SWITCHES	
SW-1	Band switch assembly	60B318
SW-2	Switch, tone control	60B319
	PLUGS AND SOCKETS	
PL-1	Line cord and plug	87A078
SO-2	Receptacle, television, phono	36A029
SO-3	Receptacle, speaker	6A277
SO-4	Receptacle, phono motor	10A015
	Socket, octal (tube)	6A296
	Socket, miniature (tube)	6A297
	Socket & bracket, dial light	86A062
	TUBES, RECTIFIERS AND LAMPS	
V-1	6AU6 antenna	90X6AU6
V-2,3	6BA6 mixer, 1st I.F.	90X6BA6
V-4,5	6SH7 2nd I.F., limiter	90X6SH7
V-6	6H6 discriminator	90X6H6
V-7	6J6 osc. & AFC	90X6J6
V-8	6SJ7 audio amp.	90X6SJ7
V-9,10	6K6GT power amp.	90X6K6GT
V-11	5Y3GT rectifier	90X5Y3GT
LM-1,2	Lamp, 6-8 V., 250 Ma., Mazda #44	39A003
	MISCELLANEOUS	
	Shaft, tuning	74A247
	Pulley, idler	28A052-6
	Switch, cam	77A261
	Drive pin	74A246
	Collar	77A267
	Bushing	77A266
	Bracket, dial plate mtg.	67A793
	Dial plate	63B332
	Dial background (paper)	32A446
	Dial glass (calibrated)	22C201
	Clip (for dial glass 22C201)	76A390
	Rubber spacer, for dial clip	16A126
	Pointer	82A147
	Dial cord	38A019
	Spring, dial cord	75A012
	Dial glass (clear)	22B205
	Clip (for dial glass 22B205)	76A331
	Escutcheon (Model S-55)	7C067-1
	Escutcheon (Model S-56)	7C067
	Knob, tone and range controls (Model S-55)	15B077-4
	Knob, tone and range controls (Model S-56)	15B068-3
	Knob, tuning and volume controls (Model S-55)	15B068-4
	Knob, tuning and volume controls (Model S-56)	15B077-3
TS-1	Terminal strip, antenna (Marked D-D)	87A379
TS-2	Terminal strip, antenna (Marked A-G)	88A327
	Line cord lock	76A299
	Mounting foot, rubber	16A007

OPERATION



92X1269

This is a combination power switch and tone control. In the OFF position the receiver is completely turned off. To turn on the receiver, turn the control to the right. The power switch will click and the dial light will illuminate the dial face indicating that the receiver is receiving power from the wall outlet. After tuning in the station this control is again adjusted for the desired tonal response. Turning the control clockwise decreases the bass response.

VOLUME - Turn this control clockwise to increase volume and counter-clockwise to decrease volume.

TUNING - The tuning control "tunes in" either AM (Standard Broadcast) or FM (Frequency Modulation) stations depending upon the setting of the range switch. The standard broadcast band dial is calibrated so that a zero must be added to the number appearing on the dial to obtain the station frequency in kilocycles. The frequencies of the FM stations are shown directly in megacycles. The frequencies of local stations are generally listed in local newspapers, AM stations in kilocycles and FM stations in megacycles. Tune for the clearest reception to obtain top performance from your receiver.

This is the combination range and operation switch. In the FM (Frequency Modulation) position, the receiver tunes the 88 to 108 megacycle FM band; in the AM (Standard Broadcast) position, the receiver operates as a regular broadcast receiver tuning the frequency range 540 to 1600 kilocycles. To use the receiver as a record player, set this switch at PHONO and operate the volume and tone controls as for normal radio reception.

MODEL ST-74

DESCRIPTION

The model ST-74 receiver is a superheterodyne receiver covering the standard broadcast (540 kc - 1600 kc) and FM broadcast (88 mc-108 mc) services. The receiver is supplied in chassis form for custom installations.

A shielded connector and power receptacle located on the rear apron of the chassis permit the attachment of a record player for recorded entertainment.

To place the receiver in operation it is merely necessary to connect the antenna and speaker and plug the power plug into the wall outlet. Refer to the installation details that follow, especially to the paragraph on "Power Source", before connecting the receiver to the wall outlet to avoid unnecessary and perhaps costly repairs.

INSTALLATION

UNPACKING - Check all shipping instruction tags carefully before removing them.

LOCATING - When locating and mounting the receiver give careful consideration to ventilation. Avoid warm locations such as are found near radiators, or hot air registers. Carefully avoid dead air spaces in the installation.

ANTENNA - The receiver is equipped with a built in loop antenna for local reception on both the FM (frequency modulation) and AM (standard broadcast) bands. Due to the directional effect of a loop antenna, it may be necessary to rotate the receiver slightly to obtain optimum performance from all of the broadcasting stations. In general, however, the receiver may be placed in operation without further antenna considerations.

Where receiving conditions are poor and maximum antenna pickup is required, antenna terminals have been provided for an outdoor antenna system.

Standard Broadcast Antenna - When required, a single wire approximately 25 to 50 feet long may be connected to the terminal marked EXTERNAL BROADCAST ANTENNA, located at the rear of the receiver, to improve reception in the standard broadcast band (540-1600 kc). This wire may be concealed in the room or erected outside the building as desired.

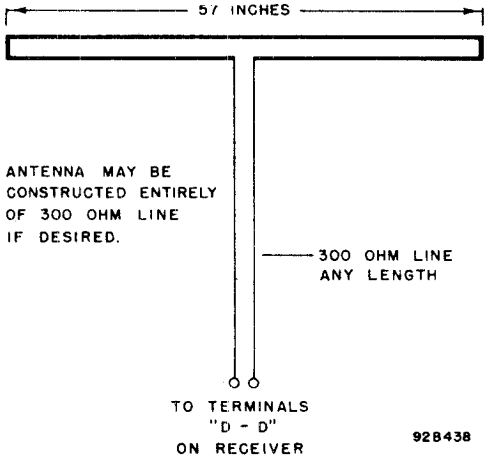


Fig. 2. Folded doublet antenna details.

FM Broadcast Antenna - Where receiving conditions demand more signal pickup on the FM band than provided by the built in loop, an FM band antenna may be erected and its transmission line connected to the two terminals marked "D-D" located on the rear apron of the receiver chassis. The receiver is designed to operate with any FM band antenna using a 300-ohm transmission line.

The simplest antenna which will provide satisfactory FM reception is the folded doublet. This antenna may be constructed of 300-ohm transmission line available at most radio supply houses. Cut and solder the transmission line conductors together as shown in Fig. 2.

Satisfactory reception may be obtained by concealing the antenna under the rug, along the molding, or along the back of a cabinet. If receiving conditions are poor in the particular location, it may be desirable to erect the antenna outdoors as high as practical. In either case the reception will be best when the antenna runs at right angles to the direction of reception.

POWER SOURCE - The receiver operates from a 105-125 V. 60 cycle AC (Alternating current) power source only. The receiver will not operate from a DC (Direct Current) or 25 cycle AC source directly. If in doubt as to the voltage and frequency rating of your power source, contact the local power company representative to avoid costly repairs. The normal power consumption for this receiver is 60 watts.

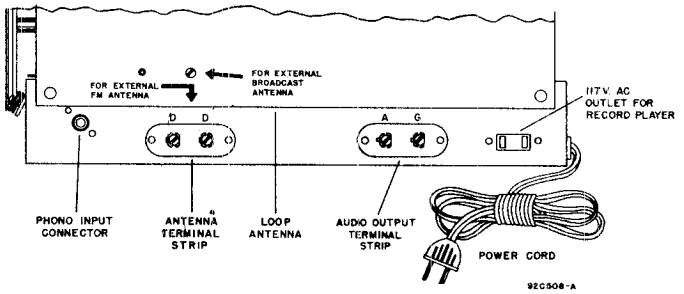


Fig. 3. Antenna & record player connections

RECORD PLAYER CONNECTION - A shielded type receptacle, accessible at the rear chassis apron, is provided to accommodate a record player pickup cable connector. Any record player employing a crystal cartridge or high level magnetic pickup in its tone arm may be used with the receiver. An a-c receptacle is also provided to accommodate the power plug on the record player. The record player is automatically shut off with the receiver when using this power outlet.

SERVICE

GENERAL SPECIFICATIONS

Tubes	Six plus rectifier	Tuning	Manual
High Impedance Output		Frequency Range . . .	Broadcast 540 kc - 1600 kc Frequency Modulation 88 mc - 108 mc
Antenna	Built-in loop type Antenna. Provisions for external antenna.	Intermediate Frequency.	455 kc/10.7 mc
		Power Supply	105-125 V. 60 cycles AC
Phono Input	High impedance	Power Consumption . .	60 watts

TUBE REPLACEMENT - The tube types and their relative position in the receiver are shown in the illustration, Fig. 5. When installing a replacement tube, insert the center guide pin into the center hole of the tube socket; rotate the tube until the key on the guide pin drops into the notch in the socket hole; and push down until the base of the tube rests firmly on the socket. A slightly different technique must be used on the miniature tubes. They have seven small pins which have to be lined up with the socket holes before pushing the tube into the socket. Handle all tubes with care as they are considered fragile and do not tolerate much mechanical abuse.

DIAL LAMP REPLACEMENT - Refer to Fig. 5. for the location of the two dial lamps. To replace a defective dial lamp, unclip the dial lamp socket by compressing the side springs. The socket and defective lamp may then be brought out into the open for service. Replace defective lamps with 6-8 V. Mazda #44 (Blue bead) or equivalent.

RESTRINGING DIAL CORD

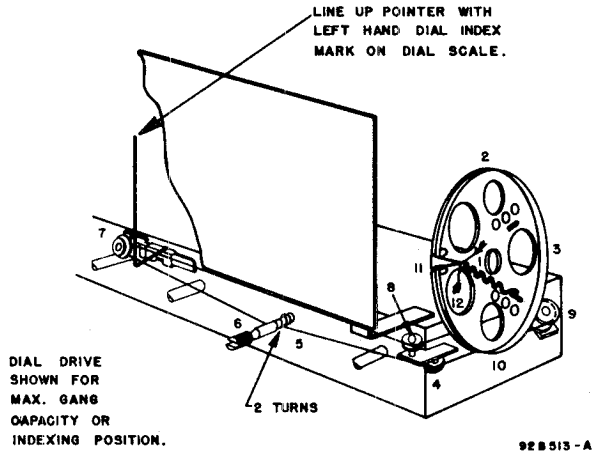


Fig. 4. Dial cable stringing procedure

Restring the dial drive with a 48-inch length of 20 lb. test dial cord. Tie one end to the tension spring and follow the stringing sequence outlined in Fig. 1. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the dial pointer to the drive string and line it up with the left hand index mark on the dial scale.

ALIGNMENT

Generator connection	See chart	Electronic voltmeter connection	See chart
Generator ground	To chassis	Volume control position.	Maximum
Output meter connection . . .	Across voice coil	Tone control position	Optional

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

MODEL ST-74

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Range Switch Position	Radio Dial Setting	Adjust	Remarks
1.	.01 mfd. cap.	To stator plates of high cap. mixer section	455 kc	2	1000 kc	A,B,C,D	Adjust for max. audio output at voice coil. Keep audio output below 50 mw to avoid AVC action.
2.	.01 mfd. cap.	To stator plates of low cap. mixer section	10.7 mc (No modulation)	1	100 mc	E,F,G,H	Adjust for max. DC voltage between pin #7 of the 6AL5 and chassis. Connect a 500,000 ohm resistor in series with voltmeter probe. Use just enough signal generator output to obtain approx. 2 volts at the electronic voltmeter.
3.	After completing the adjustments required by step 2. detune the signal generator on each side of 10.7 mc and note the generator dial or frequency reading for one half of the DC voltage measured by the electronic voltmeter. Use just enough signal generator output to obtain a maximum of 2 volts at the center frequency of the IF channel. Set the signal generator frequency at the midpoint of the two readings obtained above and align the FM detector transformer as follows:						
4.	Without changing the setup, adjust the primary of the FM detector transformer (I) for maximum DC voltage. Disconnect the electronic voltmeter probe and reconnect it to the junction of R24 and R25 using the 500,000-ohm resistor as before for isolation. Adjust the secondary of the FM detector (J) for the null or zero DC voltage. This completes the IF amplifier adjustment.						
5.	Std. RMA dummy	To BC antenna terminal on back of loop.	1500 kc	2	1500 kc	*K,L	Adjust for max. audio output as in step 1.
			600 kc	2	600 kc	*M	
6.	300-ohm carbon resistor	To terminals "D-D" on rear chassis apron. Connect resistor to high side or ungrounded terminal	108 mc	1	108 mc	*N,O	Adjust for max. DC voltage as in step 2.

*Calibration adjustment.

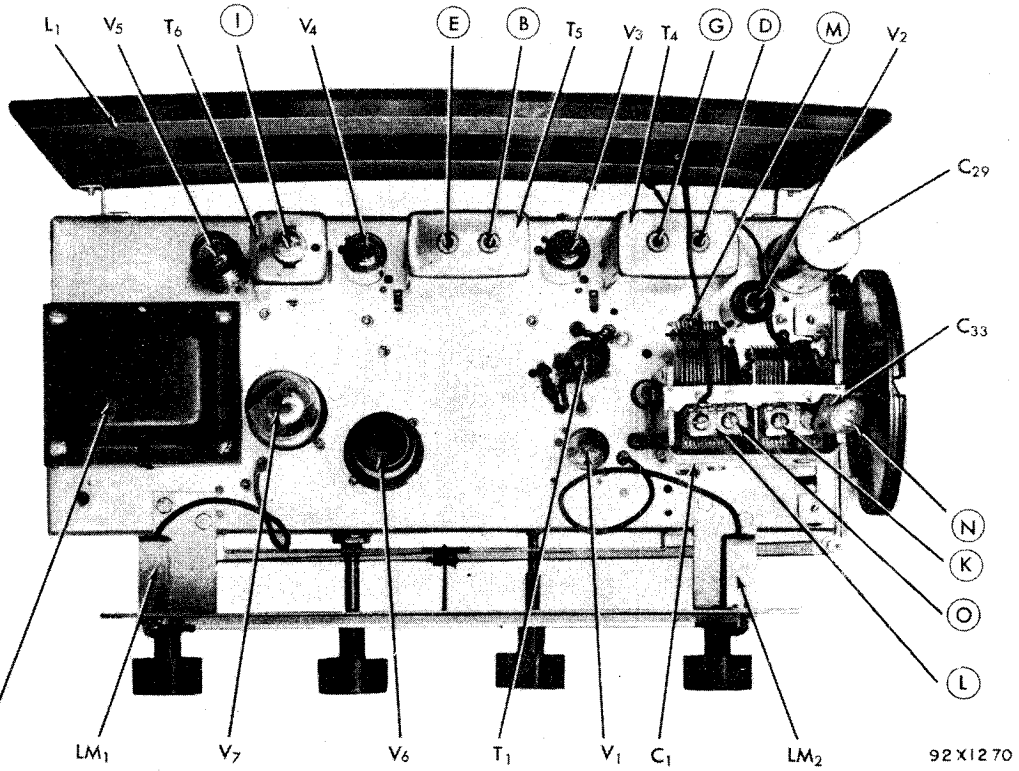


Fig. 5. Top view, alignment, adjustments and component location.

MODEL ST-74

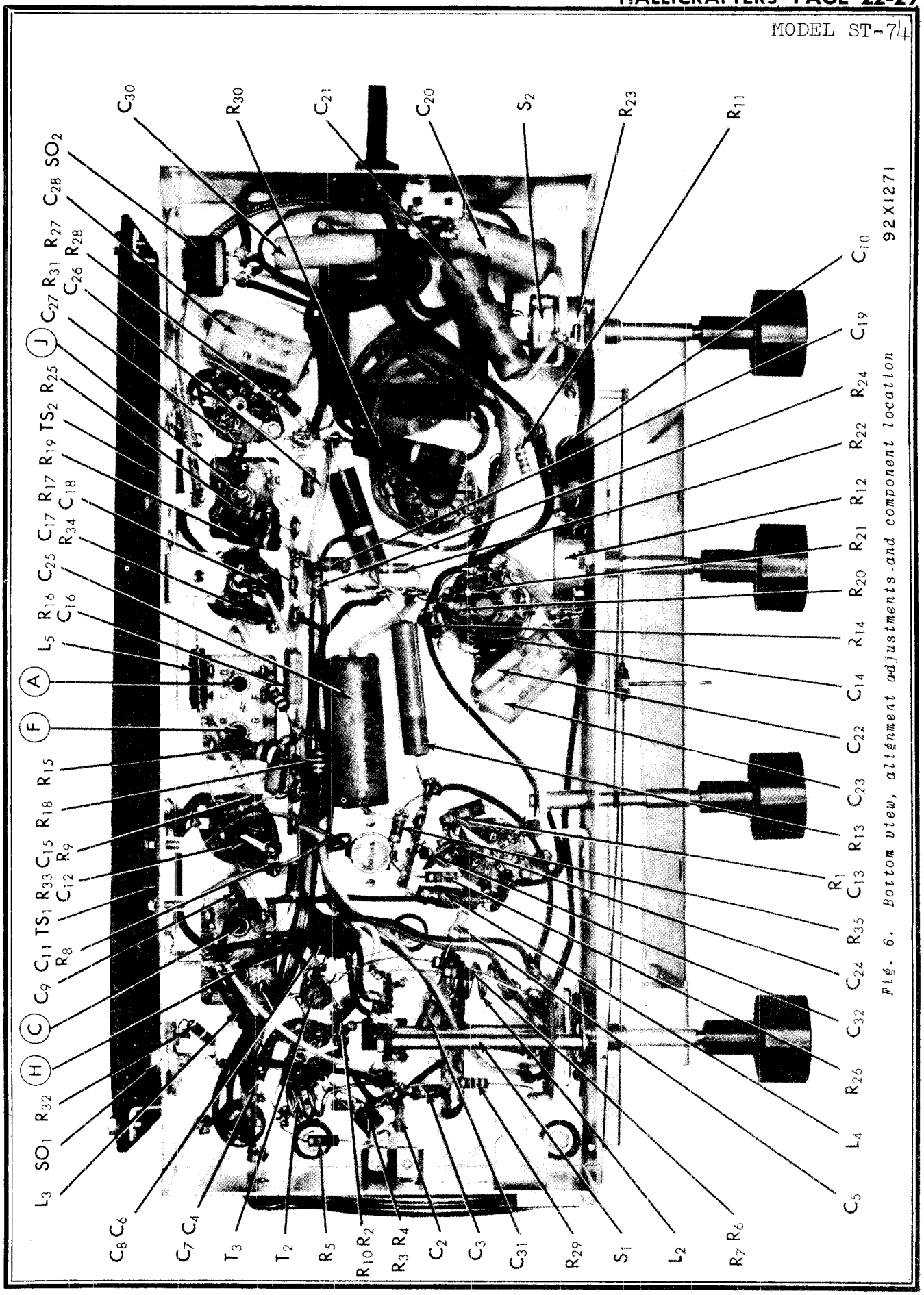
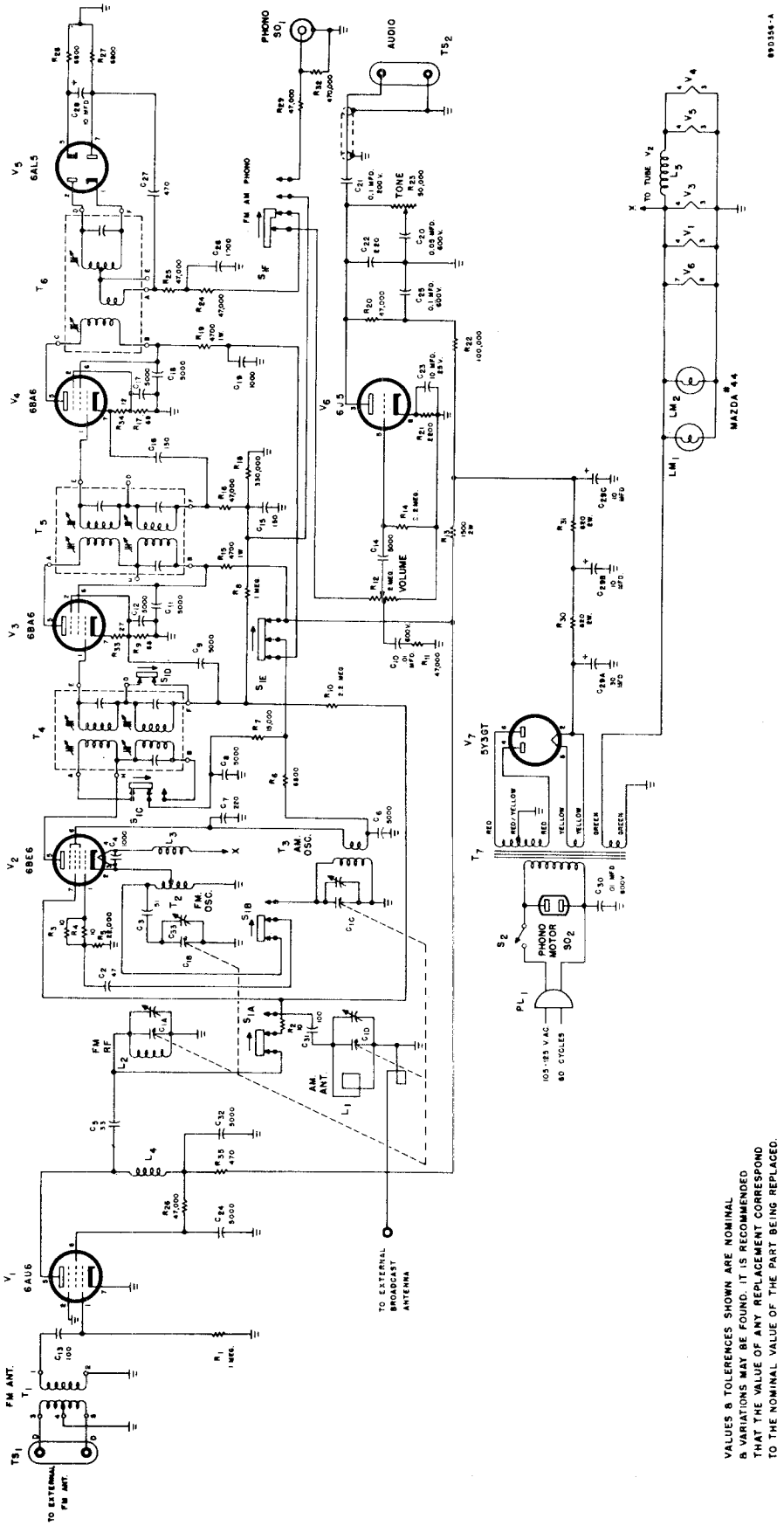


Fig. 6. Bottom view, alignment adjustments and component location

MODEL ST-74



VALUES & TOLERENCES SHOWN ARE NOMINAL
& VARIATIONS MAY BE FOUND. IT IS RECOMMENDED
THAT THE VALUE OF ANY REPLACEMENT CORRESPOND
TO THE NOMINAL VALUE OF THE PART BEING REPLACED.

NOTES-

RESISTOR VALUES ARE IN OHMS.
RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
CAPACITOR VALUES ARE IN MMF UNLESS OTHERWISE SPECIFIED.
RANGE SWITCH S-1 SHOWN IN FM. POSITION.

LAST CAPACITOR SYMBOL —— C-33
LAST RESISTOR SYMBOL —— R-35

Fig. 7. Schematic Diagram

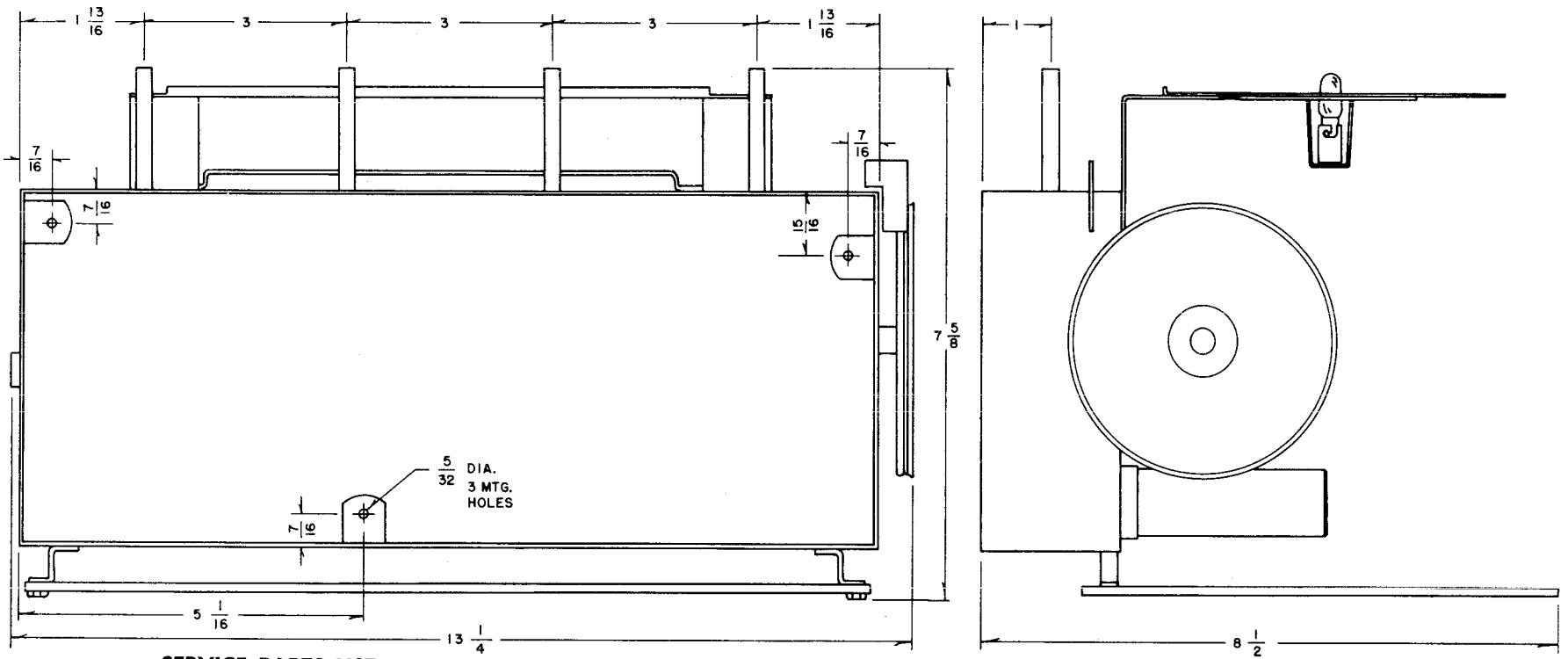


Fig. 8. Chassis mounting dimensions

SERVICE PARTS LIST

CONDENSERS

Ref. No.	Description	Manufacturer's Part Number
C-1	Capacitor, main tuning	48C203-1
C-2	47 mmf. 500 V., ceramic	47X21UK470K
C-3	51 mmf. 500 V., ceramic	47X21UK510J
C-4,19,26	1000 mmf, 500 V., ceramic	47B20A102N5
C-5	33 mmf. 500 V., ceramic	47X20UK330K
C-6,8,9,11, 12,14,17, 18,24,32	5000 mmf. 500 V., Hi Kap	47A168
C-7,22	220 mmf. 500 V., mica	47X20B221M
C-10	.01 mfd. 600 V., tubular paper	46AY103J
C-13,31	100 mmf. 500 V., Hi Kap	47B20A101M5
C-15,16	150 mmf. 500 V., mica	47X20B151M
C-20	.05 mfd. 600 V., tubular paper	46AY503J
C-21	.1 mfd. 200 V., tubular paper	46AU104J
C-23,28	10 mfd. 25 V., electrolytic	45A121
C-25	.1 mfd. 600 V., tubular paper	46AY104J
C-27	470 mmf. 500 V., ceramic	47B20A471M5
C-29	30-10-10 mfd. 350 V., electrolytic	45B131
C-30	.01 mfd. 600 V., molded paper	46AG103J
C-33	Trimmer	44A115

TRANSFORMERS AND COILS

T-1	Coil, FM antenna	51B1021
T-2	Coil, FM oscillator	51A1062
T-3	Coil, AM oscillator	51B1063
T-4	Transformer, 1st IF	50B399
T-5	Transformer, 2nd IF	50B400
T-6	Transformer, ratio detector	50B401
T-7	Transformer, power	52C200-B
L-1	Loop Antenna	57D123
L-2	Coil, FM-RF	51A1061
L-3,4	Choke, RF	53A136
L-5	Choke, RF	53B124

SWITCHES

S-1	Switch, assembly band selector	60B328
S-2	Switch, power (part of tone control R-23)	

RESISTORS

92C1261

R-1,8	1 megohm 1/2 watt, carbon	23X20X105M
R-2,3,4	10 ohms 1/2 watt, carbon	23X20X100M
R-5	22,000 ohms 1/2 watt, carbon	23X20X223K
R-6,27,28	6800 ohms 1/2 watt, carbon	23X20X682K
R-7	15,000 ohms 1/2 watt, carbon	23X20X153M
R-9,17	68 ohms 1/2 watt, carbon	23X20X680K
R-10,14	2.2 megohms 1/2 watt, carbon	23X20X225M
R-11,16,20, 24,25,26, 29	47,000 ohms 1/2 watt, carbon	23X20X473K
R-12	Volume control, 2 megohms	25B624
R-13	1500 ohms 2 watt, carbon	23X40X152M
R-15,19	4700 ohms 1 watt, carbon	23X30X472M
R-18	330,000 ohms 1/2 watt, carbon	23X20X334M
R-21	2200 ohms 1/2 watt, carbon	23X20X222K
R-22	100,000 ohms 1/2 watt, carbon	23X20X104M
R-23	Tone control and AC switch, 50,000 ohms	25B759
R-30,31	820 ohms 2 watt, carbon	23X40X821K
R-32	470,000 ohms 1/2 watt, carbon	23X20X474M
R-33	27 ohms 1/2 watt, carbon	23X20X270K
R-34	12 ohms 1/2 watt, carbon	23X20X120K
R-35	470 ohms 1/2 watt, carbon	23X20X471K

PLUGS AND SOCKETS		
PL-1	Line cord and plug	87B1669
SO-1	Receptacle, phono	36A041
SO-2	Socket, AC receptacle	10A015
	Socket, octal (tubes V-6,7)	6A296
	Socket, miniature (tubes V-1,2,3,4,5)	6A308
	Socket, dial light	86A062-1
TUBES, RECTIFIERS AND LAMPS		
V-1	Type 6AU6, RF amp.	90X6AU6
V-2	Type 6BE6, mixer/osc.	90X6BE6
V-3	Type 6BA6, 1st IF amp.	90X6BA6
V-4	Type 6BA6, 2nd IF amp. and detector (AM)	90X6BA6
V-5	Type 6AL5, detector (FM)	90X6AL5
V-6	Type 6J5, audio amp.	90X6J5
V-7	Type 5Y3GT, rectifier	90X5Y3GT
LM-1,2	Lamp, 6-8 V., Mazda #44 (Blue bead)	39A003
MISCELLANEOUS		
TS-1	Terminal strip, antenna (FM)	88A379
TS-2	Terminal strip, audio output	88A327
	Bracket, dial plate mtg.	67A834
	Bracket, gang mtg.	67B825
	Dial background (black)	32A446
	Dial cord	38A001
	Dial plate	63B332
	Dial scale (glass)	22B301
	Escutcheon	7D067
	Glass	22B205
	Knob, tuning and volume controls	15B067-2
	Knob, tone and range controls (1 dot)	15B142-6
	Line cord lock (male section)	76A397-1
	Line cord lock (female section)	76A397-2
	Pointer	82A152
	Shaft, tuning	74A251
	Shield, tube V-5	69A232
	Spring, dial cord	75B012
	Spring, retainer	75A062
	Template	95D177

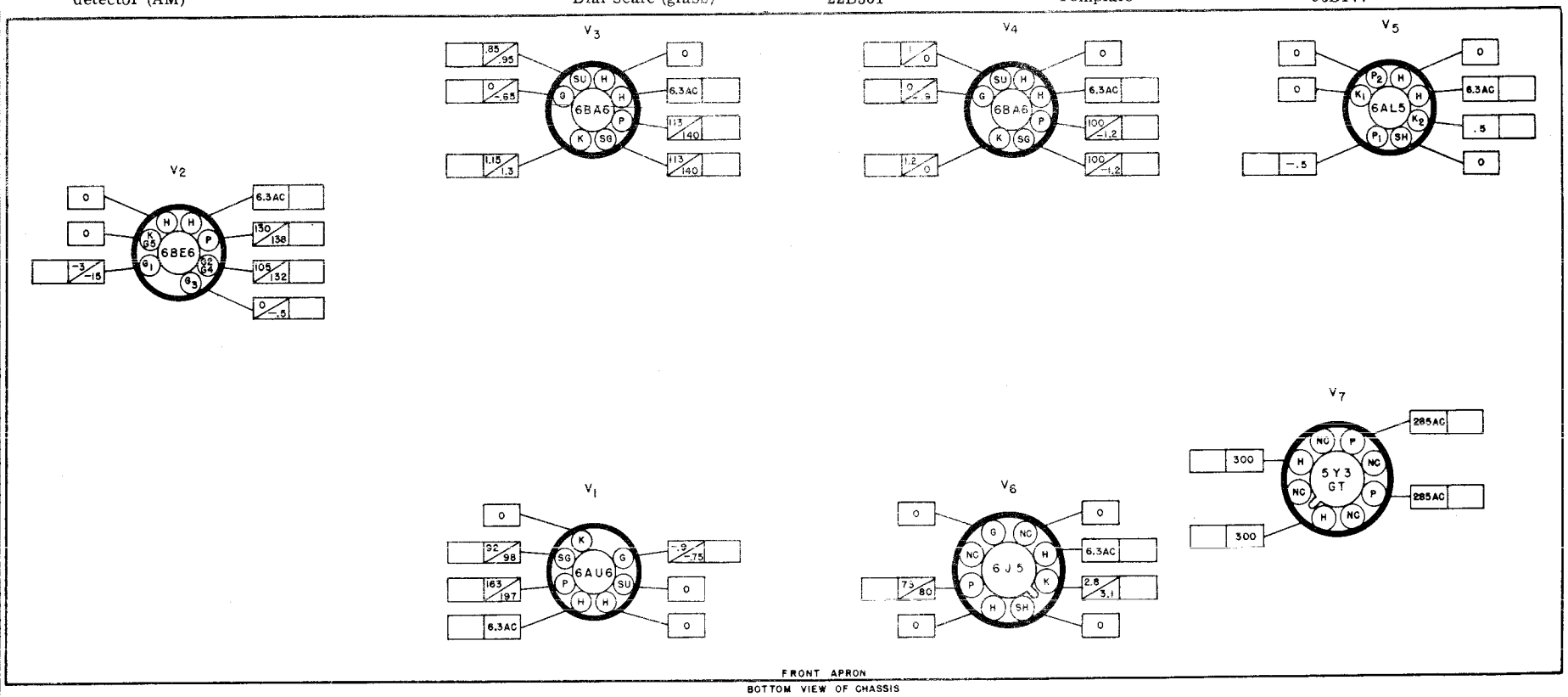


Fig. 9 Tube socket voltage chart

NOTES—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
3. LINE VOLTAGE — 117 V. AC.
4. ALL VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER AND AT ZERO SIGNAL.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
6. FM / AM WHERE TUBE SOCKET VOLTAGES CHANGE FROM FM TO AM RECEPTION TWO READINGS ARE SHOWN, UPPER LEFT SHOWS FM READINGS — LOWER RIGHT SHOWS AM READINGS.
7. "NC"— NO CONNECTION. READING SHOWN ONLY WHEN TERMINAL IS USED AS A TIE LUG.
8. "NR"— NOT READABLE OR READING GENERALLY MEANINGLESS.
9. [ ] THE BLANK SPACES ARE PROVIDED FOR THE SERVICE METER READING. FILL IN THE ACTUAL READING AS TAKEN WITH YOUR OWN TEST EQUIPMENT USING A NORMAL OPERATING RADIO FOR THESE MEASUREMENTS.

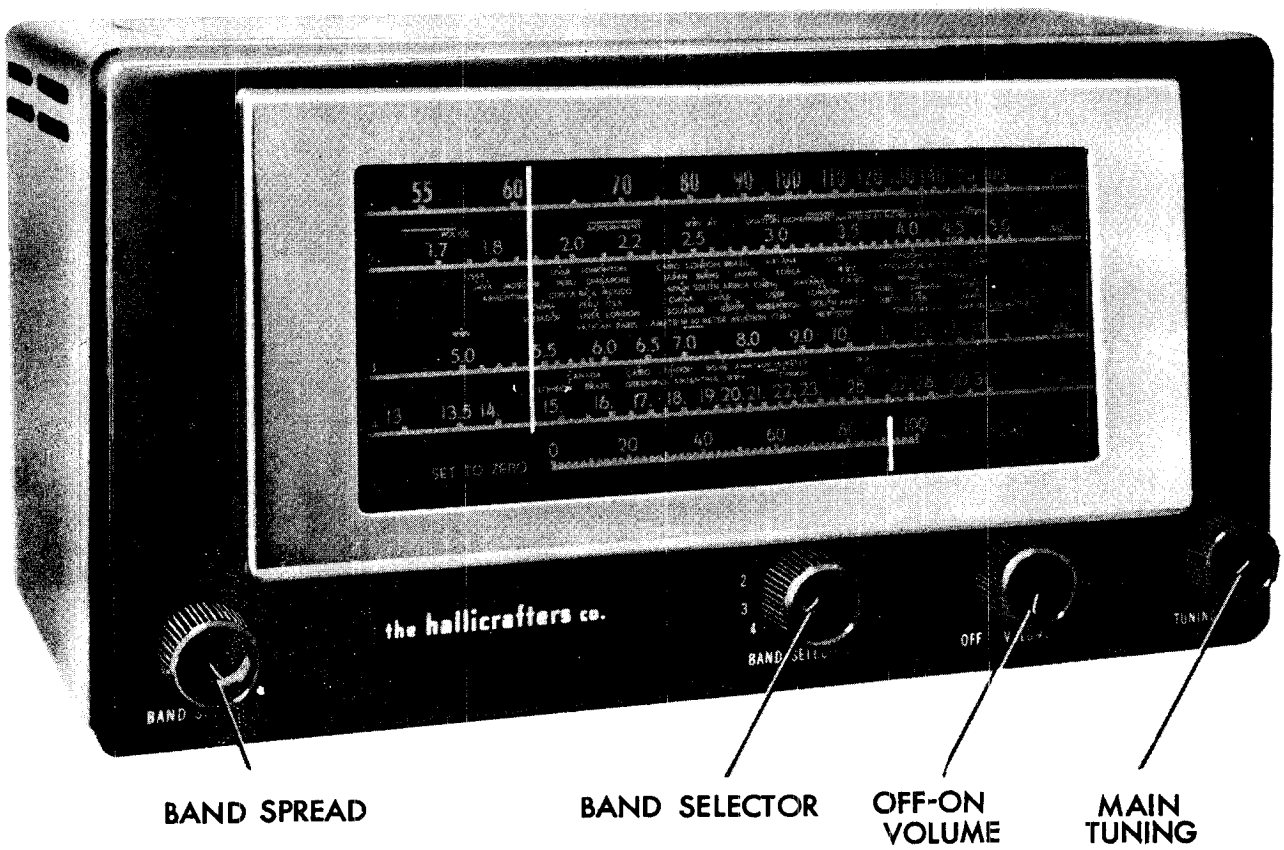


FIG. 1. RADIO RECEIVER MODEL 5R10

INSTALLATION

LOCATION - The receiver is equipped with rubber feet for table top or shelf mounting. When locating and mounting the receiver, avoid excessively warm locations such as those found near radiators and hot air registers or recessed installations which prevent proper circulation of air. If the receiver is placed with its back to the wall, leave about an inch or two of clearance between the back of the cabinet and the wall for proper ventilation.

POWER SOURCE - The receiver operates from a 105-125 volt DC (direct current) or 60 cycles AC (alternating current) source. The normal power consumption of the receiver is 30 watts. The receiver will not operate from a 25-cycle AC source directly. If in doubt as to the voltage and frequency rating of your power source, contact the local power company representative to avoid costly repairs. If the receiver does not respond after a minute warm-up period when operating on a DC source, it may be necessary to reverse the power plug at the wall outlet.

Operation from a 210-250 volt AC/DC source is possible by using a special line cord adapter available as an accessory. Consult your Hallicrafters dealer regarding this adapter unit (Hallicrafters part number 87D1566) if 210-250 volt operation is desired.

ANTENNA - A three terminal strip is provided on the rear chassis apron for antenna connections. The terminals are marked "A1", "A2" and "G". A jumper bar is normally connected between terminals "A2" and "G" for single wire antenna systems and unbalanced antenna transmission lines. For doublet antenna installations using a balanced transmission line, the jumper between "A2" and "G" is disconnected. A good ground connection, when used, is connected to terminal "G".

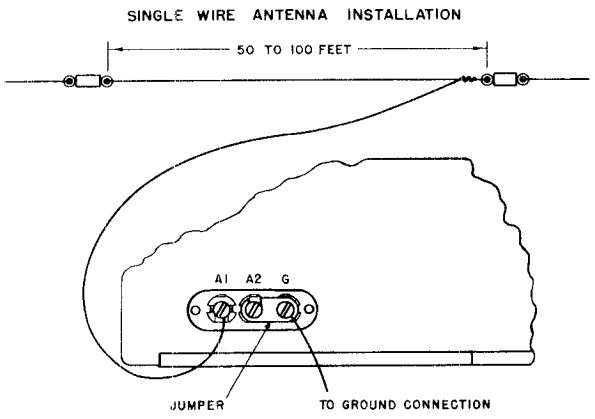


FIG. 2. SINGLE WIRE ANTENNA INSTALLATION

SINGLE WIRE ANTENNA - For a single wire antenna installation, connect a jumper between antenna terminals "A2" and "G". A single wire antenna of about 50 to 100 feet long (including lead-in) is then connected to terminal "A1". Erect the antenna as high and free of surrounding objects as possible. For improved reception, it may be desirable to connect a ground wire between terminal "G" and a suitable ground such as a water pipe or outside ground stake.

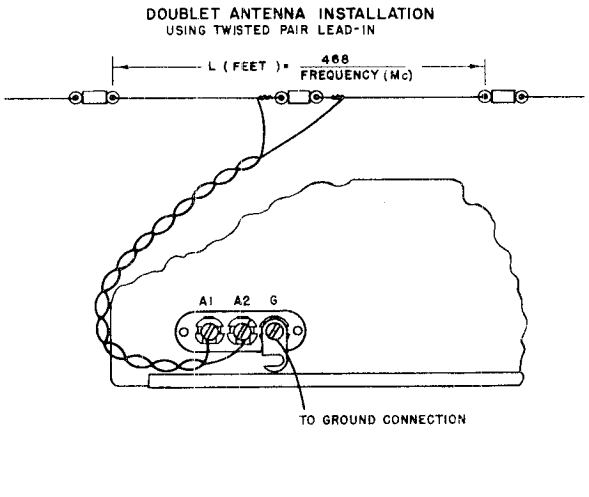


FIG. 3. DOUBLET ANTENNA INSTALLATION

DOUBLET ANTENNA - The doublet antenna is recommended for the high frequency bands, especially where a maximum signal to noise ratio is required over a relatively narrow range of frequencies. The antenna transmission line is connected to terminals "A1" and "A2". If a concentric line with a grounded outer conductor is used, connect the inner conductor to terminal "A1", the outer conductor to terminal "A2", and connect a jumper between terminals "A2" and "G".

The overall length (feet) of a doublet antenna may be determined by dividing the constant 468 by the desired frequency in megacycles. Keep in mind that this type of antenna is directional broadside to its length and should be so oriented if maximum pickup from a given direction is desired.

OPERATION

STANDARD BROADCAST RECEPTION - For standard broadcast reception set the BAND SELECTOR switch to position "1", the SPEAKER/PHONES switch to "SPEAKER" and the BAND SPREAD dial pointer to "0". Note that the main tuning dial calibration will be true only when the bandspread dial pointer is set at zero. Turn on the receiver with the VOLUME control by turning it clockwise beyond the point of switch action. Adjust the TUNING and VOLUME controls in the usual manner, tuning carefully for the clearest reception. When operating the receiver from a DC source allow about a minute for warm-up. If the receiver doesn't respond after this warm-up period, reverse the power plug at the wall outlet to obtain proper polarity. In certain cases hum picked up from an AC outlet may be reduced by properly polarizing the power plug.

To turn off the receiver, turn the VOLUME control fully counter-clockwise beyond the point of switch action.

SHORT-WAVE RECEPTION - Reception in the short-wave bands is accomplished as described above for standard broadcast reception except that the BAND SELECTOR is set for bands 2, 3, or 4. The frequency of reception is read from the dial scale which corresponds to the setting of the BAND SELECTOR. Any narrow range of frequencies covered by the receiver may be spread out by tuning the stations with the BAND SPREAD control as explained below.

BAND SPREAD TUNING - To use the band spread dial, set the bandspread dial pointer to zero, set the main tuning dial pointer at the high frequency limit of the range of frequencies to be covered and then tune in the stations with the BAND SPREAD control. For example: Assume that the 40 meter amateur band is to be covered. Set the BAND SELECTOR to position "3", the main tuning dial pointer to 7.3 MC and tune in the stations with the BAND SPREAD control.

IMPORTANT - The calibrations on the main tuning dial scale are correct only when the BAND SPREAD dial pointer is set at "0".

SPEAKER PHONES - Normally this switch is set at "SPEAKER" for loud speaker operation. Setting the switch to the "PHONES" position switches the output circuit from the speaker to the headset output jacks located on the rear apron of the chassis.

SERVICE

GENERAL SPECIFICATION

Tubes	Four plus rectifier
Speaker	5-inch PM
Voice coil impedance	3.2 ohms
Headset output	High impedance (1500 to 5000 ohms)
Antenna	Provisions for external antenna with transmission line or single wire feed.
Intermediate frequency	455 KC
Power Supply	105-125 volts DC or 60 cycles AC
Power Consumption	30 watts
Tuning	Manual

TUNING RANGE

Band Selector Position	Frequency Range
1	540 KC - 1650 KC
2	1.65 MC - 5.1 MC
3	5 MC - 14.5 MC
4	13 MC - 31 MC

RESTRINGING DIAL CORD

MAIN TUNING DIAL POINTER DRIVE

Restring the main tuning dial pointer drive with a 39-inch length of 30 lb. test dial cord. Set the main tuning capacitor in a fully closed position. Tie one end of the cord to the tension spring at position "A" and follow the stringing procedure "A" through "I" as illustrated in Fig. 4. At position "I", stretch the tension spring and tie the cord securely. Note that three and a quarter turns of dial cord are wrapped around the main tuning drive shaft for proper traction.

Index the main tuning dial pointer by setting the main tuning gang at maximum capacity (fully closed) and aligning the dial pointer with the left hand dial index marker.

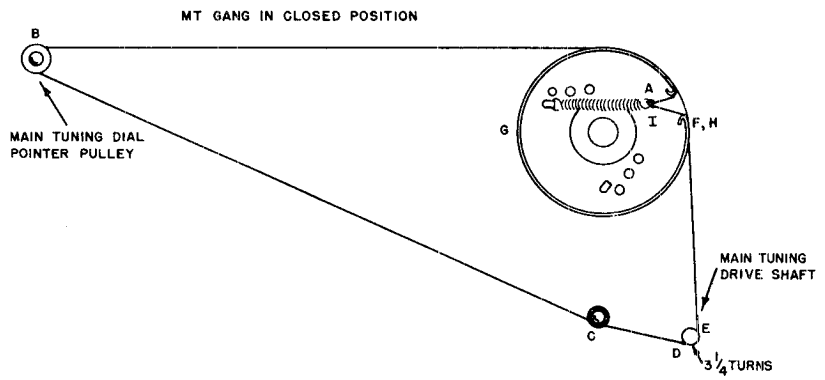


FIG. 4. MAIN TUNING DIAL POINTER DRIVE STRINGING PROCEDURE 92B1329

MODEL 5R10

MAIN TUNING GANG DRIVE

Restring the main tuning capacitor drive with a 30-inch length of 30 lb. test dial cord. Set the main tuning capacitor in a fully open position. Tie one end of the cord to the tie point at position "1" and follow the stringing sequence "1" through"14" as shown in Fig. 5. At position "14", stretch the tension spring and tie the cord securely to the spring.

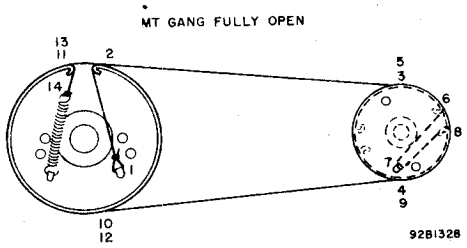


FIG. 5. MAIN TUNING GANG DRIVE STRINGING PROCEDURE

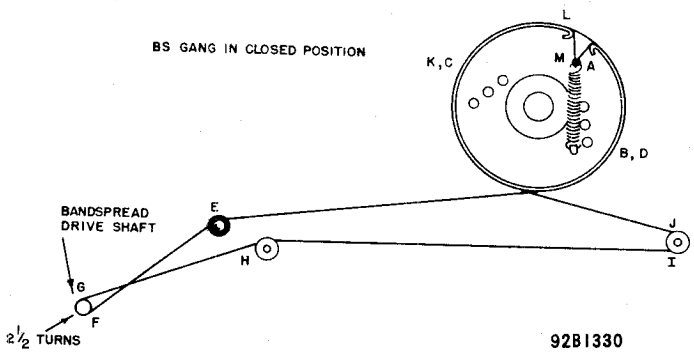
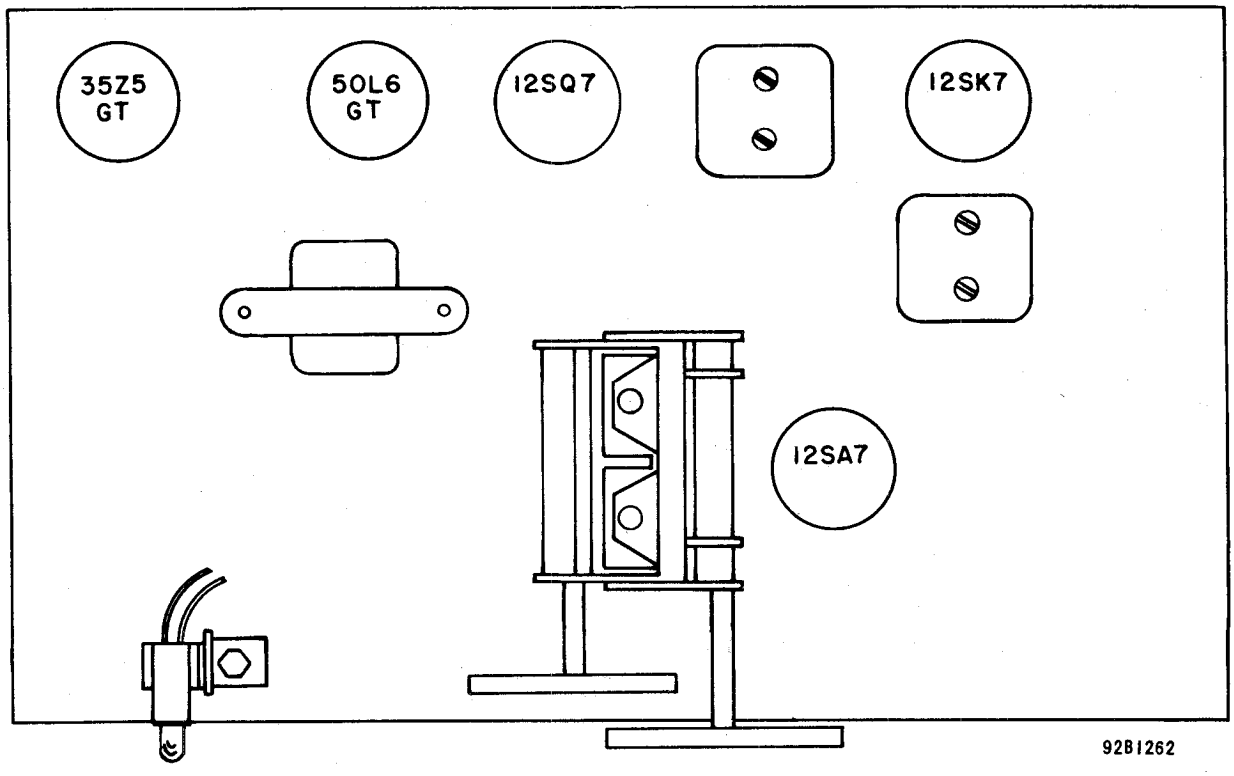


FIG. 6. BAND SPREAD GANG AND DIAL POINTER DRIVE STRINGING PROCEDURE

BAND SPREAD GANG AND POINTER DRIVE

Restring the band spread gang and pointer drive with a 44-inch length of 30 lb. test dial cord. Set the band spread capacitor in a fully closed position. Tie one end of the cord to the tension spring at position "A" and follow the sequence outlined in Fig. 6. At position "M", stretch the tension spring and tie the cord securely.

Index the band spread dial pointer by setting the band spread gang at maximum capacity and aligning the pointer with the position marked "100" on the band spread dial.



DIAL LAMP MAZDA #47

FIG. 7. TOP VIEW, LOCATION OF TUBES AND DIAL LAMPS

TUBE REPLACEMENT

The tube types and their relative position in the receiver are shown in the illustration, Fig. 7. When installing a replacement tube, insert the center guide pin into the center hole of the tube socket; rotate the tube until the key on the guide pin drops into the notch in the socket hole and then push down until the tube rests firmly on the socket.

Handle tubes with care as they are considered fragile and do not tolerate much mechanical abuse.

DIAL LAMP REPLACEMENT

Refer to Fig. 7. for the location of the dial lamp used in the receiver. To replace a defective lamp, remove the cabinet back, reach in through the rear of the cabinet and unclip the dial lamp socket from the mounting clip. The socket may then be brought out into the open for dial lamp replacement. Make replacement with 6-8 volt Mazda #47 (brown bead) lamps or equivalent.

ALIGNMENT PROCEDURE

Holes in the bottom cover permit minor adjustment of the oscillator and converter stage trimmers; however for complete alignment, the chassis will have to be removed from the cabinet. To separate the chassis from the cabinet, first remove the cabinet back, the bottom cover which is held in place by the four mounting feet, and the front control knobs. Next, remove the speaker from the cabinet. The chassis is fastened to the cabinet by four Phillips head screws located at the bottom of the cabinet.

CAUTION - The rubber grommets, fiber washers and nylon insulators are used to insulate the chassis from the cabinet. Check the condition of these insulators and replace them if necessary.

The standard RMA dummy antenna specified in the alignment chart consists of a 200 mmf. capacitor in series with a 20 micro-henry r-f choke which is shunted by a 400 mmf. capacitor in series with a 400 ohm carbon resistor.

Before starting alignment, set the SPEAKER/PHONES switch at SPEAKER, the VOLUME control fully clockwise and the BAND SPREAD control to zero. For the settings of the remaining controls, see the alignment chart.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Selector Setting	Receiver Dial Setting	Adjust	Remarks
1	.01 mfd cap.	Stator plates, front section of tuning gang.	455 kc	1	1000 kc	A,B, C,D	Adjust for max. audio output at speaker voice coil. Use just enough signal generator output to obtain a suitable output indication.
2	Std. RMA dummy	High side to term. A1 on antenna strip. Jumper wire between A2 and G.	30 mc	4	30 mc	F,G	Max. output as in step 1.
3	Std. RMA dummy	See step 2.	14 mc	3	14 mc	H,J	Max. output as in step 1.
4	Std. RMA dummy	See step 2.	5 mc	2	5 mc	K,L	Max. output as in step 1.
5	Std. RMA dummy	See step 2.	1500 kc 600 kc	1	1500 kc 600 kc	M,N P	Max. output as in step 1.

MODEL 5R10

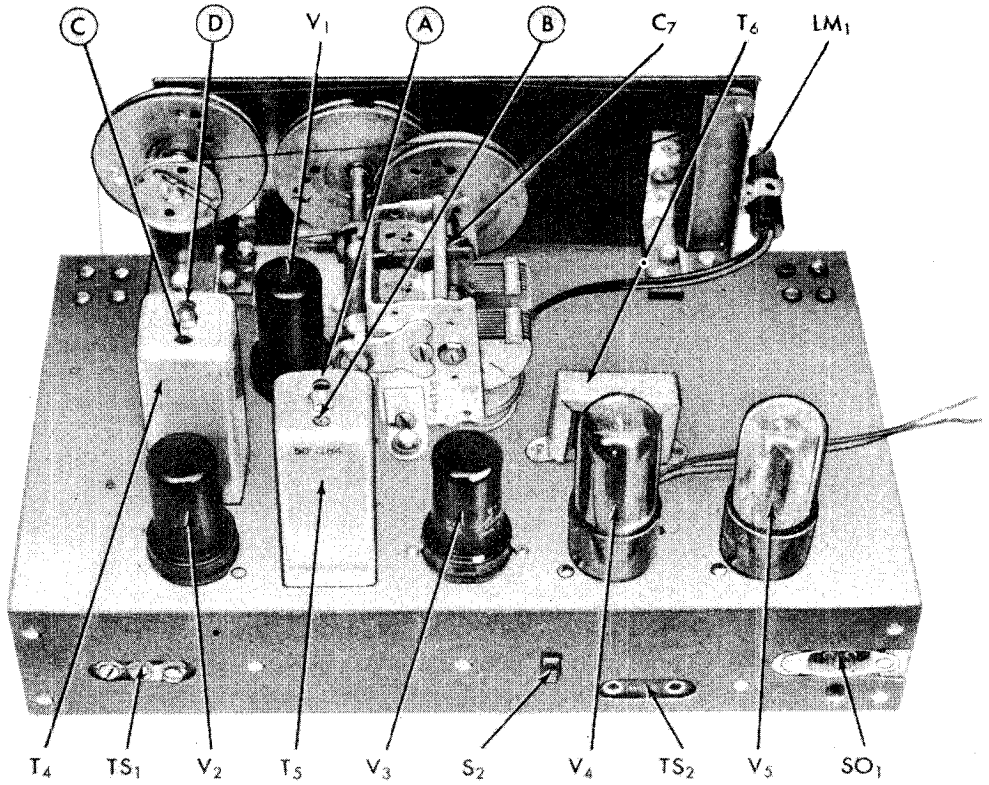


FIG. 8. TOP VIEW, ALIGNMENT POINTS AND COMPONENT LOCATIONS

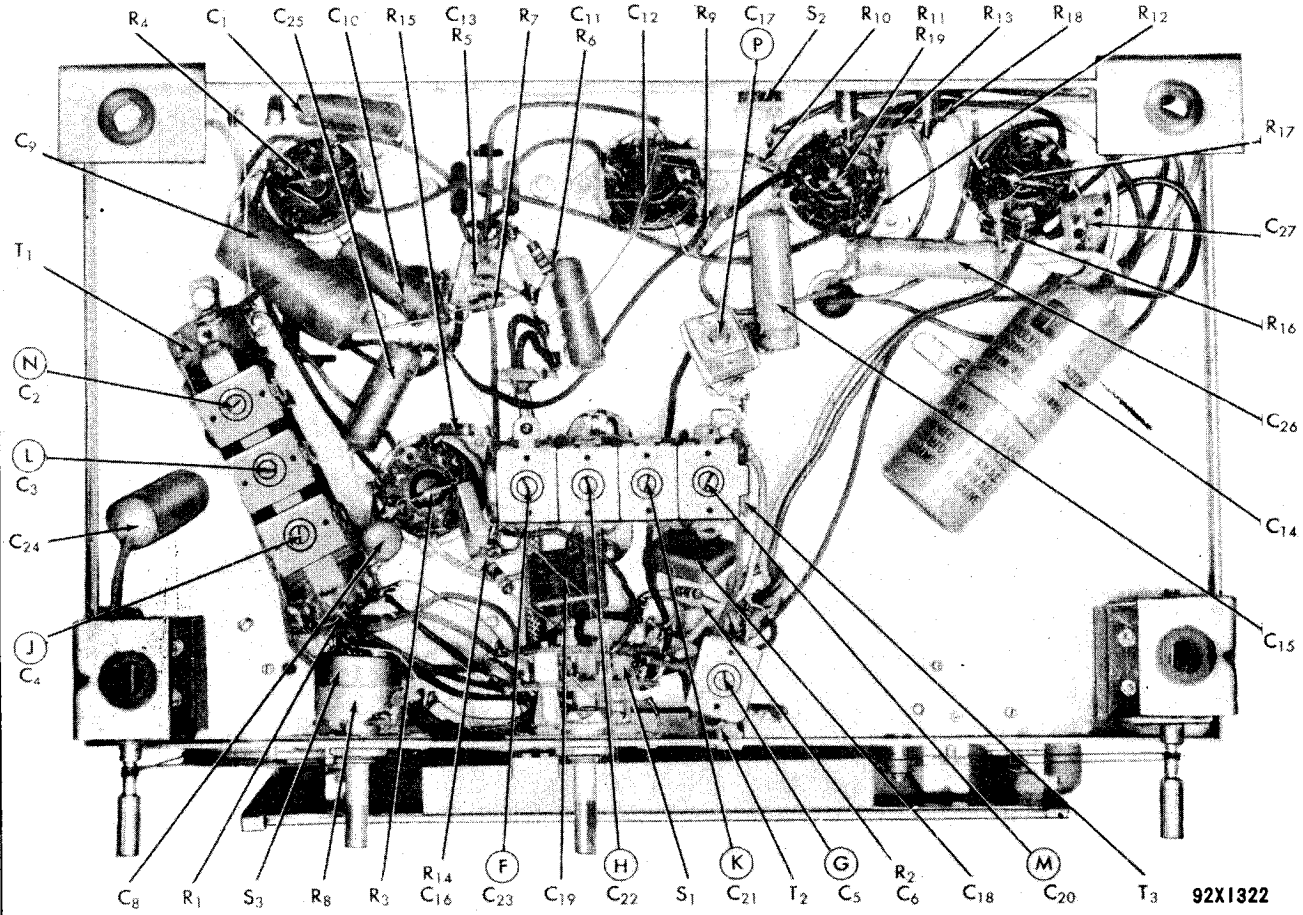
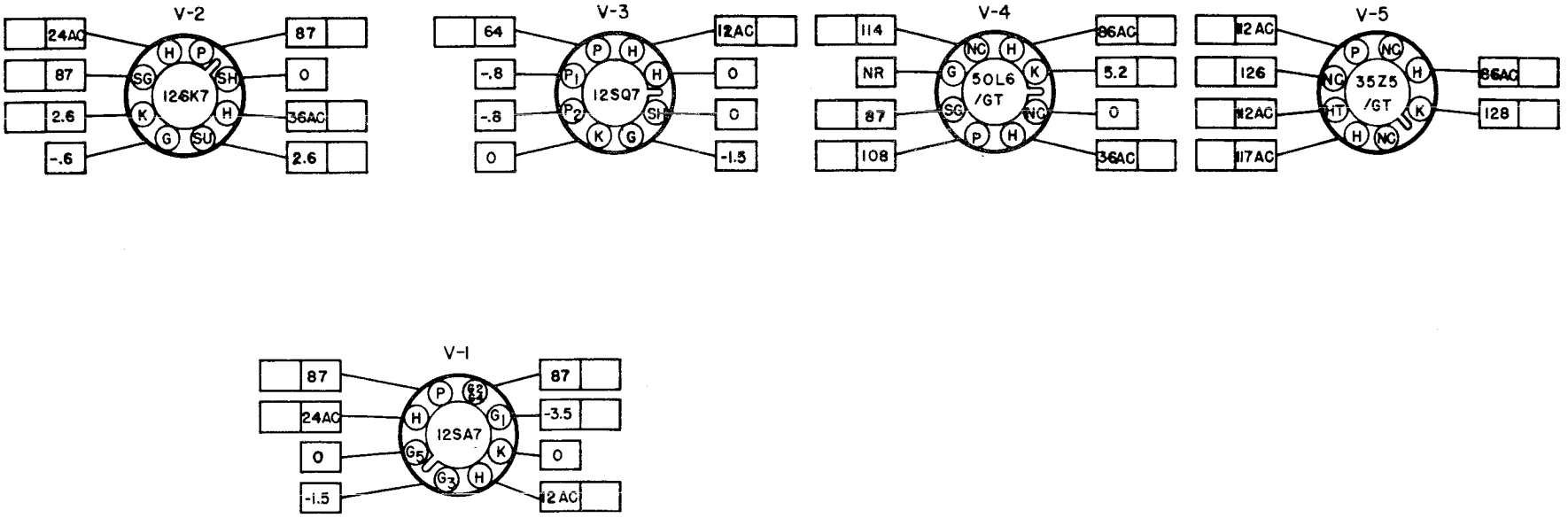


FIG. 9. BOTTOM VIEW, ALIGNMENT POINTS AND COMPONENT LOCATIONS



FRONT APRON

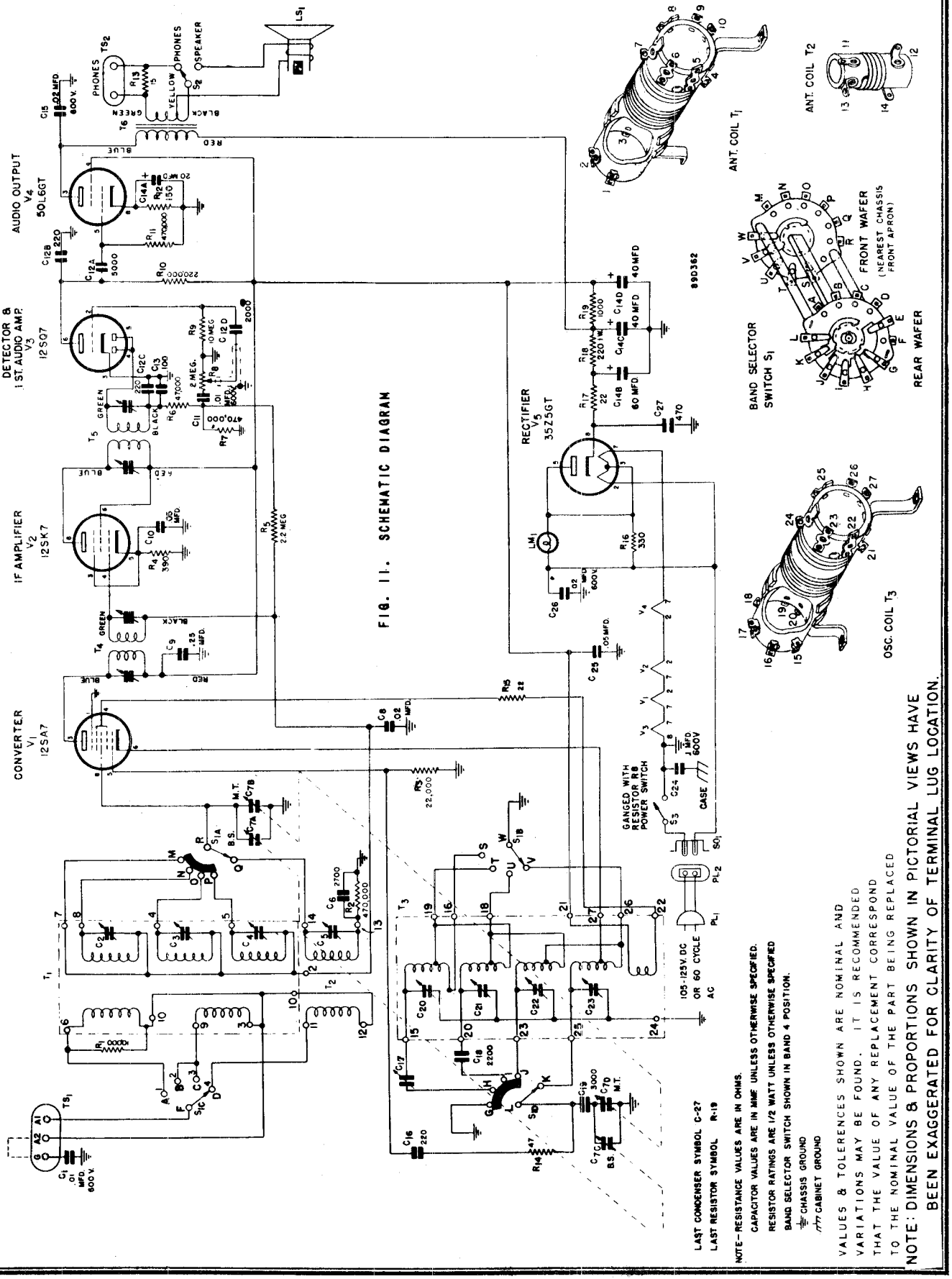
BOTTOM VIEW OF CHASSIS

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS & CHASSIS, WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC. AC VOLTAGES WILL BE DC VOLTAGES WHEN OPERATING FROM A DC SOURCE.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH A VACUUM TUBE VOLTMETER.
6. "NC" NO CONNECTION. (VOLTAGES SHOWN FOR THIS TERMINAL ONLY WHEN TERMINALS ARE USED AS A TIE LUG.)
7. "NR" NOT READABLE. (READING GENERALLY MEANINGLESS)
8. ☐ SPACE PROVIDED FOR SERVICE METER READINGS.
9. BAND SELECTOR SWITCH AT BAND "4" POSITION.

92C1327

FIG. 10. TUBE SOCKET VOLTAGE CHART

MODEL 5R10



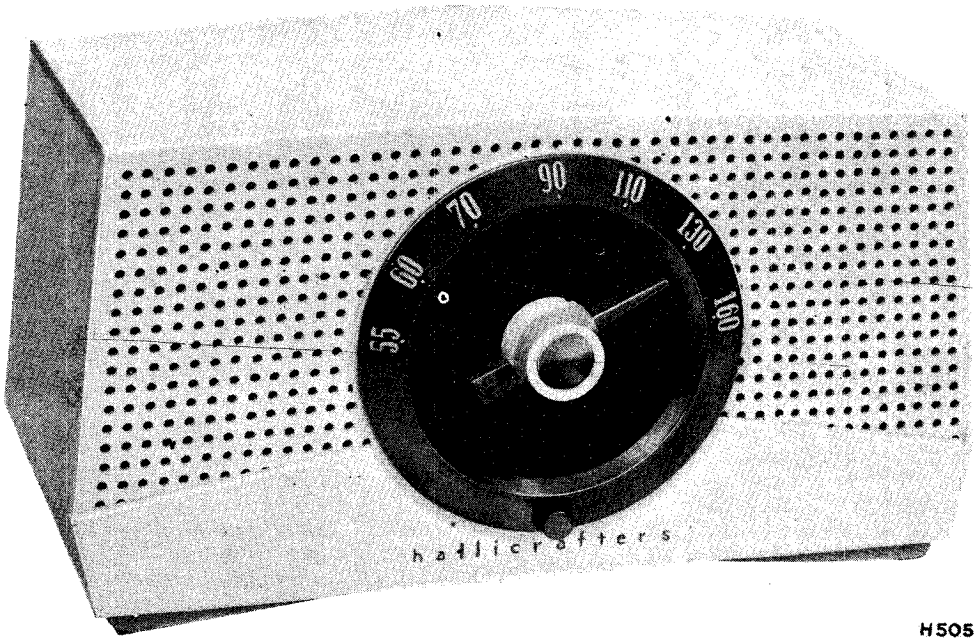
MODEL 5R10

SERVICE PARTS LIST

Ref. No.	Description	Manufacturer's Part Number
	CAPACITORS	
C-1,11	.01 mfd. 600 V., tubular paper	46AZ103J
C-2,3,4	Trimmer, adj. (part of antenna coil T-1)	
C-5	Trimmer, adj. (for antenna coil T-2)	44A039
C-6	2700 mmf. 500 V., mica	47X30B272J
C-7	Tuning capacitor, 2 section	48C246-B
C-8	.02 mfd. 400 V., tubular paper	46AW203J
C-9	.25 mfd. 200 V., tubular paper	46AT254J
C-10,25	.05 mfd. 200 V., tubular paper	46AU503J
C-12	Capacitor, composite: 5000, 2X220, and 2000 mmf. 500 V.; ceramic	46A151
C-13	100 mmf. 500 V., mica	47X20B101K
C-14	60-40-40 mfd. 150 V., 20 mfd. 25 V., electrolytic	45B091
C-15,26	.02 mfd. 600 V., tubular paper	46AY203J
C-16	220 mmf. 500 V., mica	47X20B221K
C-17	Padder, adj. (for oscillator coil T-3, band 1)	44A349
C-18	2200 mmf. 500 V., mica	47X30B222J
C-19	3000 mmf. 500 V., mica	47X30B302J
C-20,21, 22,23	Trimmer, adj. (part of oscillator coil T-3)	
C-24	.1 mfd. 600 V., tubular paper	46AZ104J
C-27	470 mmf. 500 V., mica	47X20B471M
	RESISTORS	
R-1	10,000 ohms 1/2 watt, carbon	23X20X103M
R-2,7,11	470,000 ohms 1/2 watt, carbon	23X20X474M
R-3	22,000 ohms 1/2 watt, carbon	23X20X223M
R-4	390 ohms 1/2 watt, carbon	23X20X391K
R-5	2.2 megohms 1/2 watt, carbon	23X20X225M
R-6	47,000 ohms 1/2 watt, carbon	23X20X473M
R-8	2 megohms; VOLUME control	25B896
R-9	10 megohms 1/2 watt, carbon	23X20X106M
R-10	220,000 ohms 1/2 watt, carbon	23X20X224M
R-12	150 ohms 1/2 watt, carbon	23X20X151K
R-13	15 ohms 1/2 watt, carbon	23X20X150M
R-14	47 ohms 1/2 watt, carbon	23X20X470M
R-15,17	22 ohms 1/2 watt, carbon	23X20X220M
R-16	330 ohms 1/2 watt, carbon	23X20X331M
R-18	220 ohms 1 watt, carbon	23X30X221M
R-19	1000 ohms 1/2 watt, carbon	23X20X102M
	TRANSFORMERS AND COILS	
T-1	Coil, antenna (bands 1, 2 and 3)	51C821
T-2	Coil, antenna (band 4)	51B1015
T-3	Coil, oscillator (all bands)	51C822
T-4	Transformer, 1st i-f	50B183
T-5	Transformer, i-f (detector)	50B184
T-6	Transformer, audio output	55A127
	SWITCHES	
S-1	Bandswitch assembly	60C393
S-2	Switch, slide; SPEAKER-PHONES	60A243
S-3	Switch, power (part of VOLUME control R-8)	
	CONNECTORS	
PL-1	Line cord and plug PL-2	87A1668-1
TS-1	Terminal strip, antenna	88A671
TS-2	Jack, PHONES	88A071
SO-1	Socket, power	10A286
	Socket, dial lamp	86B105
	Socket, octal; tube	6A250
	TUBES, RECTIFIERS AND DIAL LAMPS	
V-1	Type 12SA7, converter	90X12SA7
V-2	Type 12SK7, i-f amplifier	90X12SK7
V-3	Type 12SQ7, detector and 1st audio amplifier	90X12SQ7
V-4	Type 50L6GT, audio output	90X50L6GT
V-5	Type 35Z5GT, rectifier	90X35Z5GT
LM-1	Lamp, dial; Mazda #47	39A004
	CABINET PARTS	
	Baffle, speaker	78B579-B
	Cabinet	66B634-B
	Cabinet back	8C1204-B
	Channel, rubber; 4 inch (for escutcheon glass)	16A211
	Channel, rubber, 3/8 inch (for escutcheon glass)	16A212
	Cover, cabinet bottom	8C1212
	Clip, antenna coil T-2 mtg.	76A326
	Dial background	32B488
	Dial cord	38A019
	Dial scale (glass)	22B318-C
	Escutcheon	7C248
	Foot,mounting; rubber	16A007
	Glass, escutcheon	22B319
	Grommet, rubber; brown	16A015
	Grommet, rubber; red	16A201
	Insulator, nylon (fits in red insulating grommet)	4A647
	Knob, BAND SELECTOR	15B322
	Knob, BANDSPREAD, OFF-VOLUME and TUNING	15B323
	Pointer, bandspread tuning	82A179
	Pointer, main tuning	82A180
	Shield, dial lamp	8A1249
LS-1	Speaker, PM; 5 inch	85C030
	Spring, dial cord	75A012
	Washer, insulating	4A646

MODELS 5R11, 5R12,
5R13, 5R14

RADIO MODELS 5R11, 5R12, 5R13, 5R14



H505

SPECIFICATIONS

Power Supply	117 volts 60 cycle AC, 117 volts DC, 29 watts
Frequency Range	535 KC to 1630 KC
Intermediate Frequency	455KC
Antenna	Built-in Loop
Tuning	Variable Capacity
Speaker	4", P.M. voice coil impedance 3.2 ohms
Power Output	0.8 watt undistorted, 1.8 watts maximum
Sensitivity	400 uv/m average for 50 milliwatts output
Selectivity	55 KC broad at 1000 times, signal at 1000KC

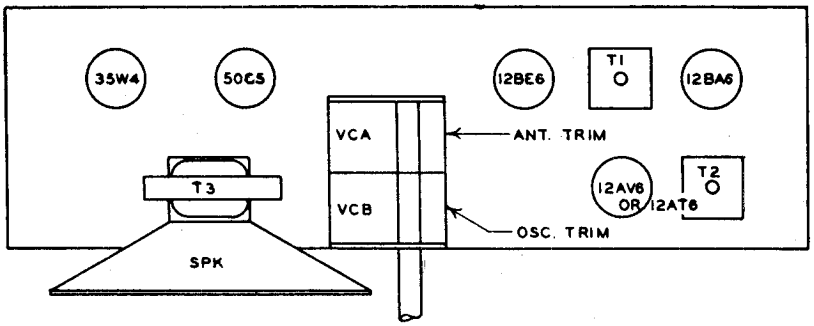
Tubes used are as follows:

12BE6 Oscillator-Converter
12AV6 or 12AT6 AVC, Detector, and Audio
12BA6 I.F. Amplifier
50C5 Power Output
35W4 Power Rectifier

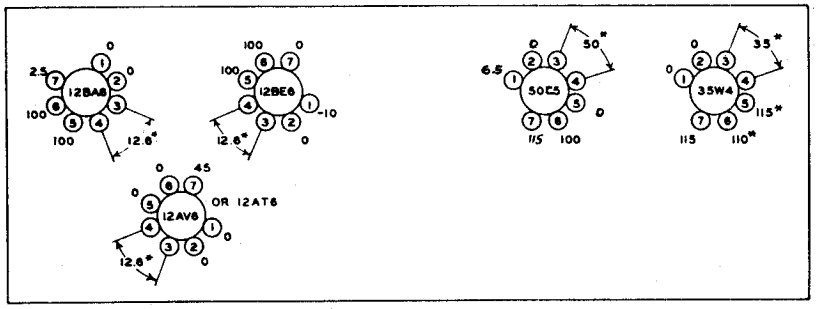
MECHANICAL PARTS

PART NO.	DESCRIPTION	MODEL RADIO
2A2047	Nut, Push-on	Used On Radio
3A189	Screw, #6X3/8 Pan Hd.	Models 5R11,
3A974	Screw, Sems 6-32X1/4 Rd. Hd.	5R12, 5R13,
3A1628	Screw, Sems 8-32X3/16 Rd. Hd.	5R14 Unless
32VLXY	Screw, 6-32X3/8 H H S Tap	Otherwise
3ZVUKZ	Screw, 6-32X1 1/2 Pan Hd.	Indicated
4AXEV	Washer, Flat #6	
5AO58	Rivet .088X.187	
6A340	Socket, 7 Pin	
7C237	Dial Escutcheon	
8A1211	Strain Relief	
11A110	Ground Lug	
15A309	Knob, Volume	5R11, 5R12, 5R13
15A310	Knob, Volume	5R14
15B313	Knob, Tuning (Front)	5R11, 5R12. 5R13
15B314	Knob, Tuning (Front)	5R14
15B317	Knob, Pointer Ass'y	5R11, 5R12, 5R13
15B318	Knob, Pointer Ass'y	5R14
33A325	Waxpaper	
66C636	Chassis Cover	
70D956	Chassis	
73A591	Spacer 1 1/8	
76A651	I.F. Mounting Clip	
78F567	Cabinet	5R11
78F568	Cabinet	5R12
78F569	Cabinet	5R13
78F570	Cabinet	5R14
87A716	Wire, #22 Blue	
87A717	Wire, #22 Red	
87A718	Wire, #22 Green	
87A721	Wire, #22 Orange	
87A723	Wire, #22 Tinned Buss	
87B1669	Line Cord	
94X655	Instruction Book	
98C215	Packaging Sequence	

MODELS 5R11, 5R12, 5R13, 5R14

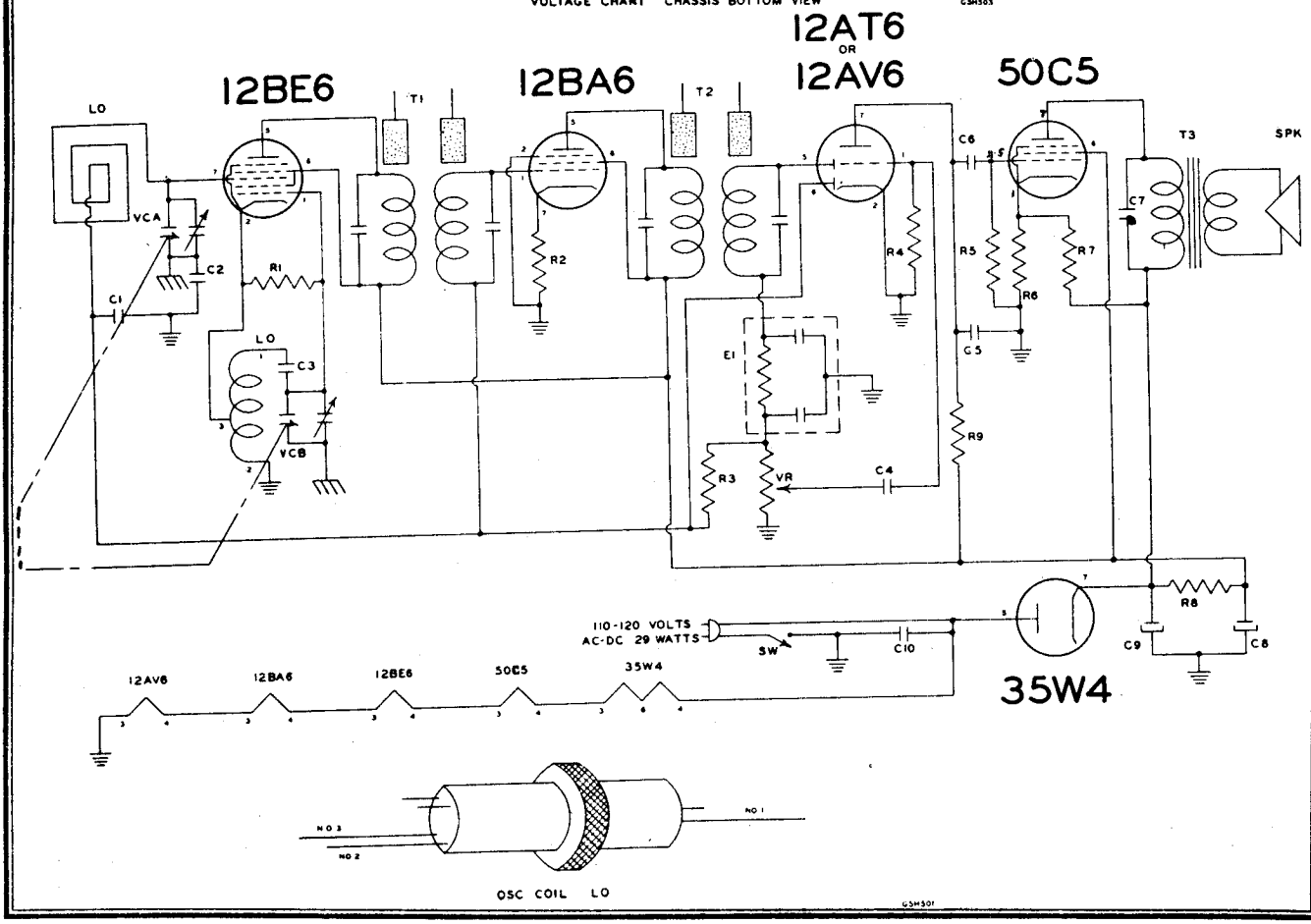


CHASSIS LAYOUT TOP VIEW GSH502



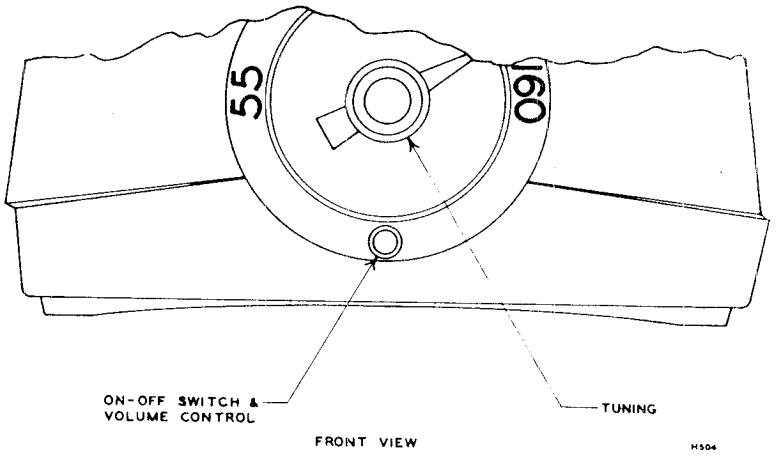
ALL DC VOLTAGES IN REFERENCE TO COMMON GROUND
*AC EXCEPT WHEN USED ON DC

VOLTAGE CHART CHASSIS BOTTOM VIEW GSH503



OSC COIL LO GSH501

MODELS 5R11, 5R12,
5R13, 5R14



ALIGNMENT PROCEDURE

(Refer to chassis view)

The following procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent AVC action from interfering with proper alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts, using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat the alignment procedure given below as a final check.

CAUTION: This is an AC/DC receiver, and when aligning the set it is necessary to isolate the signal generator or the receiver from the line by use of a transformer, or to place a .2 MFD condenser in each test lead of the signal generator.

	SIGNAL GENERATOR		POSITION OF	ADJUST FOR MAXIMUM
Frequency	Dummy Antenna	Connection to Radio	VARIABLE	OUTPUT
455 KC	.1 MFD	12BE6 Grid Stator VCA	Fully Open	T1 & T2
1625 KC		12BE6 Grid Stator VCA	Fully Open	VCB Oscillator
1400 KC	.1 MFD	Loosely Coupled to Loop	Tune in Signal Generator	VCA Antenna

Connect low side of signal generator to common negative.

PARTS VALUES FOR HALLICRAFTER MODELS 5R11, 5R12, 5R13, 5R14

CIRCUIT COMPONENTS

SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING	TOL.
VCA-VCB	48-248	Variable Capacitor			
C1	46AU503J	Capacitor, Tub. Paper	.05 MFD	200 volts	
C2	46AU104J	Capacitor, Tub. Paper	.1 MFD	400 volts	
C3	46AY203J	Capacitor, Tub. Paper	.02 MFD	600 volts	
C4, C6, C7	46AY502J	Capacitor, Tub. Paper	.005 MFD	600 volts	
C5	47X20B251K	Capacitor, Mica	250 MMF	500 volts	
C9, C8	45B183	Capacitor, Elect.	40-20 MFD	150 volts	
C10	46AW503J	Capacitor, Tub. Paper	.05 MFD	400 volts	
R1	23X20X223K	Resistor, Carbon	22K Ohm	1/2 watt	20%
R2	23X20X391K	Resistor, Carbon	390 Ohm	1/2 watt	10%
R3	23X20X105M	Resistor, Carbon	1 Megohm	1/2 watt	20%
R4	23X20X106M	Resistor, Carbon	10 Megohm	1/2 watt	20%
R5, R9	23X20X474M	Resistor, Carbon	470K Ohm	1/2 watt	20%
R6	23X20X121K	Resistor, Carbon	120 Ohm	1/2 watt	10%
R7	23X30X103K	Resistor, Carbon	10K Ohm	1 watt	20%
R8	23X30X102K	Resistor, Carbon	1000 Ohm	1 watt	20%
VR-SW	25B918	Volume Control & Switch	1 Megohm	S.P.S.T.	
E1	49A016	Diode Filter Unit	2x100 MMFD-47K Ohm		
LA	57C149-B	Loop Antenna & Back			
LO	51B1300	Oscillator Coil			
T1, T2	50B487	I. F. Coil			
SPK-T3	85C109	Speaker & Output Transformer			
12AV6	90X12AV6	Tube, Type 12AV6			
12BA6	90X12BA6	Tube, Type 12BA6			
12BE6	90X12BE6	Tube, Type 12BE6			
35W4	90X35W4	Tube, Type 35W4			
50C5	90X50C5	Tube, Type 50C5			

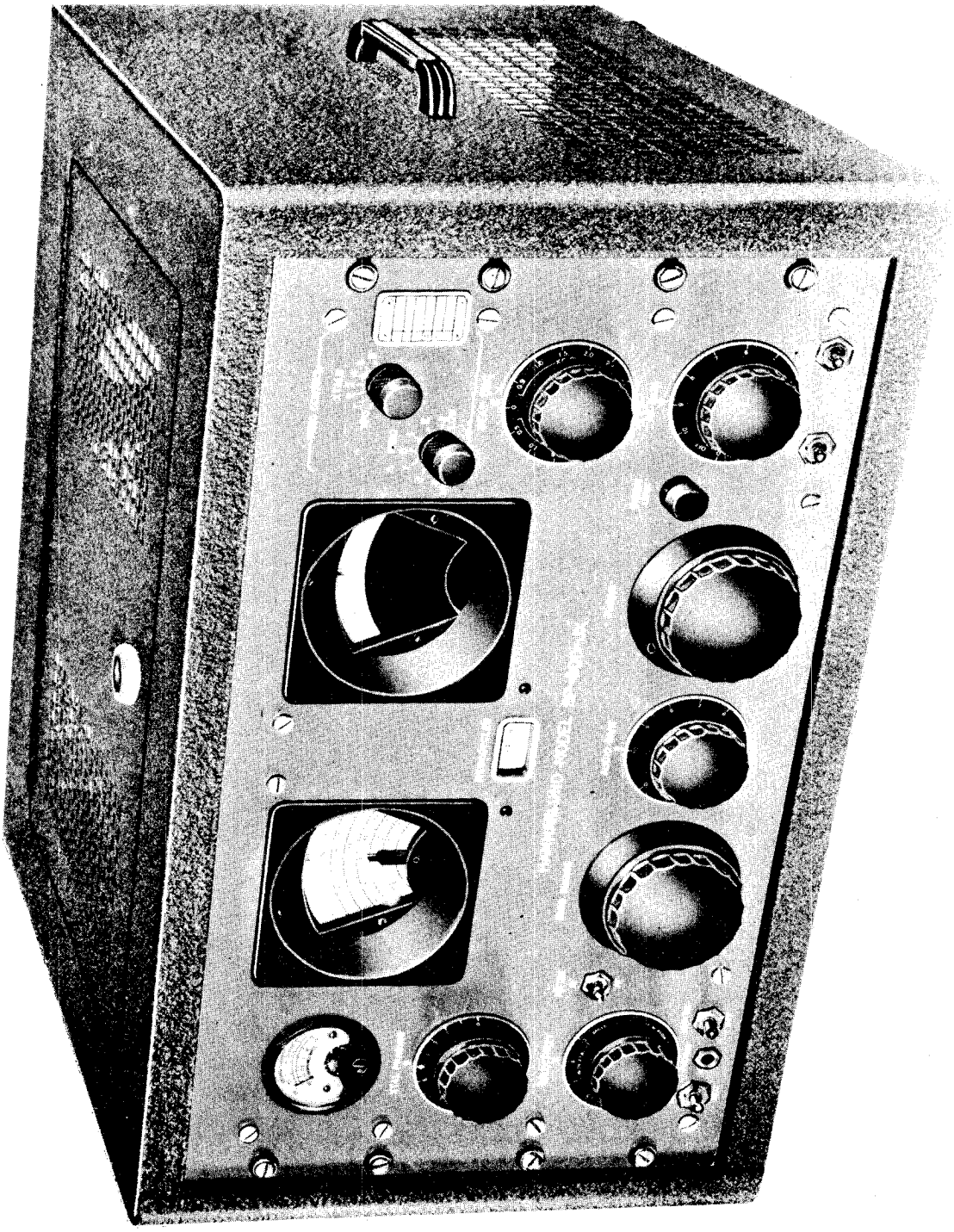


FIG. 1
FRONT VIEW OF RECEIVER
SP-600-JX IN CABINET

MODEL SP-600-JX

TECHNICAL SUMMARY

Electrical Characteristics

Frequency Range—total 6 bands ..... **.54 to 54.0 mc**
Band 1 ..... .54 to 1.35 mc
Band 2 ..... 1.35 to 3.45 mc
Band 3 ..... 3.45 to 7.40 mc
Band 4 ..... 7.40 to 14.8 mc
Band 5 ..... 14.80 to 29.7 mc
Band 6 ..... 29.70 to 54.0 mc

Maximum Undistorted Output—approximate—2.5 watts.

Output Impedance—600 ohms-balanced split windings.

Phone jack-winding; delivers 15 milliwatts to an 8000 ohm resistive load, when the audio output to the 600 ohm power load is adjusted to 500 milliwatts.

Power Supply Requirements

Line Rating ..... 95, 105, 117, 130, 190, 210, 234 and 260 volt taps, 50-60 cycles.
Power Consumption ..... 130 watts, 1.25 amps. at 117 volts—maximum.

Tube Complement—total 20

RF, IF and BFO Amplifiers ..... 7 — 6BA6
HF, 2nd Conversion and BFO Oscillators ..... 3 — 6C4
Crystal Controlled HF Oscillator ..... 1 — 6AC7
Mixers ..... 2 — 6BE6
Detector, "C" Bias Rectifier and Noise Limiter & Meter Rectifier ..... 3 — 6AL5
AF Amplifier and IF Output ..... 1 — 12AU7
Power Output ..... 1 — 6V6GT
Rectifier ..... 1 — 5R4GY
Voltage Regulator ..... 1 — 0A2

Mechanical Specifications

Rack Model — Dimensions; 19 inches wide, 10½ inches high and 16½ inches deep from rack mounting surface. Weight 66 lbs.
Table Model — Dimensions; 21⅜ inches wide, 12¾ inches high and 17⅛ inches deep. Weight 87½ lbs.

Performance Data — (approximate values-taken on a sample receiver)

Sensitivity is 2.3 microvolts, or better, throughout the entire frequency range, for a signal to noise power ratio of 10 to 1.
Image rejection ratios are better than 80 db throughout the frequency range.
The IF rejection ratio at 600 kc is 2700 to 1
The AVC action will maintain the output constant within 12 db when the input is increased from 2 to 200,000 microvolts.

GENERAL DESCRIPTION

The SP-600-JX is a 20 tube Radio Communications Receiver with self contained power supply. The JX suffix in this model number denotes that this receiver is made in accordance with JAN specifications, with the exception of the use of a few capacitors and resistors where special design considerations require special values and tolerances not included in the JAN preferred value lists or where space limitations do not permit their use. The special components so used are equal or superior to the JAN components in quality.

The receiver is supplied in either a well ventilated steel, table model cabinet finished in dark grey to complement the lighter grey front panel or for mounting in a standard 19 inch relay rack.

The self contained power supply is designed for operation from a single phase, 50 to 60 cycle alternating current power source. The power transformer primary is provided with taps covering a line voltage range from 90 to 270 volts. The power consumption is 130 watts.

The receiver is suitable for either headphone or loud speaker reception of AM radio telephone, CW telegraph or AM MCW telegraph signals.

The standard model provides continuous coverage over a frequency range from 0.54 to 54.0 megacycles in six bands. The large easily operated band change control knob, on the front panel, selects the desired frequency band and a band indicator visible through a small front panel window indicates the frequency band in use. This control also aligns the dial frequency indicator with the proper dial scale.

In addition to the frequency scales, the main dial has an arbitrary scale which in conjunction with the band spread dial provides continuous band spread scales over each frequency band for extremely accurate logging and resetability.

The single tuning control is large and of special design to permit maximum traverse speed as well as exceptional operating ease. It controls both the main and band spread dials. An anti-backlash gear train provides extremely close calibration accuracy and completely accurate resetability. A tuning lock provides positive locking action without affecting the frequency setting.

The tuning ratio from the tuning control to the main dial is 50 to 1 and the ratio from the band spread dial to the main dial is 6 to 1.

An ingeniously designed rotary turret is employed to change bands and to place the coil assemblies of the RF amplifier, Mixer and First Heterodyne Oscillator stages directly adjacent to their respective sections of the four gang tuning capacitor and their respective tubes. This assures maximum sensitivity at high signal to noise ratio.

Two stages of tuned radio frequency amplification are provided on all bands. The circuit for single conversion, used on frequencies up to 7.4 megacycles, includes a mixer, heterodyne oscillator, four stages of IF amplification, detector and AVC rectifier, noise limiter and meter rectifier, beat frequency oscillator, beat frequency buffer amplifier, IF output, AF amplifier and output power stage. The circuit for double conversion, employed for frequencies above 7.4 megacycles, includes a second mixer and a second heterodyne crystal controlled oscillator. The power supply system includes a B power rectifier, C bias rectifier and a voltage regulator.

The frequency control unit provides for fixed channel crystal controlled operation on any six frequencies chosen within the range of the receiver. Front panel controls permit the selection of the normal high stability continuously variable tuning or either of the six selected fixed frequency signals. For crystal controlled fixed channel operation it is only necessary to set the dial to the signal frequency, switch to the crystal frequency desired and tune with the delta frequency control. No retuning of the main tuning is necessary or desirable, when switching from VFO to crystal operation for the same signal frequency. These crystals are not supplied with the receiver, but should be purchased on special order from HAMMARLUND MFG. CO. specifying the **signal** frequency for which it is to function.

The two scale tuning meter normally indicates the relative strength of the received signal in db from 1 microvolt, when operated on AVC and with the RF gain control at maximum. A rear control is provided for adjustment at the plus 20 db scale reading with an RF signal input of 10 microvolts. On depression of the panel meter switch the lower scale of the meter indicates the audio output power level in db from 6 milliwatts. A rear control is provided for adjustment of the 0 db reading.

The AVC circuit is provided with separate time constants for CW and MCW operation. The beat frequency oscillator employs a high capacity Colpitts circuit which gives a high order of frequency stability and minimizes oscillator harmonics. The beat frequency oscillator voltage is introduced into the detector through a buffer amplifier which eliminates oscillator lock-in. This feature makes it possible to tune signals sharply to zero beat and permits the in-

clusion of the rear control for adjusting the beat oscillator injection to suit operating conditions. A front panel control varies the audio beat frequency from 0 to plus or minus 3 KC.

The noise limiter circuit effectively limits the interference from ignition systems or other sources of pulse type noise. The limiter switch permits optional use of the limiter.

The antenna input circuit is designed for use with a balanced line. The input impedance is nominally 100 ohms. The receiver may also be operated with a conventional single wire antenna.

The audio output circuit is designed for a 600 ohm load or line and is provided with a four terminal split winding for balanced load operation. Undistorted power output is approximately 2.5 watts. The head phone circuit when referred to an 8000 ohm load provides signals attenuated approximately 15 db below the 600 ohm power output.

An RF gain control is provided for the manual control of sensitivity in the presence of strong signals and operates on either MANUAL or AVC.

The send receive switch desensitizes the receiver but leaves the power on to provide for instant reception between transmission periods. A rear receptacle provides for the connection of an external relay.

Radiation is negligible and complies with requirements for shipboard operation and for multi-receiver installations.

Frequency drift after a 15 minute warm up period, ranges between .001 percent and .01 percent of frequency depending on the frequency used. This is a very unusual degree of frequency stability for variable tuned HF oscillators and closely approaches crystal stability.

The selectivity control provides three degrees of crystal and three degrees of non-crystal selectivity ranging from sharp (.2kc) to broad (13.KC). The crystal filter embodies the same circuit features that have proved so effective and desirable in Hammarlund Super Pro Receivers, incorporated in an improved mechanical design.

II
CIRCUIT DESCRIPTION

General — The circuit is shown schematically in Figure 11. A block diagram, Figure 2, is provided to more clearly show the arrangement and functions of the various circuit sections. The location of the various tubes is shown in Figure 3. The circuit, for single conversion, used for signal frequencies up to 7.4 mc consists of two stages of RF amplification V-1 and V-2, First Mixer V-5, First Heterodyne Oscillator V-4, four stages of IF amplification V-7, V-9, V-10 and V-11, Detector and AVC rectifier V-14, Noise Limiter V-15, Beat Frequency Oscillator V-13, IF output and AF amplifier V-16-A and V-16-B, Output Power stage V-17 and the Power Supply system which includes B Power Rectifier V-19, C Bias Rectifier V-20 and Voltage Regulator V-18.

In the circuit for double conversion, used for signal frequencies above 7.4 mc, the Second Mixer V-6 and Second Heterodyne Oscillator V-8 are substituted for the Gate tube V-7.

Input Coupling — The antenna coupling is designed to provide optimum coupling from a 100 ohm transmission line. A balanced doublet or straight wire antenna may be used.

RF Amplifier — An ingeniously designed rotary turret is employed to change bands and to place the coil assemblies of the RF amplifier V-1 and V-2, Mixer V-5 and First Heterodyne Oscillator V-4 stages directly adjacent to their respective sections of the four gang tuning capacitor and their respective tubes. This assures maximum sensitivity at high signal to noise ratio.

First Heterodyne Oscillator — (Variable V-4) — The rotary turret band change switch, advanced design of the four gang, twin section, variable tuning capacitor and rugged construction throughout, provide frequency stability and dial calibration accuracy to a previously unattained degree.

First Heterodyne Oscillator — (Crystal Controlled V-3) — For services requiring extremely stable, fixed frequency operation, a crystal controlled high frequency oscillator is provided. Instant changeover from variable to crystal controlled oscillator, with a choice of six crystal positions, is effected by a front panel control. A second front panel control permits adjustment of the crystal oscillator frequency over a plus or minus .005 percent range.

Intermediate Frequency Amplifier — Single conversion to 455 kc is employed for signal frequencies below 7.4 mc. There are four stages of IF amplification incorporating the Hammarlund patented crystal filter circuit. Six positions of selectivity provide 6 db bandwidths of .2, .5, 1.3, 8 and 13 kc. On the three narrower bandwidth positions, the crystal filter is in operation. The crystal phasing control provides extreme selectivity for the high attenuation of closely adjacent interfering signals.

Double conversion is employed for signal frequencies above 7.4 mc. The signal is heterodyned to 3.955 mc by the First Mixer V-5 and Heterodyne Oscillator V-4 or V-3 for high image rejection. The 3.955 mc signal is then heterodyned to 455 kc by the Second Mixer V-6 and the 3.5 mc Fixed Crystal Controlled Oscillator V-8, for selectivity.

Detector and AVC — The V-14 tube is used as a high level Detector and AVC Rectifier. The AVC circuit is provided with separate time constants for CW and MCW operation.

Beat Frequency Oscillator — The beat frequency oscillator employs a high capacity Colpitts circuit which gives a high order of frequency stability and minimizes oscillator harmonics. The beat frequency Oscillator V-13, is coupled into the detector circuit through Buffer Amplifier V-12, which eliminates oscillator lock-in and permits variation of the beat oscillator injection by means of a control located on the rear of the chassis. A front Panel control varies the audio beat frequency, from zero beat to plus or minus 3 kc.

Noise Limiter — The noise limiter circuit V-15, limits the noise interference from ignition systems or other sources of pulse type noise. A separate control switch S-6, permits optional use of the limiter on any mode of operation when pulse type interference is present.

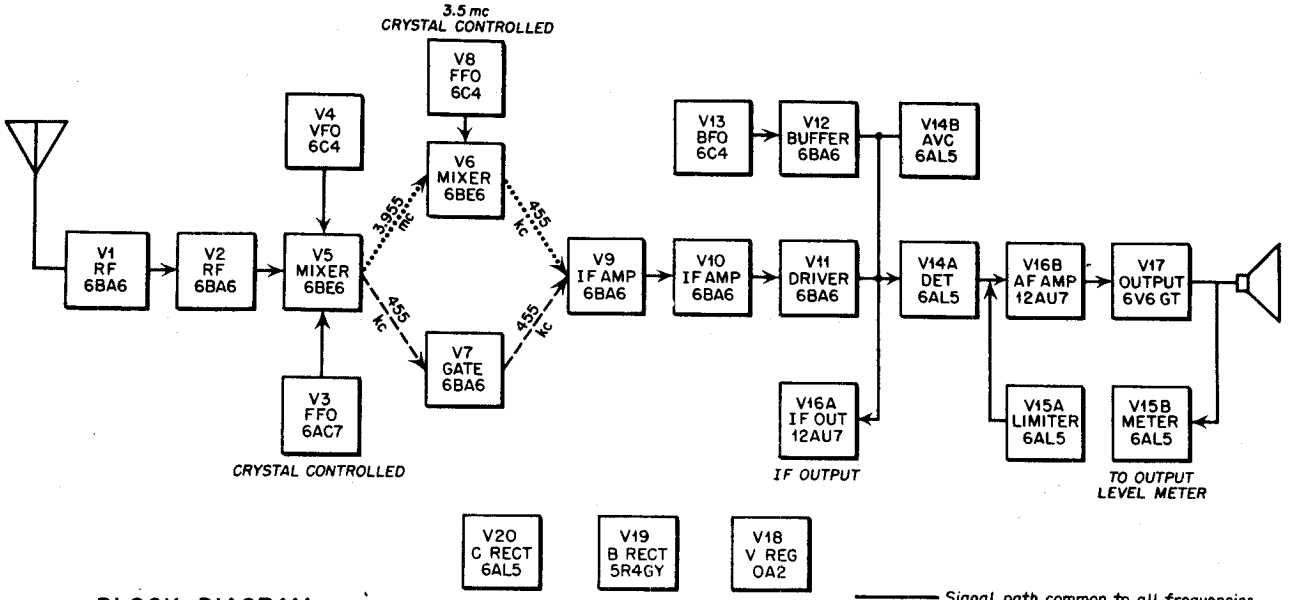
Audio Frequency Amplifier — A resistance coupled amplifier triode V-16-B, amplifies the audio frequency signal from the detector.

Audio Output — The audio output tube V-17, is transformer coupled through a split, balanced winding to deliver 2.5 watts undistorted output to a 600 ohm load. The split balanced winding permits balancing of the direct current in the output circuit, as used for teletype or similar service. A separate secondary winding provides attenuated audio signal output for headphone operation. This winding will deliver an output of 15 milliwatts into an 8000 ohm resistive load when the 600 ohm power secondary is delivering 500 milliwatts to a 600 ohm resistive load.

IF Output — A cathode follower V-16-A provides a low impedance source of intermediate frequency (455 Kc) signal to the connector on the rear skirt of the chassis.

Power Supply — The power supply is an integral part of the receiver. It includes the B rectifier V-19 and the C rectifier V-20, together with their respective low pass filters and the Voltage Regulator V-18. The power transformer is provided with screw terminal primary taps, covering a power line source range of 90 to 270 volts, 50 to 60 cycles. The power transformer is protected by a fuse in the primary circuit.

Tuning Meter — The tuning meter is used on AVC operation to indicate the accuracy of tuning and the relative strength of received signals. Depression of the Meter Switch converts the meter circuit for indication of output level in db from 6 milliwatts.



·BLOCK DIAGRAM·

FIG. 2

RF Gain Control and Power Switch — The RF gain control is provided for manual control of sensitivity to prevent overloading on strong signals when operating with the AVC-MANUAL switch in the "MANUAL" position. This control also operates when the switch is in the "AVC" position. The Power "ON-OFF" switch is operated at the counter-clockwise extremity of the RF gain control.

Send-Receive Switch — The send-receive switch desensitizes the receiver but leaves the power "on" to provide for instant reception between transmission periods. A receptacle is provided on the rear of the receiver for the external connection of a relay.

Convenience Outlet — A convenience power outlet is provided on the rear of the chassis for the connection of an accessory such as a lamp or electric clock.

Radiation — Advanced design and shielding of the high frequency, second conversion crystal and beat frequency oscillators has reduced radiation to a negligible point so that interference of this nature, common in multi-receiver installations, is reduced to a minimum.

III
INSTALLATION

Tubes and Packing — Inspect the chassis to see that all tubes are firmly in their respective sockets and that any packing is removed from the receiver.

Power Supply — Make sure that the primary tap lead on the power transformer is connected to the transformer tap which most nearly agrees with the 50 to 60 cycle power source voltage.

Antenna — The input impedance at the antenna terminals is designed to match a 100 ohm transmission line. The angle plug adapter and connector, supplied with the receiver, is designed for use with a small diameter, "TWINAX" transmission line, which should be used with a balanced antenna installation. If it is desired to operate with a single wire antenna, the antenna lead-in wire should be connected to one terminal of the connector plug and a ground lead should be connected from the other terminal of the connector plug to the ground terminal, which is adjacent to the antenna input receptacle at the rear of the tuning unit.

Speaker — The loud speaker should be of the permanent magnet dynamic type and should include a speaker voice coil to 600 ohm line matching transformer for connection to the 600 ohm audio output terminals of the receiver.

Headphones — Either low or high impedance headphones may be used in the phone jack. The high impedance type is recommended. The phone jack is located at the lower left side of the front panel.

Mounting — The receiver may be placed on a table or mounted in a standard 19 inch rack. If a table model is purchased, it is supplied with a steel cabinet. The cabinet should be placed in a position which permits the free access of air for the ventilation louvers.

IV
OPERATION
DESCRIPTION OF CONTROLS

The front panel dials and controls are shown in Figure 1 and the rear chassis skirt controls and terminals are shown in Figure 6.

Tuning Dials — The main dial is to the left and the band spread dial is to the right. The main dial has six frequency band scales, calibrated in megacycles and an arbitrary, outer scale. The band spread dial has an arbitrary, 0 to 100, scale. The numeral under the fixed pointer of the main dial indicates the number of revolutions that have been made by the band spread dial at any setting. Thus, if the pointer, for the outer scale, of the main dial indicates over the figure 4 and the band spread dial indicates 87.6, the reading to log for this setting is read, 487.6. This precise mechanical band spread system divides the rotation of the main dial over each frequency band into approximately 600 band spread divisions, with one half division calibration points. Since it is easy to estimate one tenth divisions, on the band spread scale, this divides each frequency band into approximately 6000 readable settings. This permits extreme accuracy in the logging of stations.

Crystal Controlled HF Oscillator — For operation on fixed frequency channels the "FREQUENCY CONTROL" is provided. The crystals are not supplied with the receiver, but will be supplied on special order. In order to insure correct crystal controlled frequency operation crystal units should be ordered from HAMMARLUND MFG. CO. INC. and the order should specify the **signal** frequency, for which each unit is to be used. The frequency control unit has provision for six crystals. Variable frequency operation or crystal controlled frequency operation on any of the six crystal positions is selected by the "CRYSTAL SWITCH". The crystal oscillator is designed for use with suitable crystals at any frequency in the range of the receiver above one megacycle. The "DELTA FREQ" control is used to compensate for a very small plus or minus frequency tolerance of the crystals.

The procedure for crystal frequency control operation should be as follows: Loosen the knurled thumb screw on top of the crystal unit and push the retainer spring assembly to the rear. Insert the crystal or crystals in the crystal sockets, numbered 1 to 6. Bring the retainer spring assembly forward so that the springs press on top of the crystal holders and tighten the thumb screw. Mark the **signal** frequency for which each crystal was selected, in megacycles on the plastic chart provided for this purpose alongside the crystal switch. Pencil or ink may be used and can be erased if it is desired to change these figures at any time. The numerals on the chart should be used so that they agree with the numerals on the crystal socket positions, which are also indicated by the crystal switch. The main tuning dial should be set at the **signal** frequency for which operation is desired. The crystal switch should be set at the position corresponding to the number for that signal frequency on the chart. The Delta Frequency control should be adjusted for maximum signal or for zero beat as required. It should be noted that this tuning adjustment of the Delta Frequency control must be made each time that the signal frequency is changed and that the main tuning dial should be set to agree with the new signal frequency.

Tuning Lock — The tuning lock, located to the right of the tuning knob, provides a positive locking for the tuning mechanism without affecting the frequency setting, when it is desired to prevent accidental shifting of the tuning or when the receiver is operated under a severe condition of vibration.

Tuning Meter — The tuning meter at the upper left on the front panel is useful in accurately tuning a signal and provides an indication of the relative strength of the received signal in db from 1 microvolt. The "METER ADJ RF" control at the rear of the chassis provides adjustment of the plus 20 db reading on the RF scale, with a 10 microvolt input signal. Depression of the "METER SWITCH" converts the meter circuit for indication of the AF output power level in db from 6 milliwatts. This switch is spring returned to the RF scale circuit position when released and **should not be depressed for the AF scale unless the audio output has been adjusted for low power output, by means of headphones or speaker. Failure to observe this precaution may result in damage to the meter.** The "METER ADJ AF" control at the rear of the chassis provides adjustment of the 0 db reading on the AF scale, which should be made when the AF output power from the 600 ohm audio output terminals is 6 milliwatts or 1.9 volts across a 600 ohm load.

Band Change — The large knob, to the left, is the band change control. Each revolution of this control turns the turret, containing the RF and HF oscillator coil, trimmer and switch contact assemblies, from one frequency band to the next. The turret has no stops and may be turned in either direction desired. A positive detent machanism assures correct location of the various bands. The band change control simultaneously operates the small frequency band dial, located at the center of the panel and aligns the dial frequency indicator with the proper scale.

Selectivity Switch — The selectivity switch provides three crystal and three non-crystal degrees of selectivity, ranging from extremely sharp, for CW reception, to broad for good fidelity MCW operation. The control knob dial indicates the 6 db band width at each setting.

Phasing Control — The phasing control permits high attenuation of closely adjacent channel interference on either side of the signal frequency, when the crystal selectivity positions are used.

Beat Frequency Oscillator — The beat frequency oscillator is turned "on" for CW signal operation by the "MOD-CW" switch. The beat frequency dial should be set at zero for tuning to zero beat and then adjusted to give the desired audio pitch. The beat frequency oscillator injection voltage is adjustable by the "BFO INJ" control on the rear skirt of the chassis.

Noise Limiter — The noise limiter switch is independent of other controls and is useful in greatly attenuating noise interference from ignition or similar pulse type sources, regardless of the mode of operation.

Send-Receive — The send-receive switch permits desensitizing the receiver during transmission periods, to prevent damage to the receiver, when operated in proximity to the transmitter and provides instant return to reception between transmission periods.

Relay Receptacle — The relay receptacle, on the rear of the receiver, is connected in parallel with the send-receive switch and provides for the connection of an externally connected relay, to perform the send-receive operation. When the relay is used the send-receive switch is left in the "open" or "send" position.

AVC-Manual Switch — The AVC-Manual Switch permits the choice of either AVC or Manual sensitivity operation as desired. The AVC has a delay bias, which insures maximum sensitivity for weak signals.

RF Gain Control — The RF gain control provides adjustment of the sensitivity for signals of various strength, when under the "manual" operating condition, in order that the receiver sensitivity may be adjusted to suit the signal strength and prevent overloading. This control is also in the circuit when operating on AVC, in order that the sensitivity may be adjusted to reduce undesirable noise during "off" periods in the transmission of the received signal. When it is desired to use the tuning meter for indication of relative signal strength, the RF gain control should be at maximum.

Audio Gain Control — The audio gain control adjusts the audio input to the audio amplifier tube. It should be adjusted for the required audio output when operating on AVC and is best left at or near maximum when operating on MANUAL control.

Phono Input — Terminals are provided on the rear of the receiver for phonograph or other audio frequency source input to the audio frequency amplifier.

Convenience Outlet — A power outlet receptacle is provided on the rear of the receiver chassis for operating an accessory, such as an electric clock or lamp.

V
MAINTENANCE

This receiver is designed for continuous duty and should normally require little attention beyond the replacement of tubes. However, should trouble develop that cannot be eliminated with new tubes, the socket voltages and resistances should be measured to chassis. Any appreciable departure from the values shown in tables 1 and 2 will generally indicate the component or circuit at fault.

Operating and maintenance of the receiver will be greatly facilitated if the contents of this instruction manual are thoroughly digested. Approximate input signal values for stage by stage gain checks are shown in table 4.

MODEL SP-600-JX

TUBE SOCKET VOLTAGES—TABLE 1

Voltage to chassis. Measurements made with Weston Model 663 Volt-Ohmmeter, except those indicated by asterisk were made with Measurements Corp. Model 62 VTVM. The 500 volt scale was used for all voltages above 10 volts and the 10 volt scale for voltages below 10 volts. Line voltage 117, no signal input. Audio Gain control at minimum and CW-MOD switch on "CW"

	SOCKET PIN NUMBERS									
TUBE	1	2	3	4	5	6	7	8	9	MODE OF OPERATION
V-1	*-1	—	*6.3ac	—	200	90	—	—	—	RF Gain max.
V-1	*-54	—	*6.3ac	—	260	235	—	—	—	RF Gain min.
V-2	*-1	—	*6.3ac	—	210	100	—	—	—	RF Gain max.
V-2	*-54	—	*6.3ac	—	260	240	—	—	—	RF Gain min.
V-3	—	*6.3ac	—	—	—	0	—	265	—	RF Gain max.—VFO operation
V-3	—	*6.3ac	—	—	—	150	—	265	—	RF Gain max.—Crystal Freq. Control
V-3	—	*6.3ac	—	—	—	0	0	290	—	RF Gain min.—VFO operation
V-3	—	*6.3ac	—	—	—	150	0	280	—	RF Gain min.—Crystal Freq. Control
V-4	130	—	*6.3ac	—	130	—	—	—	—	RF Gain max. or min.
V-5	—	1.2	*6.3ac	—	140	110	—	—	—	RF Gain max. or min.
V-6	—	—	*6.3ac	—	225	—	*-1	—	—	RF Gain max.—Freqs. below 7.4mc
V-6	—	—	*6.3ac	—	260	—	*-1	—	—	RF Gain min.—Freqs. below 7.4mc
V-6	—	—	*6.3ac	—	225	90	*-1	—	—	RF Gain max.—Freqs. above 7.4mc
V-6	—	—	*6.3ac	—	260	105	*-1	—	—	RF Gain min.—Freqs. above 7.4mc
V-7	*-11	—	*6.3ac	—	225	170	—	—	—	RF Gain max.—Freqs. below 7.4mc
V-7	*-11	—	*6.3ac	—	260	190	—	—	—	RF Gain min.—Freqs. below 7.4mc
V-7	*-11	—	*6.3ac	—	225	0	—	—	—	RF Gain max.—Freqs. above 7.4mc
V-7	*-11	—	*6.3ac	—	260	0	—	—	—	RF Gain min.—Freqs. above 7.4mc
V-8	0	—	*6.3ac	—	0	—	—	—	—	Frequencies below 7.4mc
V-8	30	—	*6.3ac	—	30	—	—	—	—	Frequencies above 7.4mc
V-9	*-1	—	*6.3ac	—	205	90	—	—	—	RF Gain max.
V-9	*-54	—	*6.3ac	—	260	235	—	—	—	RF Gain min.
V-10	*-1	—	*6.3ac	—	205	90	—	—	—	RF Gain max.
V-10	*-54	—	*6.3ac	—	260	235	—	—	—	RF Gain min.
V-11	*-11	—	*6.3ac	—	210	145	—	—	—	RF Gain max.
V-11	*-11	—	*6.3ac	—	240	145	—	—	—	RF Gain min.
V-12	—	—	*6.3ac	—	210	40	—	—	—	RF Gain max.—BFO Injection max.
V-12	—	—	*6.3ac	—	240	45	—	—	—	RF Gain min.—BFO Injection max.
V-13	25	—	*6.3ac	—	25	—	—	—	—	RF Gain max. or min.
V-14	—	—	*6.3ac	—	*22	—	—	—	—	RF Gain max. or min.
V-15	—	—	*6.3ac	—	—	—	—	—	—	RF Gain max. or min.
V-16	50	—	1.5	—	—	210	—	6.4	*6.3ac	RF Gain max.
V-16	52	—	1.6	—	—	240	—	7.4	*6.3ac	RF Gain min.
V-17	—	—	260	228	—	—	*6.3ac	12	—	RF Gain max.
V-17	—	—	280	265	—	—	*6.3ac	13	—	RF Gain min.
V-18	150	—	—	—	150	—	—	—	—	RF Gain max. or min.
V-19	—	300	—	—	—	—	—	300	—	RF Gain max.—*5 V ac Pin 2 to Pin 8
V-19	—	320	—	—	—	—	—	320	—	RF Gain min.—*5 V ac Pin 2 to Pin 8
V-20	—	*-96	*6.3ac	—	—	—	*-96	—	—	RF Gain max.
V-20	—	*-97	*6.3ac	—	—	—	*-97	—	—	RF Gain min.

TUBE SOCKET TERMINAL RESISTANCE—TABLE 2

Resistance to chassis. Measurements made with Weston Model 663 Volt-Ohmmeter.

Tube removed from socket under measurement. Audio Gain Control at maximum, RF Gain Control at minimum. Limiter Switch "OFF". CW-MOD Switch on "CW". AVC-MAN Switch on "AVC".

Socket Pin No.	1	2	3	4	5	6	7	8	9	MODE OF OPERATION
Tube Socket										
V-1	1.8M	0	—	0	48K	80K	0	—	—	
V-2	1.8M	0	—	0	48K	80K	0	—	—	
V-3	0	—	0	47K	0	46K	—	46K	—	Crystal Freq. control pos. 1–6
V-4	Inf.	Inf.	—	0	Inf.	47K	0	—	—	Crystal Freq. control pos. 1–6
V-4	48K	Inf.	—	0	Inf.	47K	0	—	—	VFO Operation
V-5	47K	150	—	0	48K	53K	500K	—	—	
V-6	22K	0	—	0	46K	Inf.	100K	—	—	Freq. Bands below 7.4mc
V-6	22K	0	—	0	46K	70K	100K	—	—	Freq. Bands above 7.4mc
V-7	115K	0	—	0	46K	Inf.	0	—	—	Freq. Bands above 7.4mc
V-7	115K	0	—	0	46K	80K	0	—	—	Freq. Bands below 7.4mc
V-8	—	—	—	0	Inf.	22K	0	—	—	Freq. Bands below 7.4mc
V-8	—	—	—	0	150K	22K	0	—	—	Freq. Bands above 7.4mc
V-9	1.3M	0	—	0	52K	80K	0	—	—	
V-10	1.3M	0	—	0	52K	80K	0	—	—	
V-11	125K	0	—	0	48K	50K	0	—	—	
V-12	0	0	—	0	48K	145K	*	—	—	*0 to 1K (BFO Injection control)
V-13	—	—	—	0	195K	100K	0	—	—	
V-14	0	770K	—	0	16K	0	220K	—	—	
V-15	94K	Inf.	—	0	Inf.	0	220K	—	—	
V-16	150K	500K	1K	0	0	46K	470K	680	—	
V-17	0	0	46K	46K	470K	Inf.	—	360	—	
V-18	118K	—	—	—	78K	—	0	—	—	
V-19	—	46K	0	55	—	55	—	46K	—	
V-20	50K	65K	—	0	50K	0	65K	—	—	

VI
ALIGNMENT

The alignment of a modern communications receiver requires precision instruments and a thorough knowledge of the circuits involved. This receiver, being a double super-heterodyne, the alignment procedure is even more involved than is usual.

Under normal service the receiver will stay in alignment for extremely long periods of time, consequently realignment should not be attempted unless all other possible causes of a particular trouble have been eliminated. When it has been determined that any realignment should be attempted, a great deal of caution should be exercised in making the adjustments, as any required readjustment should not entail more than a slight angular motion of the adjusting screw.

ALIGNMENT OF THE IF STAGES

The low frequency IF should be aligned first. The recommended method for aligning the low frequency IF involves the use of a sweep frequency signal generator and an oscilloscope. Since these instruments are not available at the average service station the alternate method using an amplitude modulated signal generator and an output meter will be described first. The additional information required for the visual alignment method will be covered in a later paragraph.

The signal generator should be coupled to the grid of the mixer tube V5 through a capacitance of approximately .01 mfd. A miniature tube adapter will be required to make the mixer grid connection available. Such an adapter is manufactured by the Alden Manufacturing Co. An output meter should be connected across the output terminals of the receiver or the speaker voice coil. The receiver controls should now be set as follows:

Control		Position
Selectivity	—	See text
Send — Receive	—	Receive
CW — Mod	—	Mod
Phasing	—	Arrow
AVC — Man	—	Man
Audio Gain	—	Set for approx. 20 volts
RF Gain	—	See text
Band Switch	—	1.35 — 3.45 mc
Dial	—	2.5 mc

The signal generator should be modulated 30 percent at 400 cycles. Turn the selectivity switch to the 3 kc position and advance the RF Gain control to maximum. Set the signal generator frequency to 455 kc and adjust its output until some deflection is noted on the output meter. Refer to figure 3 for the location of the various alignment adjustments. Adjust L42, L41, L39, L38, L36 and L32 for maximum output, reducing the signal generator output and the RF Gain control as required to prevent overload or excessive output. Now turn the selectivity switch to the narrowest position, .2 kc, and adjust the signal generator frequency for the maximum output. This establishes the correct signal frequency by the 455 kc crystal for the IF amplifier and the frequency of the signal generator should not be disturbed for the remainder of the low frequency IF alignment, unless it should be to recheck this establishment of crystal frequency to make sure that the signal generator frequency has not drifted during the alignment. The selectivity switch is now turned to the 3 kc position and L42, L41, L39, L38, L36 and L32 are again adjusted for maximum output. Now turn the selectivity switch to the 1.3 kc position and adjust L37 for maximum output. Before changing this set-up the BFO should be turned on by throwing the CW-Mod switch to CW and checked for zero beat with the BFO knob dial at its zero reading. If necessary L44 should be adjusted for zero output. This check and adjustment of the BFO should be done with the signal generator carrier unmodulated.

The procedure for the visual method of aligning the low frequency IF should be the same as the above except that the adjustments are made for both maximum amplitude and coincidence of the oscilloscope images. The oscilloscope vertical input should be connected across the diode detector load resistance, from the junction of R64 and R65 to chassis.

The high frequency IF should be aligned next. Set the band switch to the 7.4 — 14.8 mc band. The selectivity switch should be in the 3 kc position. Adjust the signal generator frequency to 3.955 mc and adjust L31, L33 and L34 for maximum output.

The 3.5 mc crystal used in the second oscillator is held to a very close frequency tolerance. However, if it is desired that this oscillator frequency be exactly 3.5 mc to permit its use as a frequency standard, as hereinafter described, this may be accomplished by adjusting capacitor C101, underneath the chassis. The exact procedure is as follows; Set the receiver to 7.0 mc on the 3.45 — 7.4 mc band. Temporarily connect, by means of a jumper, the center and the open terminals on switch S4 at the rear of the tuning unit. Attach a two foot length of insulated wire to the antenna terminal and dress the free end around the tube shield on the 3.5 mc oscillator tube V8 with the CW-Mod switch on CW rock the tuning control slightly until a beat note is heard in the headphones or speaker. Now throw the CW — Mod switch to Mod and couple a 1.0 mc frequency standard to the antenna input terminal. Adjust capacitor C101 for zero beat. Remove the jumper from S4 and remove the two foot test lead. If appreciable adjustment of C101 was required it is advisable to repeat the high frequency IF alignment.

The 3.5 mc oscillator may now be used as a frequency standard at multiples of 3.5 mc from 10.5 mc upwards, by temporarily connecting the two foot length of wire as described above.

ALIGNMENT OF THE RF AMPLIFIER & HF OSCILLATOR

To adequately align the RF Amplifier and HF Oscillator an accurately calibrated signal generator and an output meter are required. The frequencies required are shown in table 3. The location of the adjustments is shown in Figure 3. The use of Table 3 and Figure 3 should be made in following this part of the alignment which will now be described for one frequency band. The same procedure should then be followed for the other frequency bands.

To align the .54-1.35 mc band the signal generator is coupled to the antenna input terminal through a 100 ohm carbon resistor. The generator should be modulated 30 percent at 400 cycles and the output meter connected across the receiver output terminals. The receiver controls should be set as follows:

Control		Position
Selectivity	—	3kc
Send-Receive	—	Receive
CW — Mod	—	Mod
AVC — Man	—	See Text
Audio Gain	—	Set for approx. 20 volts
RF Gain	—	See text
Band Switch	—	set for band to be aligned
Limiter	—	off

Set the receiver and signal generator dials to .56 mc. The RF Gain control should be set at maximum and the AVC — Man switch set on AVC. The HF Osc. L adjustment shown in Figure 3, should now be set for maximum output. Then the Ant., 1st RF and 2nd RF L adjustments should be set for maximum output. The receiver and signal generator dials are now set to 1.3 mc and the C adjustments, shown in Figure 3, should be adjusted for maximum output in the same order, beginning with the Osc C adjustment and then making the C adjustments for the Ant, 1st RF and 2nd RF. This procedure should be carefully repeated until no increase in output can be realized. The AVC — Man switch should then be set to Man and the signal generator should be set for approximately 3 micro volts. The L and C adjustments should now be checked for maximum output, adjusting the RF Gain control as found necessary to maintain the output at approximately 20 volts.

Following the frequencies, shown in Table 3, align the remaining bands using the same procedure as above.

TABLE No. 3

RF AND HF OSCILLATOR ALIGNMENT FREQUENCIES AND ADJUSTMENT DESIGNATIONS

FREQ. BAND IN MC	.54—1.35	1.35—3.45	3.45—7.4	7.4—14.8	14.8—29.7	29.7—54.0
RF & HF OSC ADJUST L AT.	.56	1.4	3.75	7.5	15.0	30.0
RF & HF OSC ADJUST C AT.	1.3	3.4	7.15	14.5	29.0	52.0

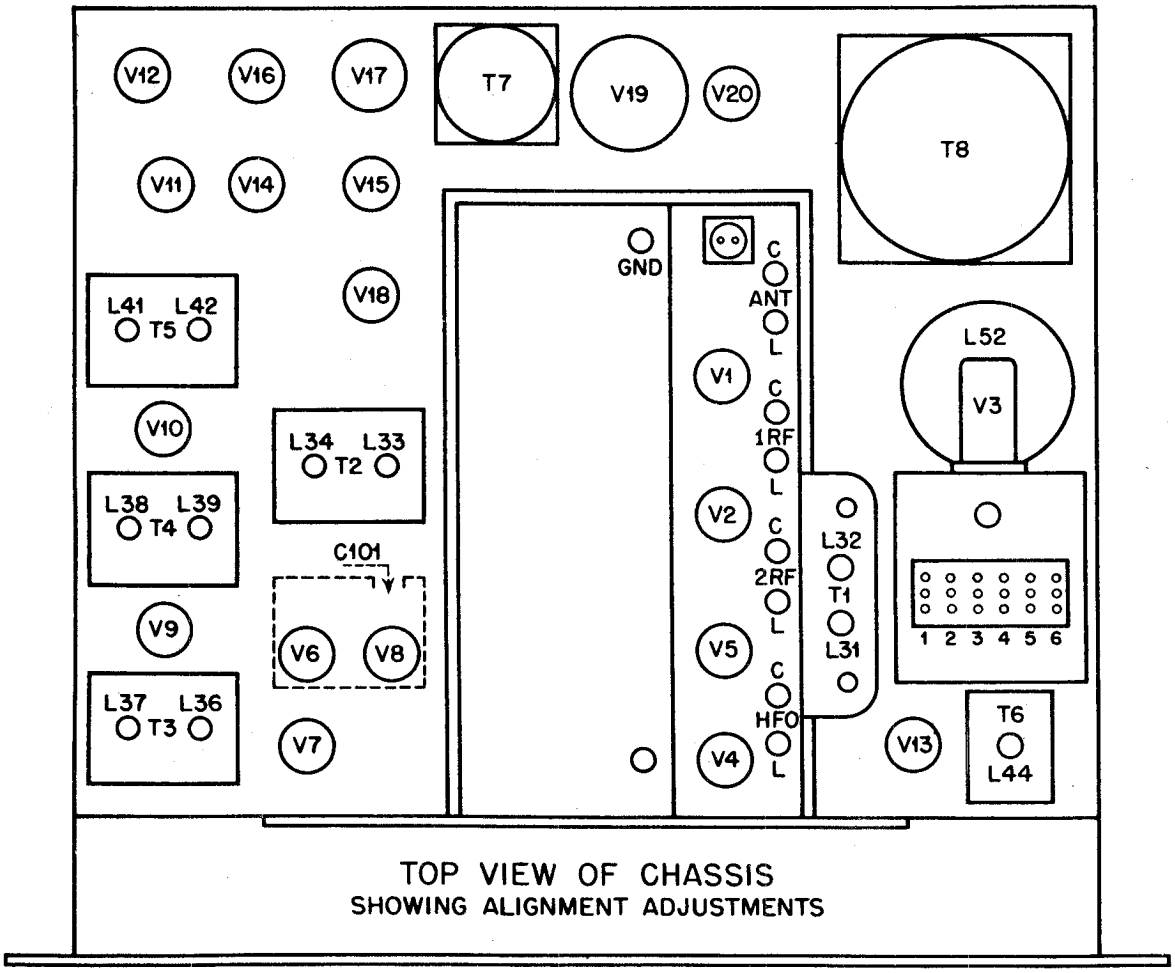
TABLE No. 4

APPROXIMATE SIGNAL INPUT AT IF & AF STAGES FOR 20 VOLTS OUTPUT

Output measured across a 600 ohm resistive load at output terminals of receiver. RF signals modulated 30 percent at 400 cycles. Signals applied to tube grids through a .01 mfd capacitor. Selectivity switch at 3 kc AVC — MAN switch on MAN. CW — MOD switch on MOD, RF Gain and Audio Gain at maximum.

BAND SWITCH	FREQUENCY	INPUT TO	APPROX. INPUT
Any	Audio 400 cycles	Pin 5, V17	3.5 volts
Any	Audio 400 cycles	Pin 2, V16B	.3 volts
1.35—3.45 mc	Mod RF 455 kc	Pin 1, V11	.35 volts
1.35—3.45 mc	Mod RF 455 kc	Pin 1, V10	6000 microvolts
1.35—3.45 mc	Mod RF 455 kc	Pin 1, V9	110 microvolts
1.35—3.45 mc	Mod RF 455 kc	Pin 1, V7	40 microvolts
1.35—3.45 mc	Mod RF 455 kc	Pin 7, V5	65 microvolts
7.40—14.8 mc	Mod RF 3.955 mc	Pin 7, V5	40 microvolts
7.40—14.8 mc	Mod RF 3.955 mc	Pin 7, V6	250 microvolts

MODEL SP-600-JX



TOP VIEW OF CHASSIS
SHOWING ALIGNMENT ADJUSTMENTS

FIG. 3

•AUDIO AND OVERALL FIDELITY CURVES•

——— CURVE – Audio frequency amplifier. Input to phono terminals.

– – – – – – – – – CURVE – Overall fidelity at 2.5 mc. Modulation 30 percent.
Selectivity switch in 13 kc position.
RF Gain set for 20 volts output at 400 cycles.
Output measured across a 600 ohm resistive load.
Audio gain control at maximum for both curves.

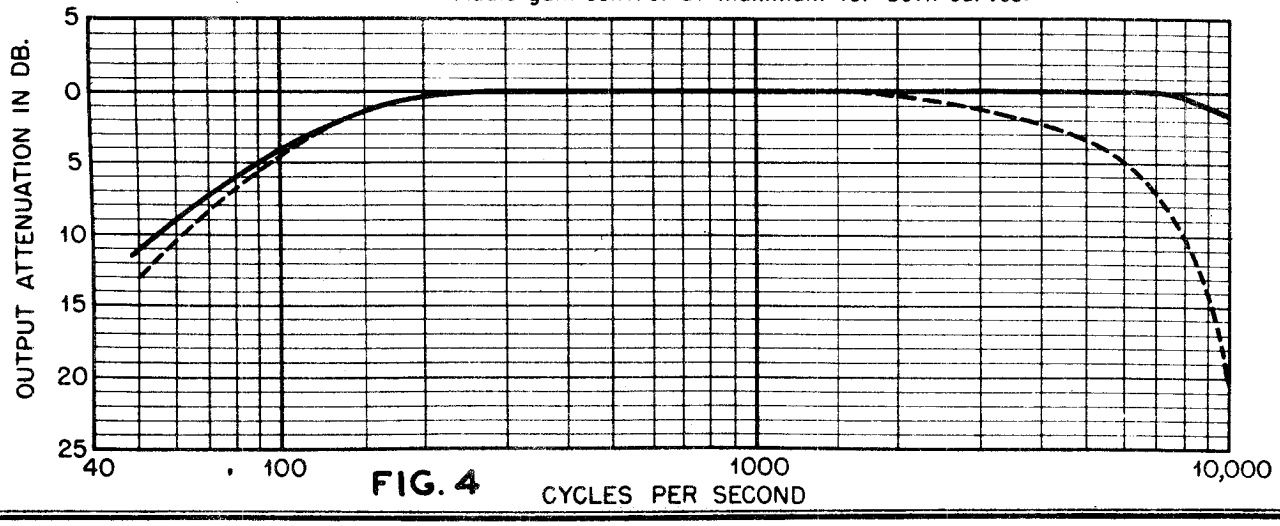


FIG. 4

• SELECTIVITY CURVES
Overall at 2 Megacycles •

NUMBERS DENOTE SELECTIVITY SWITCH POSITIONS
1,2 AND 3 NON CRYSTAL — 4,5 AND 6 CRYSTAL

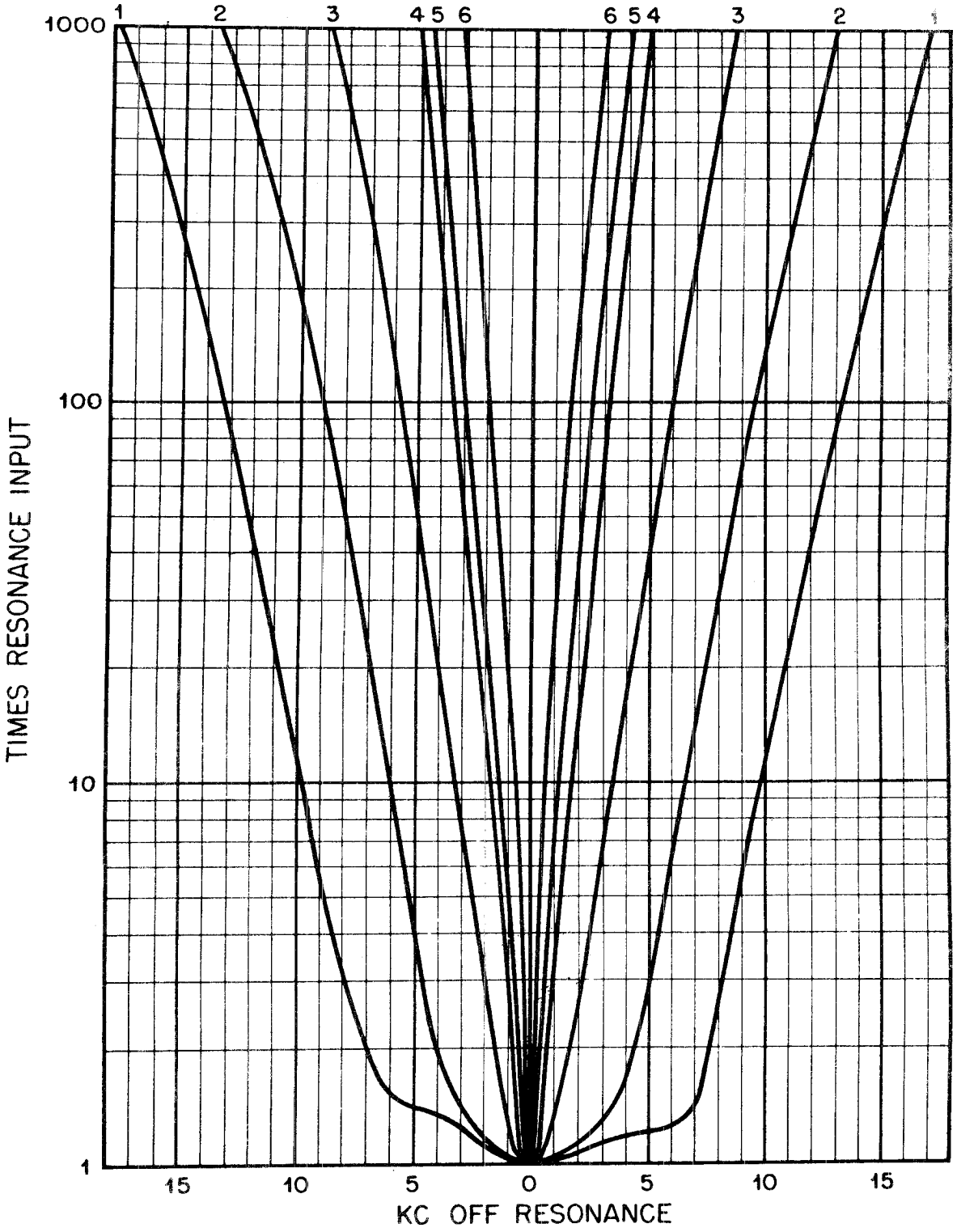


FIG. 5

MODEL SP-600-JX

TABLE No. 5
PARTS LIST

Symbol Designations	DESCRIPTION	Hammarlund Part No.
C1A, B, C, D, E, F, G, H	Capacitor, variable, 8 sections	34001-G1
C3, 5, 19, 20, 21, 22, 23, 24, 27, 29, 40, 41, 42, 43, 44, 47, 49, 61, 64, 66, 68, 70, 71, 72, 73, 74, 100, 105, 115,116, 121, 122, 127, 135, 153, 154, 155	Capacitor, .01 mfd	23012-1
C6, 30, 50	Capacitor, 20 mmf	23003-41C
C8, 32, 52, 132	Capacitor, 2400 mmf	23011-40C
C9, 33, 53	Capacitor, 33 mmf	23003-45C
C11, 17, 35, 55	Capacitor, 1500 mmf	23011-62C
C12, 138, 145	Capacitor, 7 mmf	23061-168F
C14	Capacitor, 1000 mmf	23011-58C
C15, 139	Capacitor, 15 mmf	23061-155J
C18, 25, 45, 75, 110, 112, 113	Capacitor, 100 mmf	23003-94C
C37, 57, 67	Capacitor, 85 mmf	23071-59
C39, 59, 99, 134	Capacitor, 51 mmf	23003-87C
C60, 88	Capacitor, 12 mmf	23023-65UJ
C62	Capacitor, 2200 mmf	23011-17C
C63	Capacitor, 39 mmf	23003-47C
C65	Capacitor, variable	11726-G109
C69, 107, 117, 124	Capacitor, 220 mmf	23003-102C
C77	Capacitor, 3300 mmf	23011-69C
C78	Capacitor, 404 mmf	23071-67
C79, 80	Capacitor, 5 mmf	23023-8UJ
C82	Capacitor, 810 mmf	23072-53
C83	Capacitor, 10 mmf	23003-2B
C85	Capacitor, 1200 mmf	23011-60C
C87	Capacitor, 120 mmf	23071-50
C89	Capacitor, 190 mmf	23071-64
C91	Capacitor, 92 mmf	23071-71
C92	Capacitor, 51 mmf	23023-45UJ
C93	Capacitor, 379 mmf	23071-63
C95	Capacitor, 42 mmf	23071-69
C96	Capacitor, 610 mmf	23072-52
C97	Capacitor, 65 mmf	23071-58
C98, 102, 103, 104, 106, 108, 109, 118, 123, 136, 146, 147, 148, 156, 157	Capacitor, .022 mfd	23013-1
C101	Capacitor, variable	11725-G151
C111	Capacitor, variable	11776-G1
C114	Capacitor, 270 mmf	23003-104C
C119, 125	Capacitor, 300 mmf	23003-105C
C120, 126	Capacitor, 1300 mmf	23011-61C
C128, 151, 158, 159, 160	Capacitor, 10 mfd, 100V HS Can, Electrolytic	15462-1
C129A, 129B, 152A, 152B	Capacitor, 2 x .05 mfd HS Can, Paper	15461-1
C130	Capacitor, 27 mmf	23023-71UJ
C131, 133	Capacitor, 430 mmf	23003-109C
C137	Capacitor, .25 mfd 200V	23911-79E
C140	Capacitor, 1000 mmf	23015-27A
C141, 142	Capacitor, 100 mmf	23024-24SL
C143, 149	Capacitor, 5100 mmf	23015-16A
C144	Capacitor, .05 mfd	23911-77E
C150	Capacitor, 2500 mmf 800V	23070-40
C161A, B, C	Capacitor, 3 x 20 mfd 450V. HS Can. Electrolytic	15463-1
E1	2 Screw Terminal, Phone Input	4904-5
E2	4 Screw Terminal, Audio Output	31141-1
E3, 4, 5, 6	Dial Lamp, No. 47 Mazda	16004-1
	Dial Lamp Socket Assembly	31453-1
E7	2 Solder Term. strip	16650-12
E8	1 Solder term. strip (left)	16650-9
E9, 10, 11, 12	1 Solder term. strip (right)	16650-11
E13, 14	6 Solder term. strip	16650-10
E15, 16	8 Solder term. strip	31163-G1
E17	15 Solder term. strip	31162-G1
E18	3 Solder term. strip (meter)	31454-G1
F1	Fuse, 3 Amp.	15928-8
	Fuse Holder	15923-1
	Fuse Holder, Spare	15923-4
J1	Antenna Input Socket	15959-1
J2	IF Output Socket	16111-1
J3	Phone Jack	5066-1
J4, 5	Power or Relay receptacle	35013-1
L1	RF Input assembly, includes C2, 3, L1 and Switch contacts for S1A	31387-G1
L2	RF Input assembly, includes C4, 5, L2 and Switch contacts for S1A	31390-G1
L3	RF Input assembly, includes C6, 7, 8, L3 and Switch contacts for S1A	31393-G1
L4	RF Input assembly, includes C9, 10, 11, L4 and Switch contacts for S1A	31396-G1
L5	RF Input assembly, includes C12, 13, 14, L5 and Switch contacts for S1A	31399-G1
L6	RF Input assembly, includes C15, 16, 17, L6 and Switch contacts for S1A	31405-G1
L7, 14, 24, 35	RF Choke, 192 microhenries	15612-G1
L8	RF Transformer assemsembly, includes C26, 27, L8, R7 and Switch contacts for S1B	31386-G1
L9	RF Transformer assembly, includes C28, 29, L9, R8 and Switch contacts for S1B	31389-G1
L10	RF Transformer assembly, includes C30, 31, 32, L10 and Switch contacts for S1B	31392-G1
L11	RF Transformer assembly, includes C33, 34, 35, L11, R10 and Switch contacts for S1B	31395-G1
L12	RF Transformer assmbly, includes C36, 37, L12 and Switch contacts for S1B	31398-G1

PARTS LIST (Continued)

Symbol Designations	DESCRIPTION	Hammarlund Part No.
L13	RF Transformer assembly, includes C38, 39, L13 and Switch contacts for S1B	31404-G1
L15	Same as L8, includes C46, 47, L15, R17 and Switch contacts for S1C	31386-G1
L16	Same as L9, includes C48, 49, L16, R18 and Switch contacts for S1C	31389-G1
L17	Same as L10, includes C50, 51, 52, L17, R19 and Switch contacts for S1C	31392-G1
L18	Same as L11, includes C53, 54, 55, L18, R20 and Switch contacts for S1C	31395-G1
L19	Same as L12, includes C56, 57, L19 and Switch contacts for S1C	31398-G1
L20	Same as L13, includes C58, 59, L20 and Switch contacts for S1C	31404-G1
L21	RF Choke, 1 millihenry	15617-G1
L22	RF Choke, 10 millihenries	15618-1
L23	RF Choke, 25 millihenries	15619-1
L25	HF Osc. assembly, includes C76, 77, 78, L25 and Switch contacts for S1D	31385-G1
L26	HF Osc. assembly, includes C81, 82, L26 and Switch contacts for S1D	31388-G1
L27	HF Osc. assembly, includes C83, 84, 85, L27 and Switch contacts for S1D	31391-G1
L28	HF Osc. assembly, includes C86, 87, 88, 89, L28 and Switch contacts for S1D	31394-G1
L29	HF Osc. assembly includes C90, 91, 92, 93, L29 and Switch contacts for S1D	31397-G1
L30	HF Osc. assembly, includes C94, 95, 96, L30, and Switch contacts for S1D	31403-G1
L47	RF Choke, 3.8 millihenries	15616-G1
L48	RF Choke, 2 ohms dc	15611-1
L49, 50	RF Choke, 2.7 ohms dc	15613-1
L51	1st Filter Choke 8.5 Hy, 170 ohms dc	31030-2
L52	2nd Filter Choke 20 Hy, 440 ohms dc	31031-2
M1	Tuning Meter	4903-2
P1	Power plug and cord	6143-1
P2	Antenna Input Plug	16016-1
P3	Antenna Adapter Connector	15987-1
P4	Cable Connector Plug (for J2)	16071-1
R1, 13, 26	Resistor 510K ohms 1/3 watt	19317-76BF
R2, 12, 44, 52, 57, 82, 90, 91, 92, 70	Resistor 10K ohms 1/2 watt	19309-278BF
R3, 14, 39, 48, 53	Resistor 33K ohms 1/2 watt	19309-282BF
R4, 6, 16, 29, 30, 47, 83, 102, 103, 104, 105, 106, 107, 108, 109, 110	Resistor 1000 ohms 1/2 watt	19309-49BF
R5, 15, 32	Resistor 510 ohms 1/2 watt	19309-170BF
R7, 8, 17, 18	Resistor 51 ohms 1/2 watt	19309-193BF
R9, 19	Resistor 24 ohms 1/2 watt	19309-189BF
R10, 11, 20, 21, 45	Resistor 22 ohms 1/2 watt	19309-9BF
R22, 23, 64, 65, 77	Resistor 47K ohms 1/2 watt	19309-89BF
R24, 25	Resistor 180 ohms 1/2 watt	19309-31BF
R27	Resistor 150 ohms 1/2 watt	19309-259BF
R28	Resistor 6800 ohms 1/2 watt	19309-69BF
R31, 37, 41, 49, 54, 58, 80	Resistor 2200 ohms 1/2 watt	19309-57BF
R33	Resisor 1500 ohms 1/2 watt	19309-53BF
R34, 35, 38, 43, 51, 56, 62, 67, 68, 75, 76, 81, 100	Resistor 100K ohms 1/2 watt	19309-97BF
R36, 96	Resistor 22K ohms 1/2 watt	19309-178BF
R40	Resistor 20K ohms 1 watt	19310-179BF
R42, 50, 55	Resistor 10 ohms 1/2 watt	19309-1BF
R46	Resistor 100 ohms 1/2 watt	19309-25BF
R59	Resistor 2200 ohms 1 watt	19310-57BF
R60, 61	Resistor 1 megohm 1/2 watt	19309-121BF
R63	Resistor 27K ohms 1/2 watt	19309-83BF
R66	Resistor 18K ohms 1/2 watt	19309-79BF
R69, 74	Resistor variable 1000 ohms	15363-1
R72	Resistor 20K ohms 1/2 watt	19309-218BF
R73	Resistor 56K ohms 1 watt	19310-186BF
R78, 98	Resistor 470K ohms 1/2 watt	19309-113BF
R79	Resistor 680 ohms 1/2 watt	19309-45BF
R84	Resistor variable 500K ohms	15342-11
R85	Resistor 2500 ohm 10 watts	19396-1
R86, 89, 95	Resistor 82K ohms 1/2 watt	19309-287BF
R87, 88	Resistor 120K ohms 1/2 watt	19309-181BF
R93	Resistor variable 50K ohms includes switch S10	15342-21

MODEL SP-600-JX

PARTS LIST (Continued)

Symbol Designations	DESCRIPTION	Hammarlund Part No.
R94	Resistor 1100 ohms ½ watt	19309-208BF
R97	Resistor 3.3 megohms ½ watt	19309-133BF
R99	Resistor 360 ohms 1 watt	19310-211BF
R101	Resistor variable 25K ohms	15342-4
S1A, B, C, D	Switch, base and spring assembly	31234-G1
S2	Crystal selector switch.	15879-1
S3	Crystal switch	31469-1
S4	Switch, conversion switching	15862-1
S5A, B, C	Selectivity switch, 3 section	15856-1
S6, 9	Toggle Switch SPST	15864-1
S7	Toggle Switch DPST	15866-1
S8	Toggle Switch DPDT	15867-1
S10	Switch "ON-OFF" part of R93	——
S11	Switch, DPDT, spring return	15880-1
T1	Mixer plate coil assembly, includes C67, 69, 70, L31, 32, R31	31183-G1
T2	IF Transformer assembly, includes C97, 98, 99, L33, 34, R35	31116-G1
T3	Crystal Filter assembly, includes C107, 110, 111, 112, 113, 114, L36, 37, R41, Y8	31114-G1
T4	IF Transformer, includes C117, 118, 119, 120, L38, 39, 40, R49	31102-G1
T5	Same as T4, includes C123, 124, 125, 126, L41, 42, 43, R54	31102-G1
T6	Beat Frequency Osc. assy., includes C130, 131, 132, 133, 134, L44, 45, 46, R76, 77	31106-G1
T7	Transformer, Audio Output	31029-2
T8	Transformer, Power	31086-2
X1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 20	Tube socket, miniature.	15989-4
X3 17, 19	Tube socket, octal	16082-1
X4	Tube socket, miniature, ceramic, less center shield	15989-5
X5	Tube socket, miniature, ceramic, with center shield	15989-3
X16	Tube socket, "Noval"	16100-1
X21	Crystal socket, ceramic, for crystals Y1 to Y6	16092-5
Y1, 2, 3, 4, 5, 6	Crystal, order special, specify signal frequency	31473-spec.
Y7	Crystal, 3.5mc	31130-1
Y8	Crystal, 455kc	31471-1
Miscellaneous	Wrench, set screw No. 6	11806-2
	Wrench, set screw No. 8	11806-3
	Wrench, set screw No. 10	11806-4
	Snap Button Plug	29619-2
	Shaft Coupling, rigid	31275-G1
	Shaft Coupling, flexible, soft	415-G3
	Shaft Coupling, flexible, stiff	415-G2
	Spring, retainer for RF coil assemblies	31003-1
	Spring, retainer for RF coil	31004-1
	Spring, grounding for IF transformer shields	31023-1
	Spring, conversion switch	31125-1
	Spring, indicator slide	31126-1
	Spring, band change detent	31205-1
	Knob, frequency control	31434-G1
	Knob, tuning lock	31462-G1
	Knob & Skirt (large)	31215-G1
	Knob & Dial (RF Gain)	31227-G1
	Knob & Dial (Audio Gain)	31227-G2
	Knob & Dial (Crystal Phasing)	31227-G3
	Knob & Dial (Beat Freq. Osc.)	31227-G4
	Knob & Dial (Selectivity)	31227-G5
	Chart, frequency control	31463-1
	Spring, anti-backlash	31239-1

VII

CONVERSION OF TABLE MODEL RECEIVER FOR RACK MOUNTING

The SP-600 Receiver is designed for either table cabinet or rack mounting. When table models are ordered, the receiver is not supplied with a bottom cover plate since the cabinet serves this purpose. When rack models are ordered the receiver is supplied with a bottom cover plate, but is not supplied with a top cover plate since in most cases the rack is of the cabinet type.

A cover plate kit is provided, on separate order, for conversion to rack mounting where table models have been ordered and where the covers are desired.

The following instructions should be followed when installing the cover kit; To install the bottom cover plate, remove the two rear corner nut plate brackets by removing the three screws at the lower rear ends of the large side mounting brackets and replace these two nut plate brackets with the two slightly shorter ones from the kit, using the same screws. Remove the nut and lockwasher from the screw, nearest the bottom edge of the chassis, holding capacitor C151 (see bottom of chassis photograph). Install the short angle bracket, from the kit, using the same screw from which the nut and washer were removed, with the tapped (smaller end) of the bracket replacing the nut. The bottom cover plate is now installed using the five 10-32 screws from the kit and the two 10-32 screws that previously held the bottom of the receiver to the cabinet. To install the top cover plate assembly, place the cover with the angles facing downward toward the chassis and with pressure applied at the rear of the plate, to slightly compress the rubber channel against the rear of the front panel, secure the assembly in place with the four 6-32 screws from the kit, engaging them in the tapped holes in the brackets through the clearance holes in the side mounting brackets.

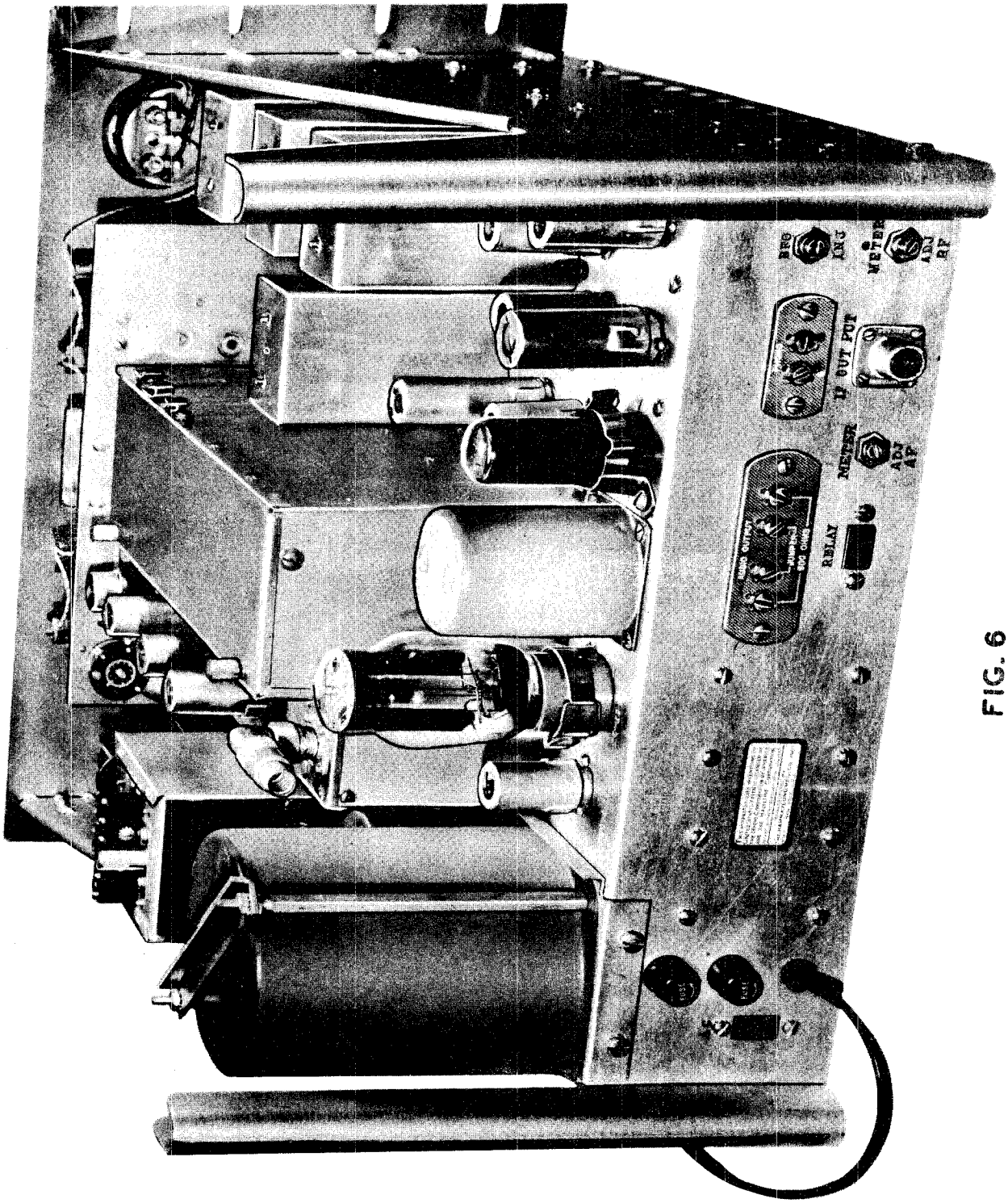


FIG. 6
REAR VIEW OF RECEIVER

MODEL SP-600-JX

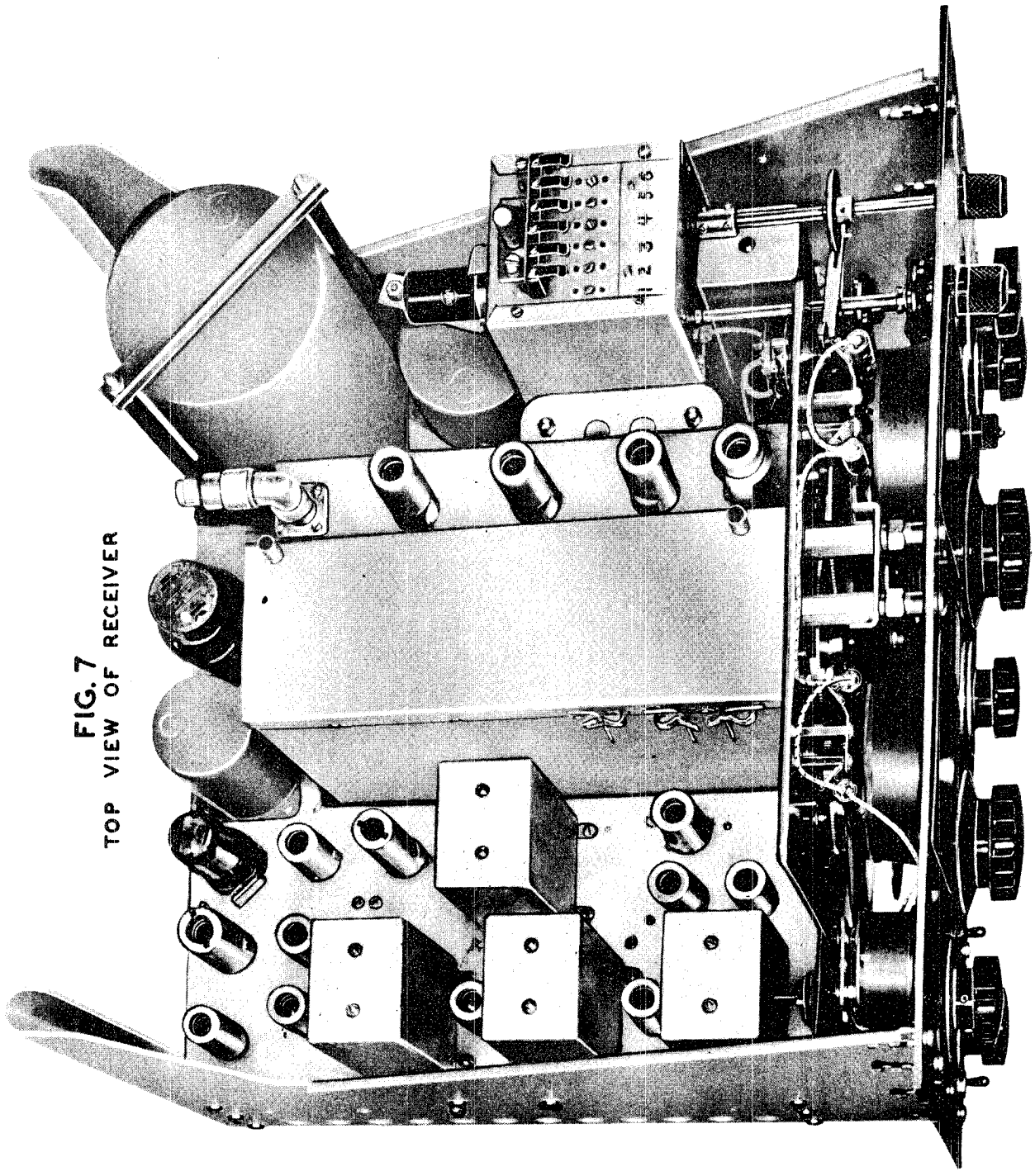


FIG. 7
TOP VIEW OF RECEIVER

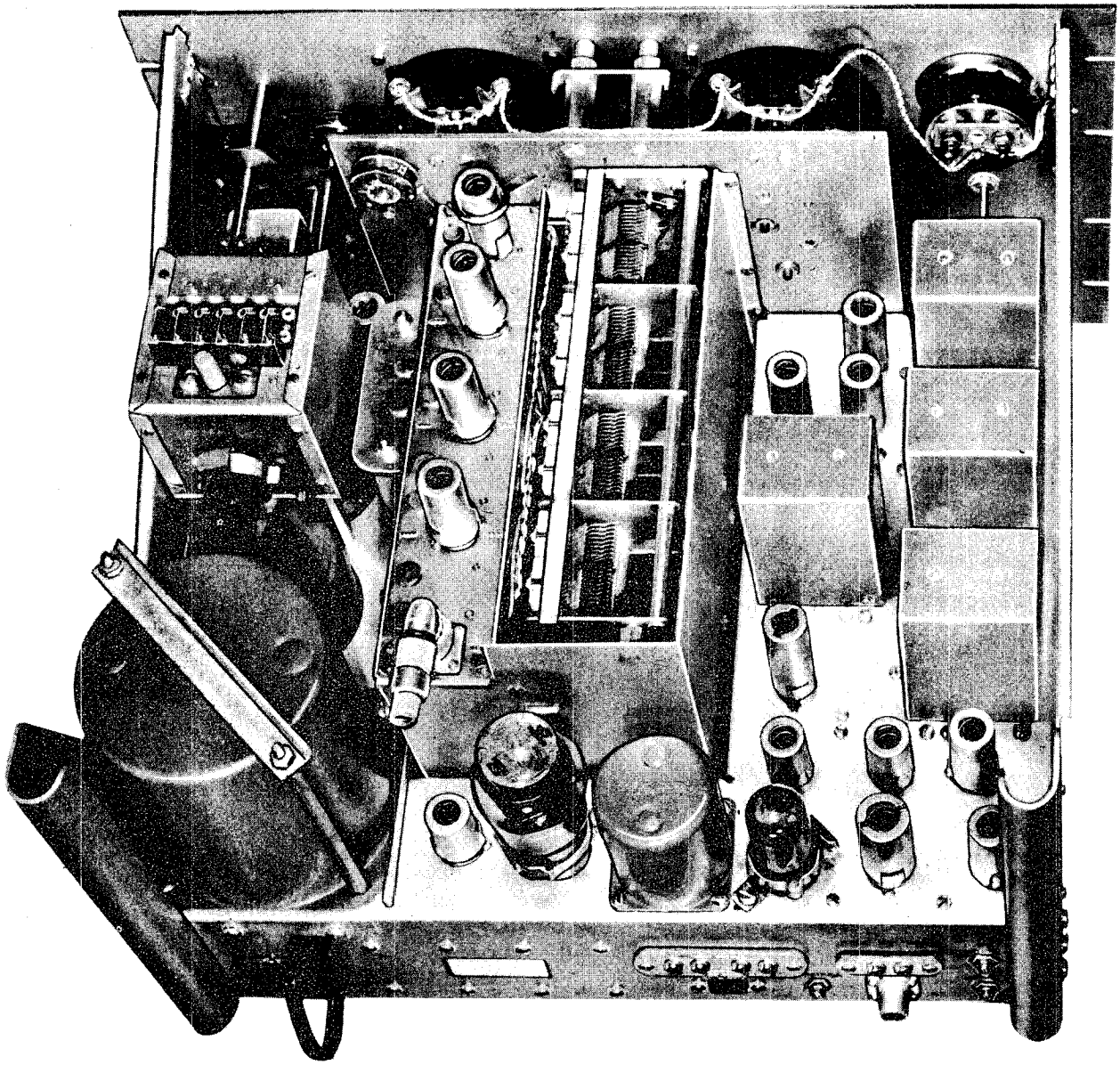


FIG. 8
TOP VIEW OF RECEIVER
CAPACITOR SHIELD REMOVED

MODEL SP-600-JX

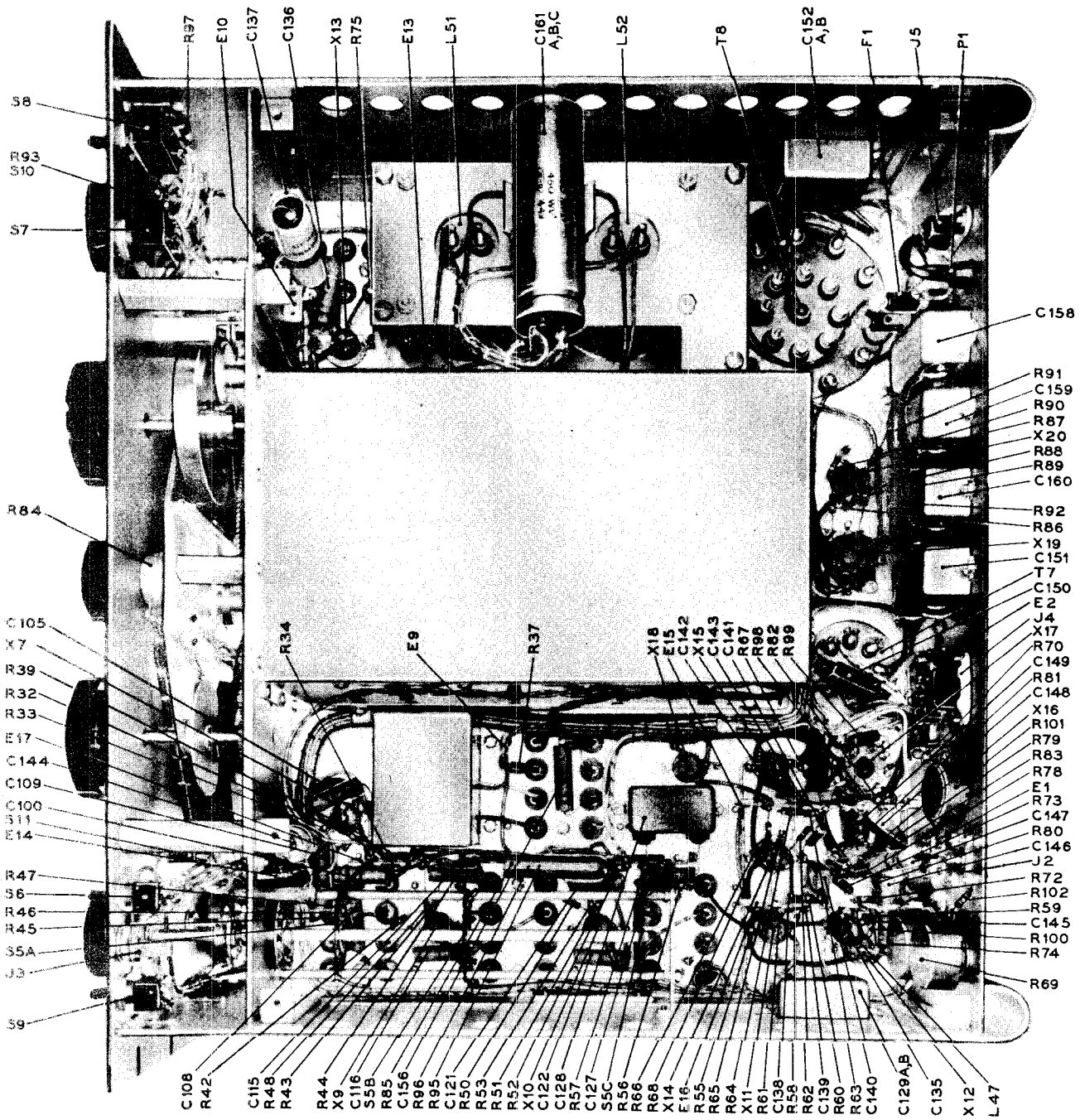


FIG. 9
BOTTOM VIEW OF RECEIVER SP-600-JX

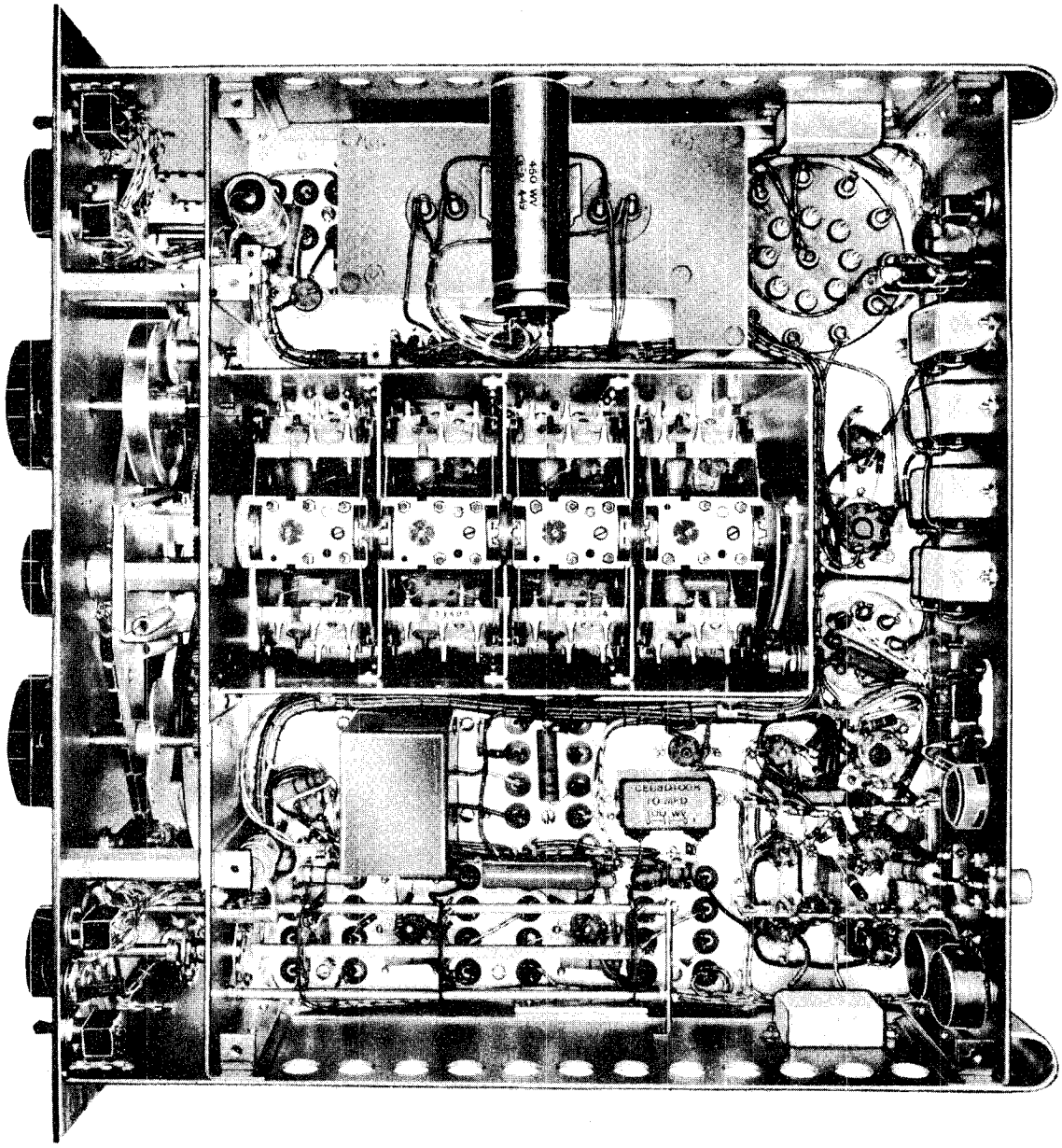


FIG. 10
BOTTOM VIEW OF RECEIVER
TUNING UNIT SHIELD REMOVED

MODEL SP-600-JX

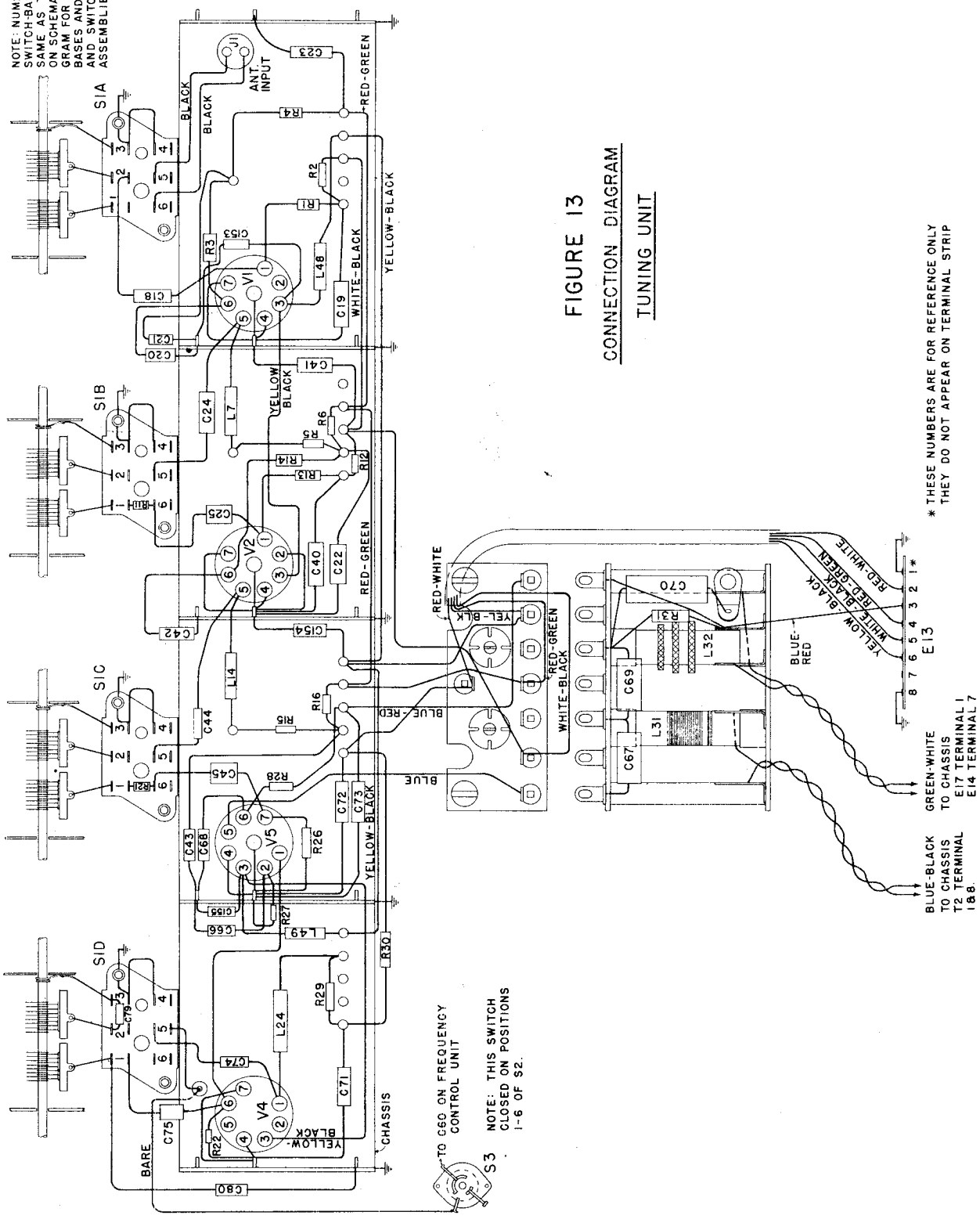
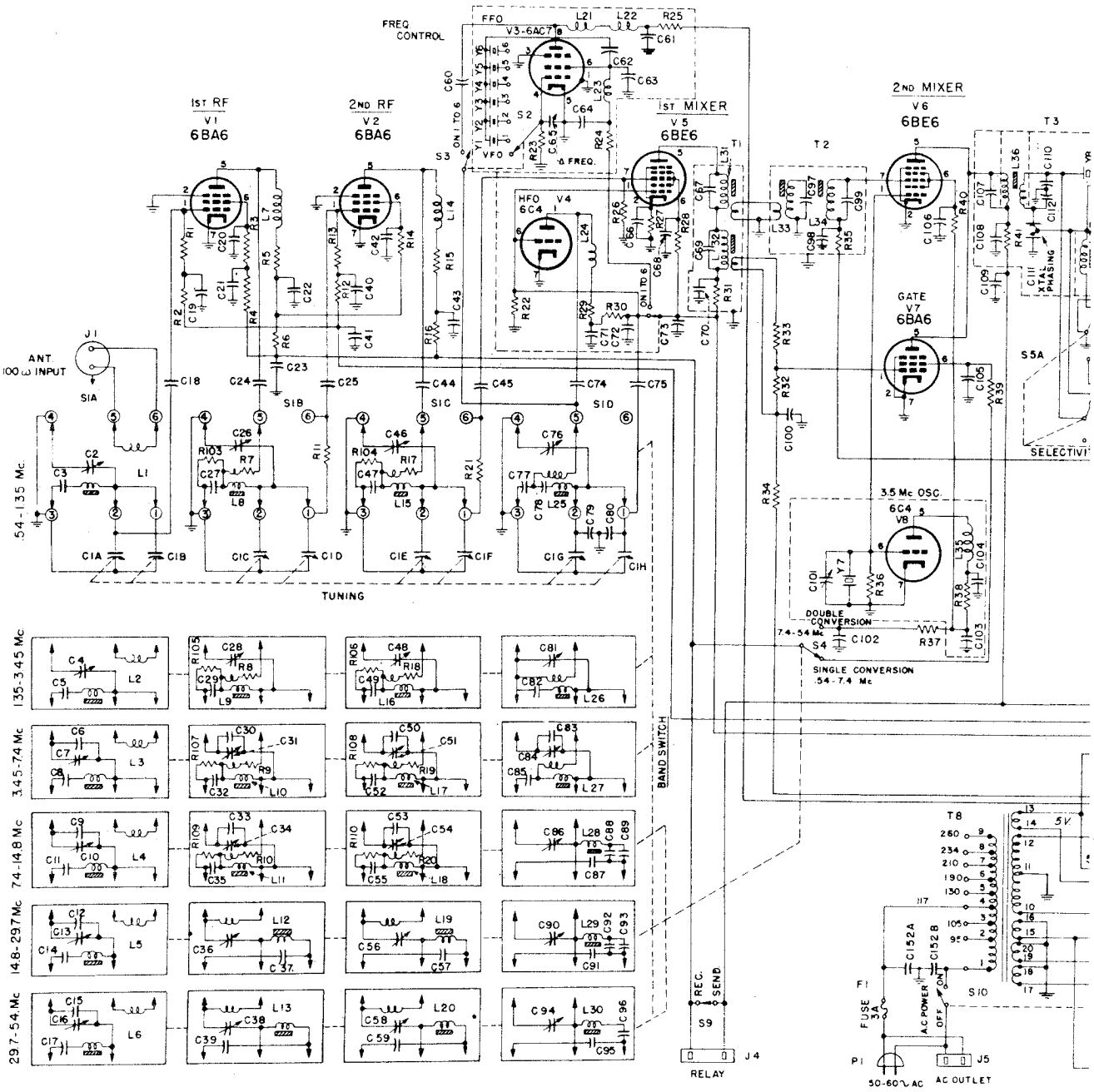


FIGURE 13

CONNECTION DIAGRAM

TUNING UNIT


FREQ CONTROL
VFO
V3-6AC7
1ST RF
V1
6BA6
2ND RF
V2
6BA6
1ST MIXER
V5
6BE6
2ND MIXER
V6
6BE6
HFO V4
6C4
GATE
V7
6BA6
3.5 Mc OSC.
6C4
V8
ANT
100 Ω INPUT
J1
SIA
SIB
SIC
SID
.54 - 1.35 Mc.
1.35 - 3.45 Mc.
3.45 - 7.4 Mc.
7.4 - 14.8 Mc.
14.8 - 29.7 Mc.
29.7 - 54 Mc.
TUNING
BAND SWITCH
S2
S3
S4
S5A
S9
S10
T1
T2
T3
T8
DOUBLE CONVERSION
7.4 - 54 Mc
SINGLE CONVERSION
.54 - 7.4 Mc
REC.
SEND
RELAY
J4
J5
P1
F1
FUSE 3A
A.C. POWER
ON
OFF
50-60 ~ AC
AC OUTLET
XTAL PHASING
SELECTIVI
5V

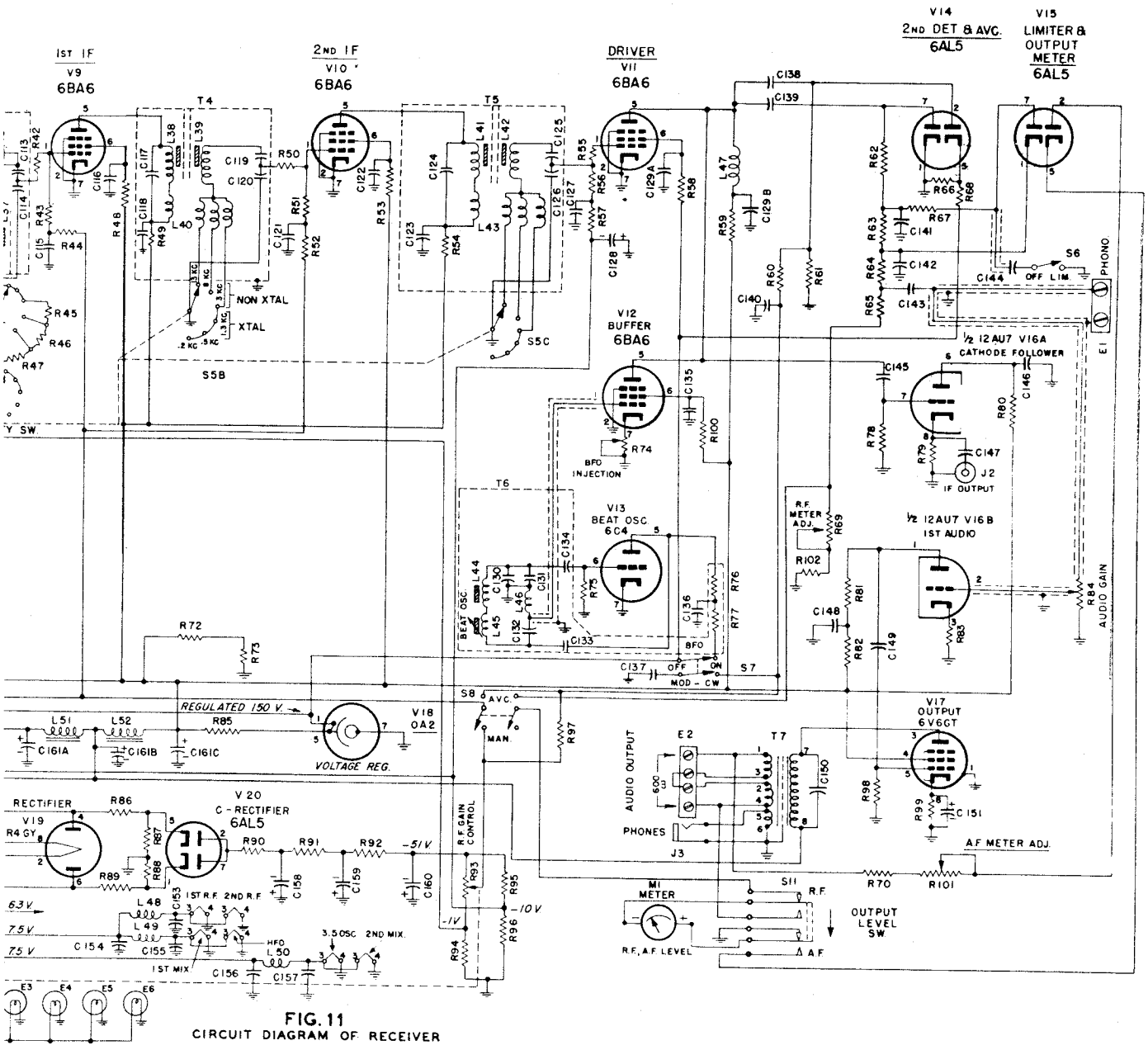
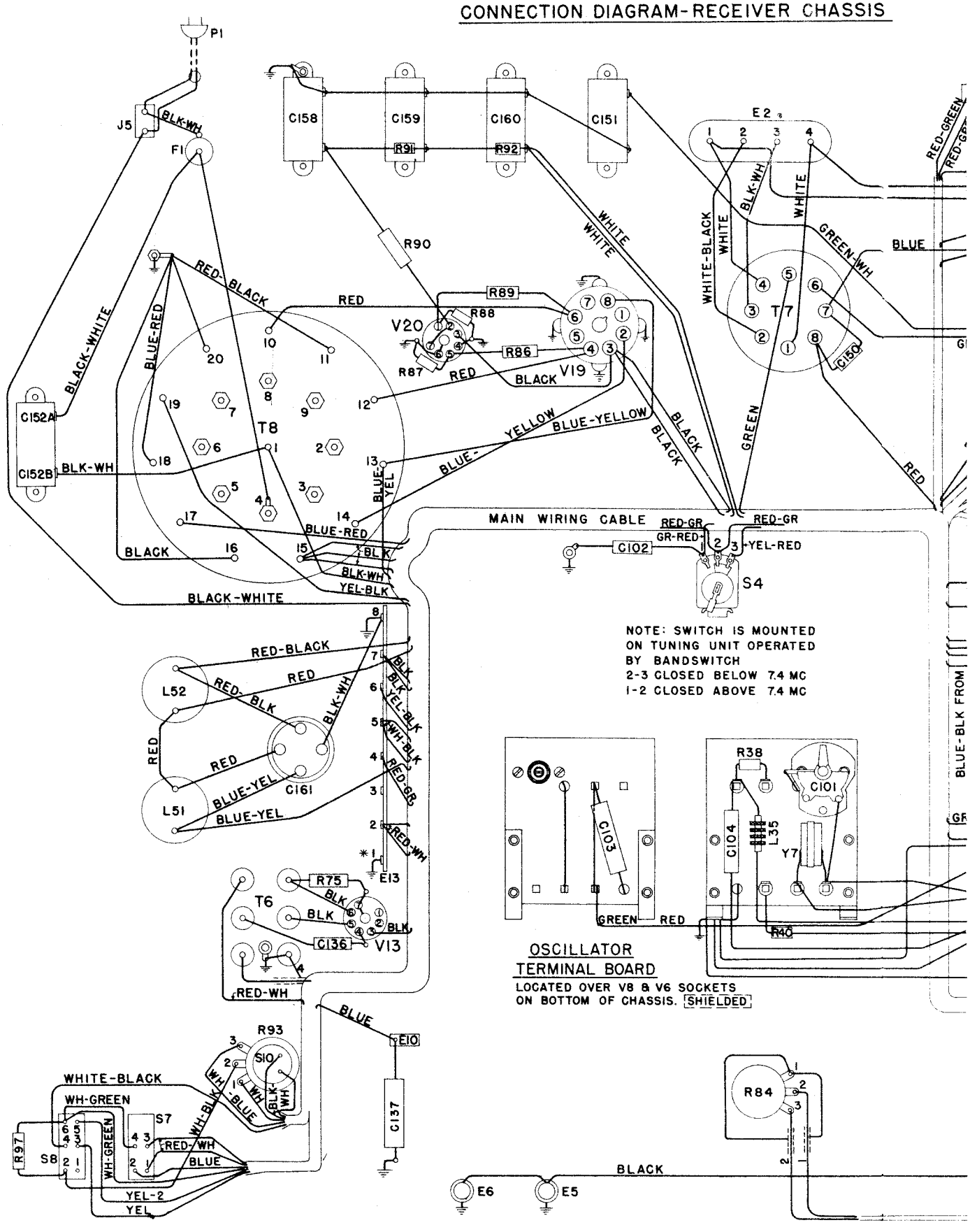


FIG. 11
CIRCUIT DIAGRAM OF RECEIVER

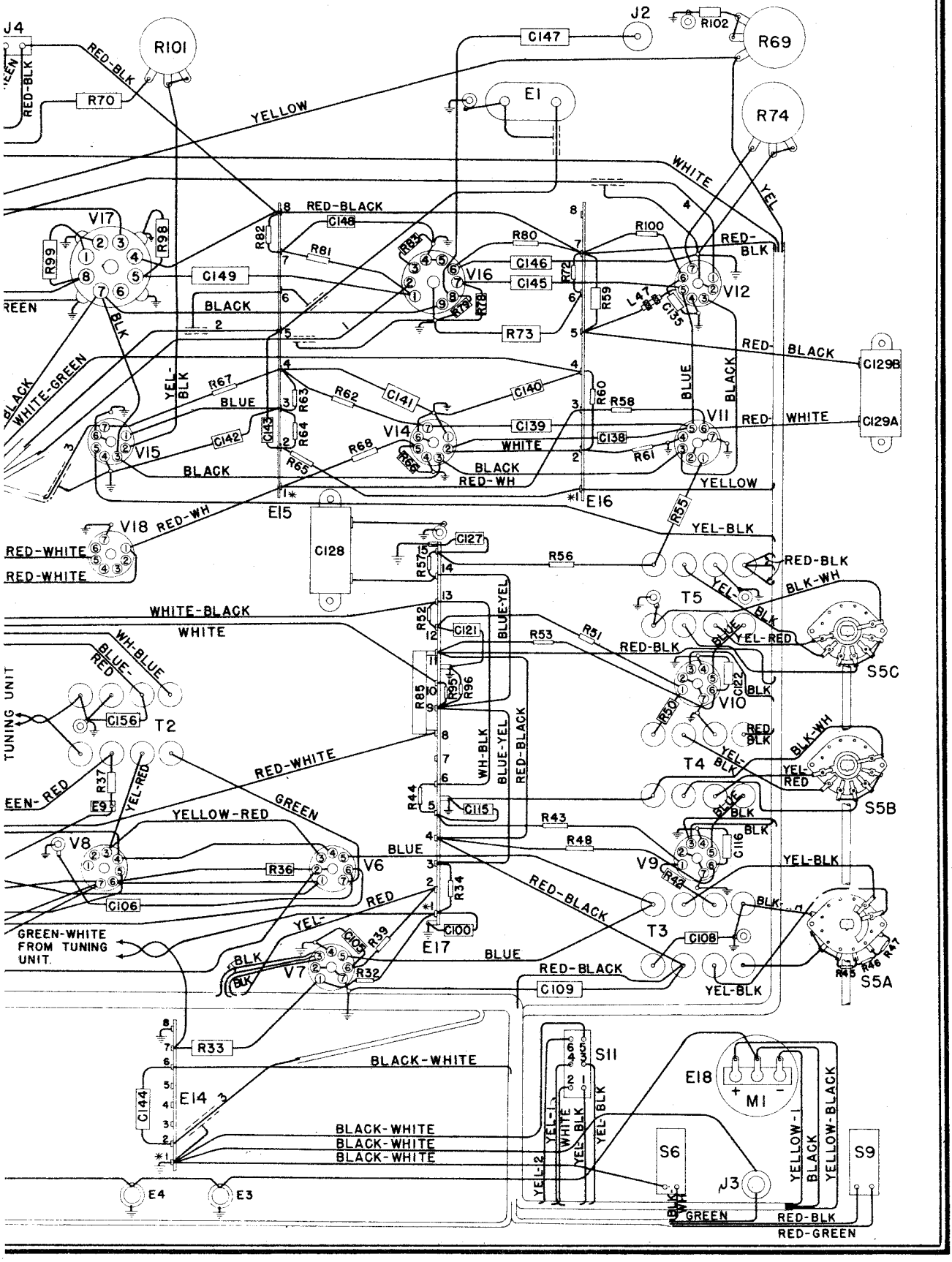
MODEL SP-600-JX

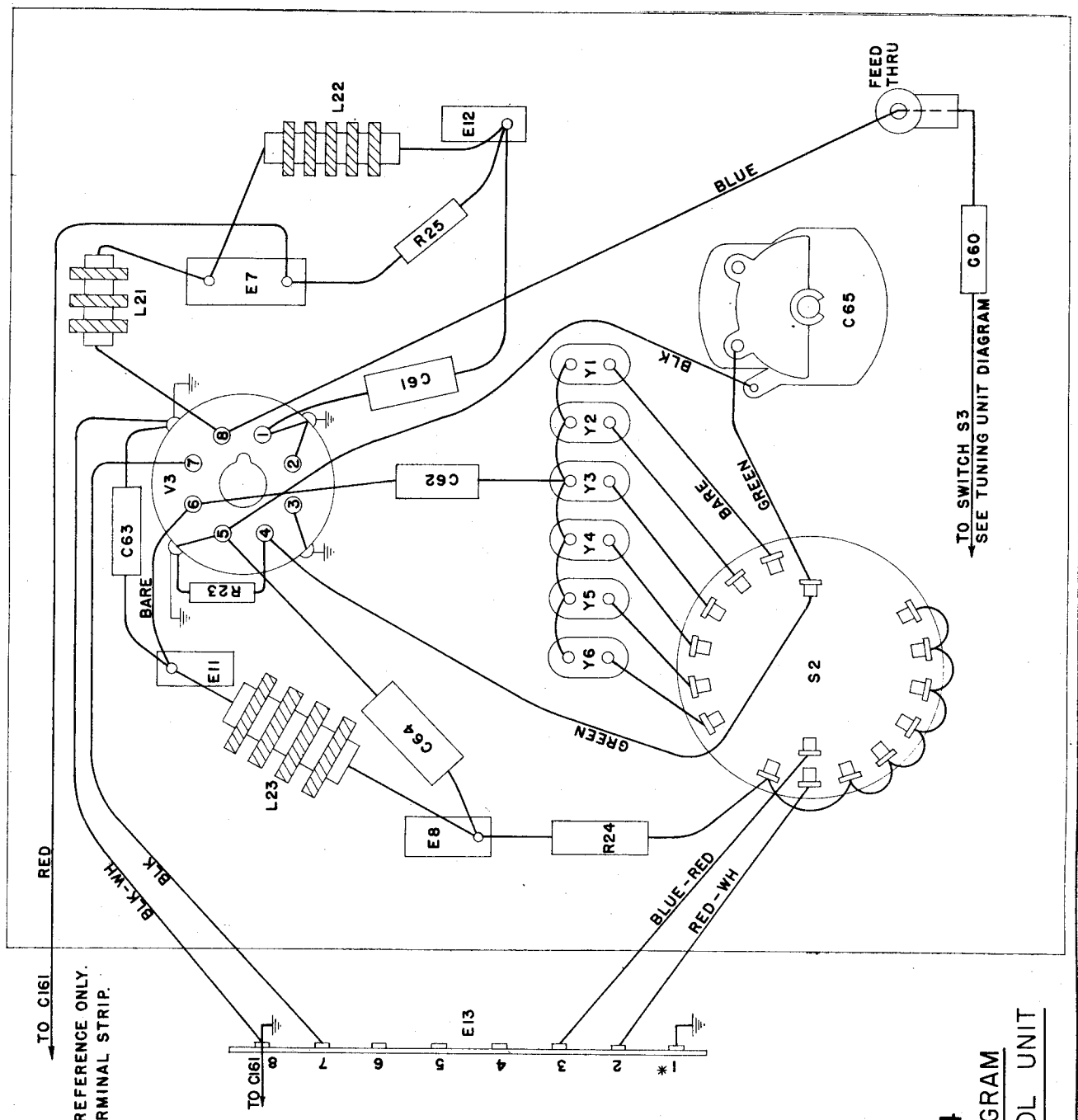
FIGURE NUMBER 12

CONNECTION DIAGRAM-RECEIVER CHASSIS



* THESE NUMBERS ARE FOR REFERENCE ONLY. THEY DO NOT APPEAR ON TERMINAL STRIP.

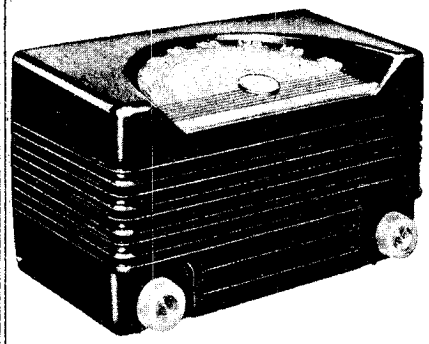




* THESE NUMBERS ARE FOR REFERENCE ONLY. THEY DO NOT APPEAR ON TERMINAL STRIP.

FIGURE 14
CONNECTION DIAGRAM
FREQUENCY CONTROL UNIT

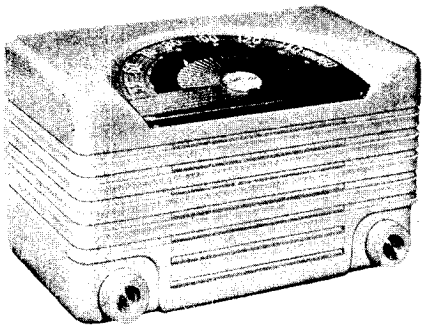
MODELS 204, 205, Ch. 165



Model 205
Brown

MAJOR COMPONENTS

Cabinet	
Model 204	7582
Model 205	7583
Radio Chassis	165
Loop Antenna	5238
Dial, Calibrated	744A
Dial Insert	746A
Bracket, Dial Mechanism	2434
Backboard	3710
Knobs	3703



Model 204
Ivory

SPECIFICATIONS

Line Voltage	115V DC or 115V AC 60 cps
Power Consumption	26 Watts
Tuning Range	540 KC to 1650 KC
Number of Tubes	5
Audio Power Output	1.0 Watt
Speaker Type	5" PM
Cabinet	
Height	6-3/4"
Width	11"
Depth	6"

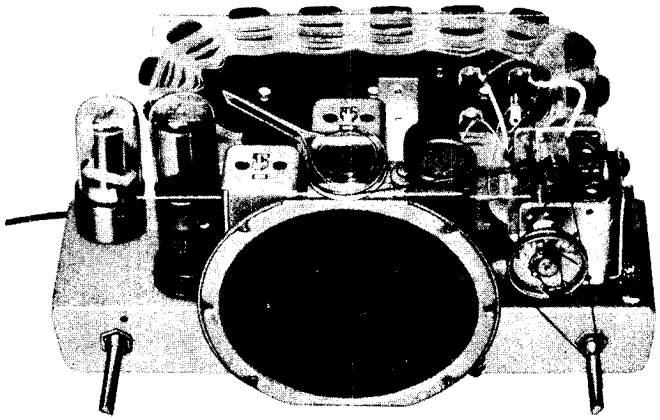


Figure 1. Chassis 165

ELECTRICAL AND MECHANICAL DATA

Power Requirements:	
Operating Voltage	115V DC or 115V AC 60 cps
Consumption	26 watts
Tuning Range	540 KC to 1650 KC
Audio Power Output	1.0 watt
Output Impedance	3.2 ohms
Intermediate Frequency	455 KC

TUBE COMPLEMENT

1	12SA7	Converter	V1
1	12SG7	IF Amplifier	V2
1	12SQ7	2nd Det., AVC, 1st Audio	V3
1	50L6GT	Audio Output	V4
1	35Z5GT	Rectifier	V5

Chassis 165 is a 5-tube AM AC-DC superheterodyne incorporating a built-in loop antenna and a 5" PM speaker. A binding post is available on the loop antenna for connection to an external long wire antenna which will be required in very weak signal areas only. Dial stringing information is given in Figure 2.

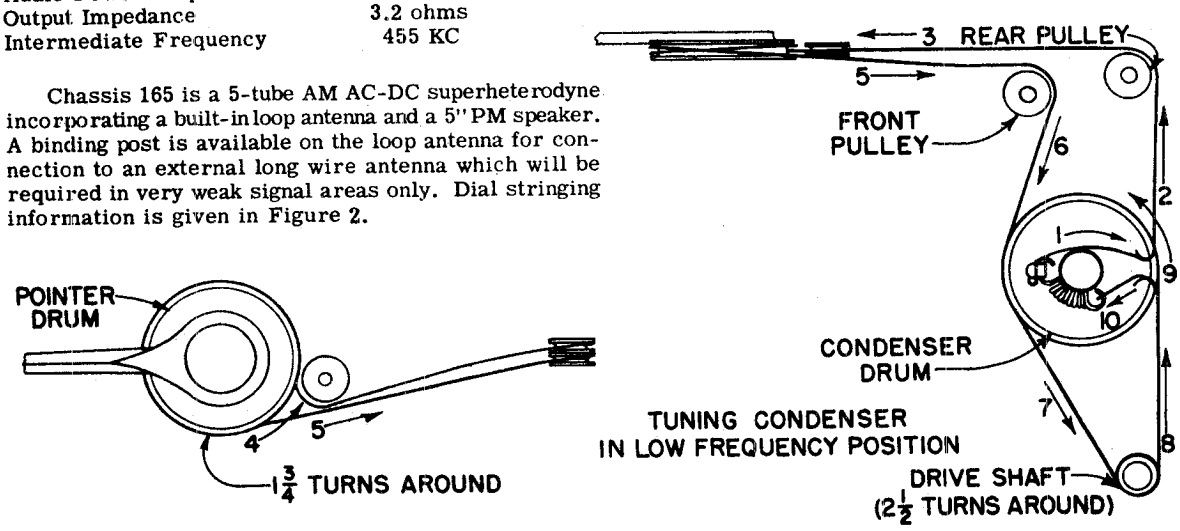


Figure 2. Dial Stringing

MODELS 204, 205, Ch. 165

ALIGNMENT

Equipment:

1. Signal generator capable of generating frequencies of 1650 KC, 1400 KC, and 455 KC.
2. AC meter with 2.5 V scale.
3. 0.1 mfd, 200 V blocking capacitor.

Procedure:

CAUTION: The chassis is the AC-DC type, and care should be exercised to avoid coming in contact with grounded objects when touching the chassis.

If the alignment is performed on a metal topped bench that is grounded, an isolation transformer must be used between the AC supply and the chassis. Allow the receiver to warm up for several minutes. Connect the AC voltmeter across the speaker voice coil. (An output meter may be used.) Set meter to 2.5 volt scale.

TABLE I - ALIGNMENT PROCEDURE

Step No.	Signal Generator Frequency, KC	Adjust	Instructions
		IF	
1	455 modulated	T4 Pri, Sec T3 Pri, Sec	Connect "hot" side of generator to antenna loop binding post, and connect ground side to receiver chassis through 0.1 condenser. Keep signal level low enough to keep maximum reading on lower half of meter scale. Set volume control at maximum and tuning condenser plates all the way unmeshed.
		RF	
2	1650 modulated	C4	Tuning condenser plates unmeshed. Connect generator to wire loop about 6" in diameter. Place loop one foot from and parallel to antenna loop. Generator level should be adjusted to produce reading on lower half of meter scale. Adjust C4 for maximum output.
3	1400 modulated	C3	Generator input remains unchanged. Turn tuning condenser so that dial pointer is over extreme clockwise calibration mark. Adjust C3 for maximum output.

NOTES:
The pin voltage readings are obtained with no signal input to receiver.
D.C. voltages measured with 20,000 ohm/volt meter.
A.C. voltages measured with 1,000 ohm/volt meter.
All voltages measured with reference to B-.
Live voltage 115V A.C.

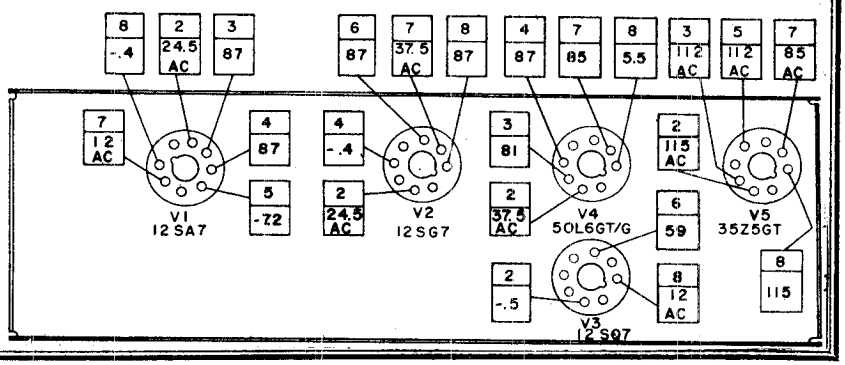


Figure 3. Pin Voltage Diagram

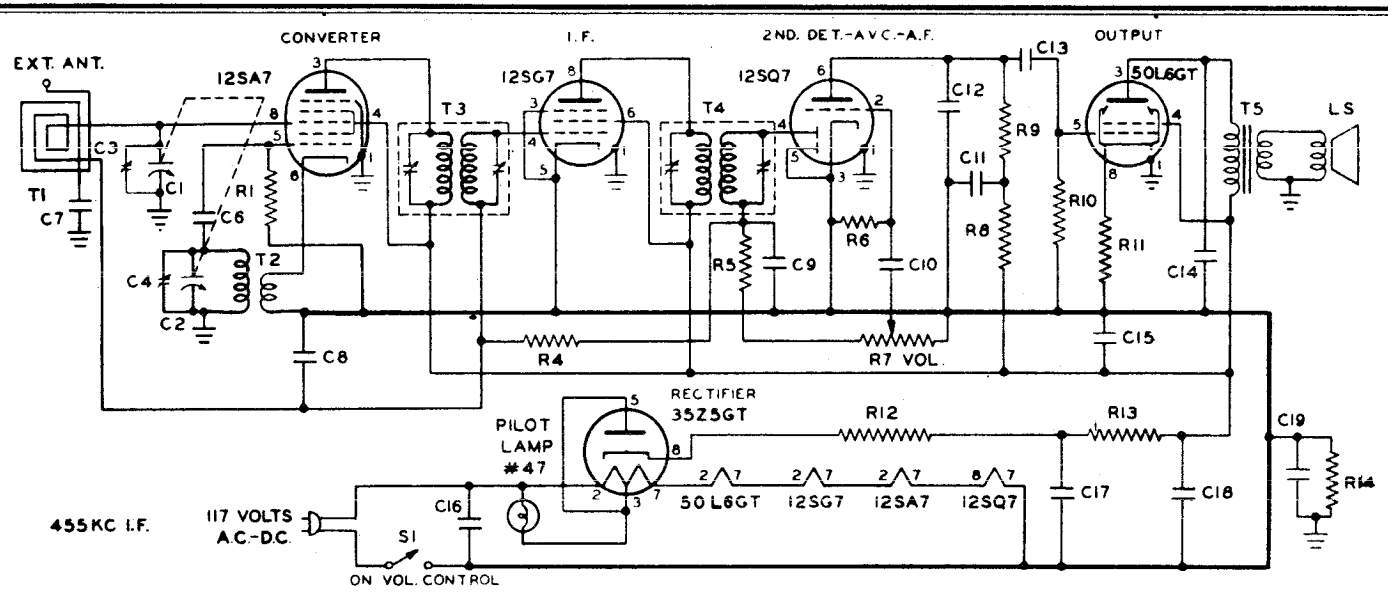


Figure 4 Receiver Schematic

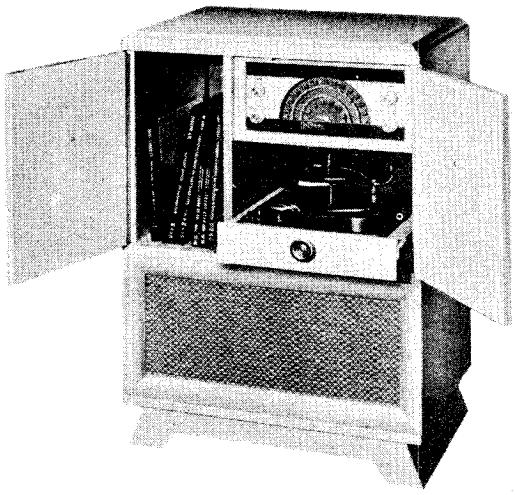
PARTS LIST

All values of capacity are microfarads unless otherwise noted.
All resistors are 1/2 watt composition type with values given in ohms unless otherwise specified.

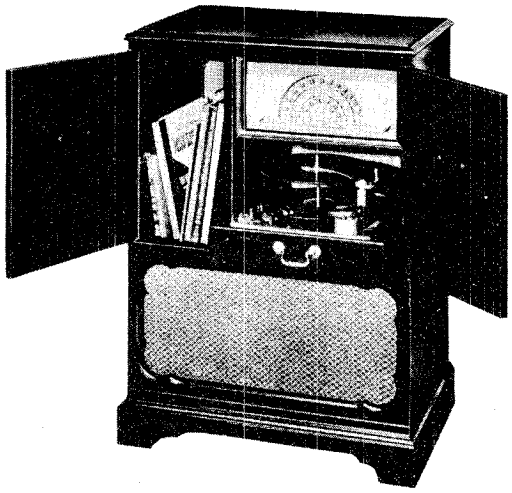
Symbol	Part No.	Value	Tolerance	Watts or Volts	Type
C1 } C2	4401	0 - 388 mmf / 0 - 180 mmf			2 Gang Variable
C3 } C4	Part of 2 Gang Variable				Trimmers
C5	Not used				
C6	4000	100 mmf	20%		Mica
C7	4102	.005		600	Paper
C8	4100	.05		200	Paper
C9	4001	270 mmf	20%		Mica
C10	4102	.005		600	Paper
C11	4100	.05		200	Paper
C12	4001	270 mmf	20%		Mica
C13	4102	.005		600	Paper
C14	4106	.02		400	Paper
C15	4100	.05		200	Paper
C16	4101	.05		400	Paper
C17	4201	50		150	Electrolytic
C18		30		150	
C19	4121	.1	20%	400	Paper
R1	4501	22K	20%		Volume Control
R2	Not used				
R3	Not used				
R4	4502	2.2 meg	20%		
R5	4504	47K	20%		
R6	4505	10 meg	20%		
R7	4836	500K			
R8	4511	100K	20%		
R9	4500	220K	20%		
R10	4506	470K	20%		
R11	4510	150	20%		
R12	4508	47	20%		
R13	4700	500	10%	5 W	
R14	4506	470K	20%		

Symbol	Part No.	Description
S1	Part of R7	
T1	5238	Loop, Antenna
T2	5208	Coil, Oscillator
T3	5205	Transformer, Input IF (455 KC)
T4	5206	Transformer, Output IF (455 KC)
T5	5101	Transformer, Audio Output
LS	9003	Speaker, 5" PM

MODELS 533,
534, Ch. 167



MODEL 533
Modern Style
Oak Cabinet



MODEL 534
Traditional Style
Mahogany Cabinet

SPECIFICATIONS

Line Voltage	115V AC 60 cps
Power Consumption	95 Watts
Tuning Ranges	
AM	535 KC to 1650 KC
FM	88 MC to 108 MC
Number of Tubes	8
Audio Power Output	3.5 Watts
Speaker Type	12" PM

Cabinet*	
Height	36-1/2"
Width	26-1/4"
Depth	17-1/16"
Record Changer	Automatically plays 1" stack of 7", 10", 12" records at 33-1/3 rpm, 45 rpm, or 78 rpm.

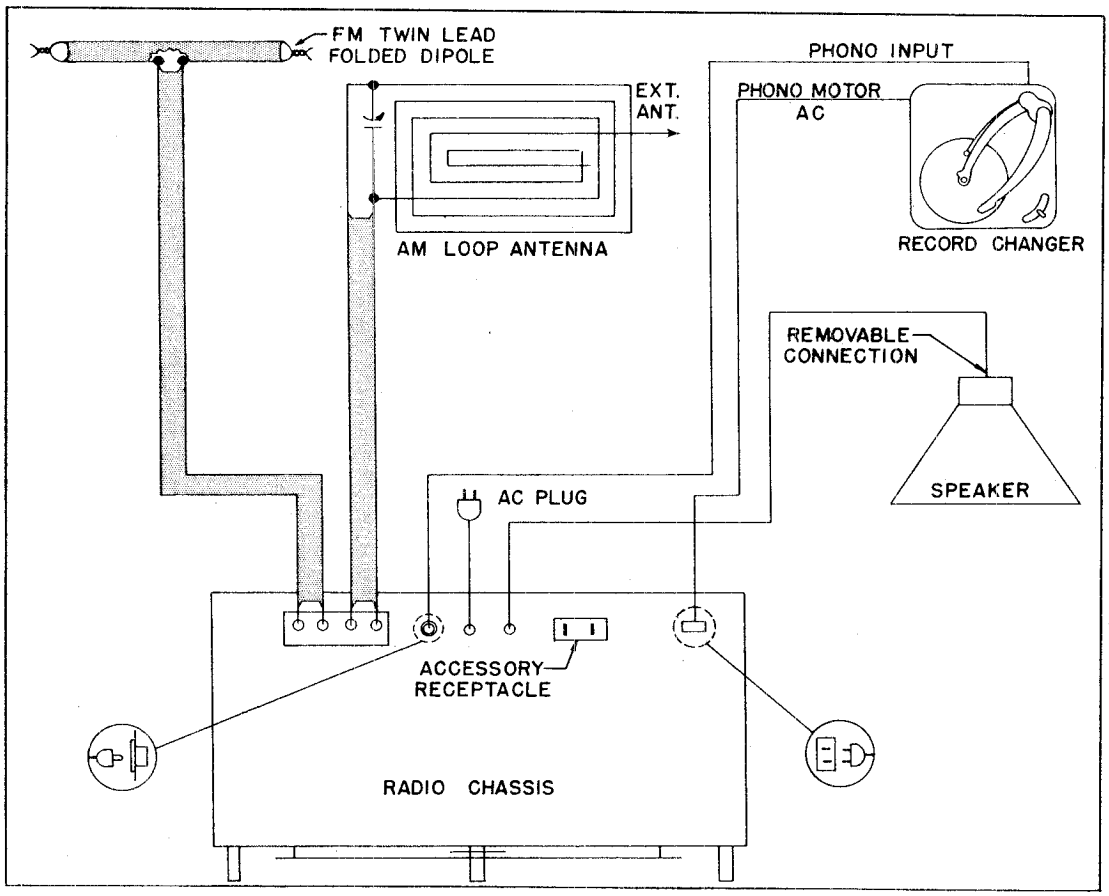
* Where there are slight variations in certain of the dimensions for the two models, the largest value is listed.

MAJOR COMPONENTS

Cabinet	
Model 533	7591
Model 534	7590
Radio Chassis	167
Speaker	9070
Antenna	
AM Assembly	55214
FM Assembly	55218
Record Changer	9078

Dial Glass	747
Backboard	3714
Record Changer Drawer	6656
Knobs	
Tuning	33517A
Off-On-Tone	33517A
Volume	33517A
Band Switch	33517C

MODELS 533, 534, Ch. 167



BLOCK DIAGRAM

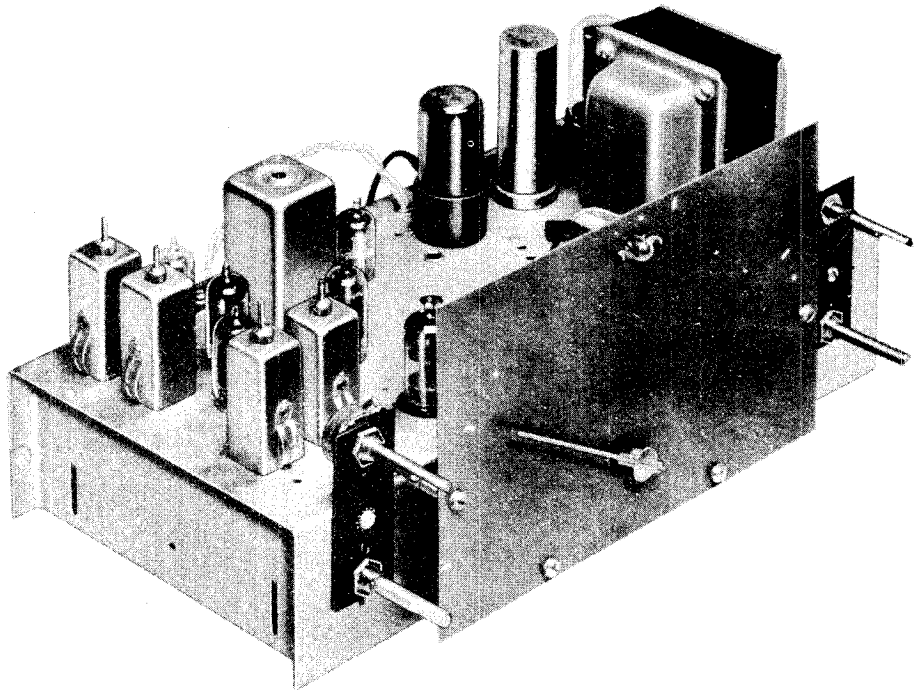


Figure 1. Chassis 167

MODELS 533,
534, Ch. 167

ELECTRICAL AND MECHANICAL DATA

Power Requirements:	
Operating Voltage	115 V AC 60 cps
Watts:	95
Tuning Range:	
AM	535 KC to 1650 KC
FM	88 MC to 108 MC
Audio Power Output	3.5 Watts
Output Impedance	3.2 ohms at 400 cps
Intermediate Frequencies:	
AM	455 KC
FM	10.7 MC
FM Antenna Input Impedance	300 ohms, balanced

Chassis 167 is an 8 tube combination AM-FM radio receiver. It employs an indoor loop antenna for AM reception and is designed to be used with an indoor FM antenna in normal signal areas and an outside FM antenna and a 300 ohm, balanced transmission line in weak signal areas. The indoor antenna is located in the receiver cabinet, and it should be disconnected from the FM antenna terminal posts when an outside antenna is used. The chassis is mounted in place horizontally on rubber shock mounts which rest on wooden blocks that are bolted in the chassis from below. Dial stringing details are indicated in figure 2. Dial calibration appears on the dial glass mounted on the front of the cabinet.

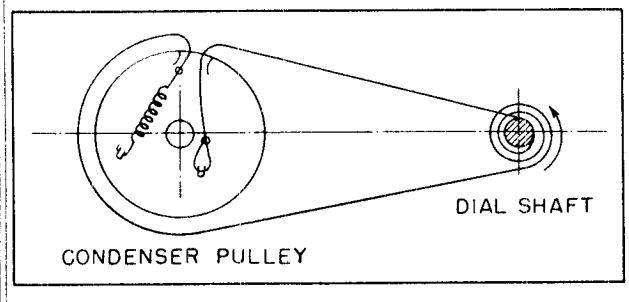


Figure 2. Dial Stringing

TUBE COMPLEMENT

1	12AT7	FM Oscillator-Converter	V1
1	6BE6	AM Oscillator-Converter	V7
1	6BA6	AM-FM 1st IF Amplifier	V2
1	6BA6	FM 2nd IF Amplifier	V3
1	6AL5	FM Detector	V4
1	6AT6	AM Detector-AVC - 1st Audio (AM-FM)	V5
1	6V6GT	Power Output	V6
1	5Y3GT	Rectifier	V8

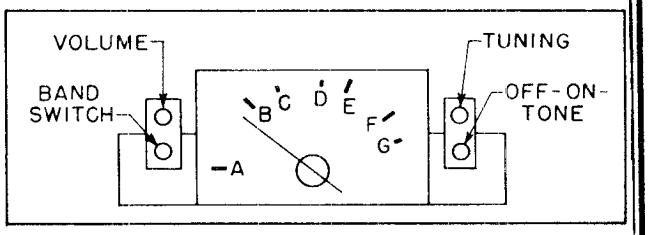


Figure 3. Location of Controls

Note: The alignment calibration marks which appear on the dial background plate are shown lettered for identification purposes. Pointer should be at "A" when condenser is in full mesh.

CONTROLS

Operation of the volume and tuning controls is straightforward. The BAND SWITCH has three positions for selecting one of the following: PHONO, AM radio, or FM radio. The PHONO position is obtained with the switch in the extreme counterclockwise position, and the other two positions are selected in the order listed by clockwise rotation of the band switch control shaft. The fourth control is the OFF-ON-TONE control. Extreme counterclockwise rotation of the control shaft turns the receiver off. Clockwise control turns the receiver on and continuously changes the tone from bass to treble.

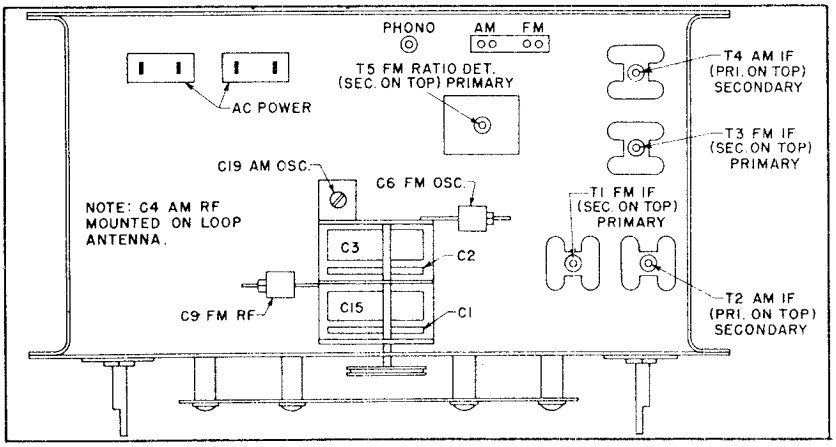


Figure 4. Trimmer Location- Bottom View

MODELS 533, 534, Ch. 167

ALIGNMENT

This section describes the minimum equipment and procedure that is required to align the receiver satisfactorily. Before beginning alignment, the tuning condenser must be fully open, and the set should be allowed to warm up about 15 minutes. It is suggested that the alignment be performed on a metal-topped bench with generator, receiver, and voltmeter well bonded together. The bench area should be free of strong extraneous radiation.

Equipment:

CW Signal Generator capable of providing the frequencies listed in the table below. Must include audio modulating signal for AM alignment.

A voltmeter with at least a sensitivity of 20,000 ohms per volt (V.T.V.M. preferable). Should have AC scale.

Two 100K ohm composition resistors.

Two 150 ohm composition resistors.

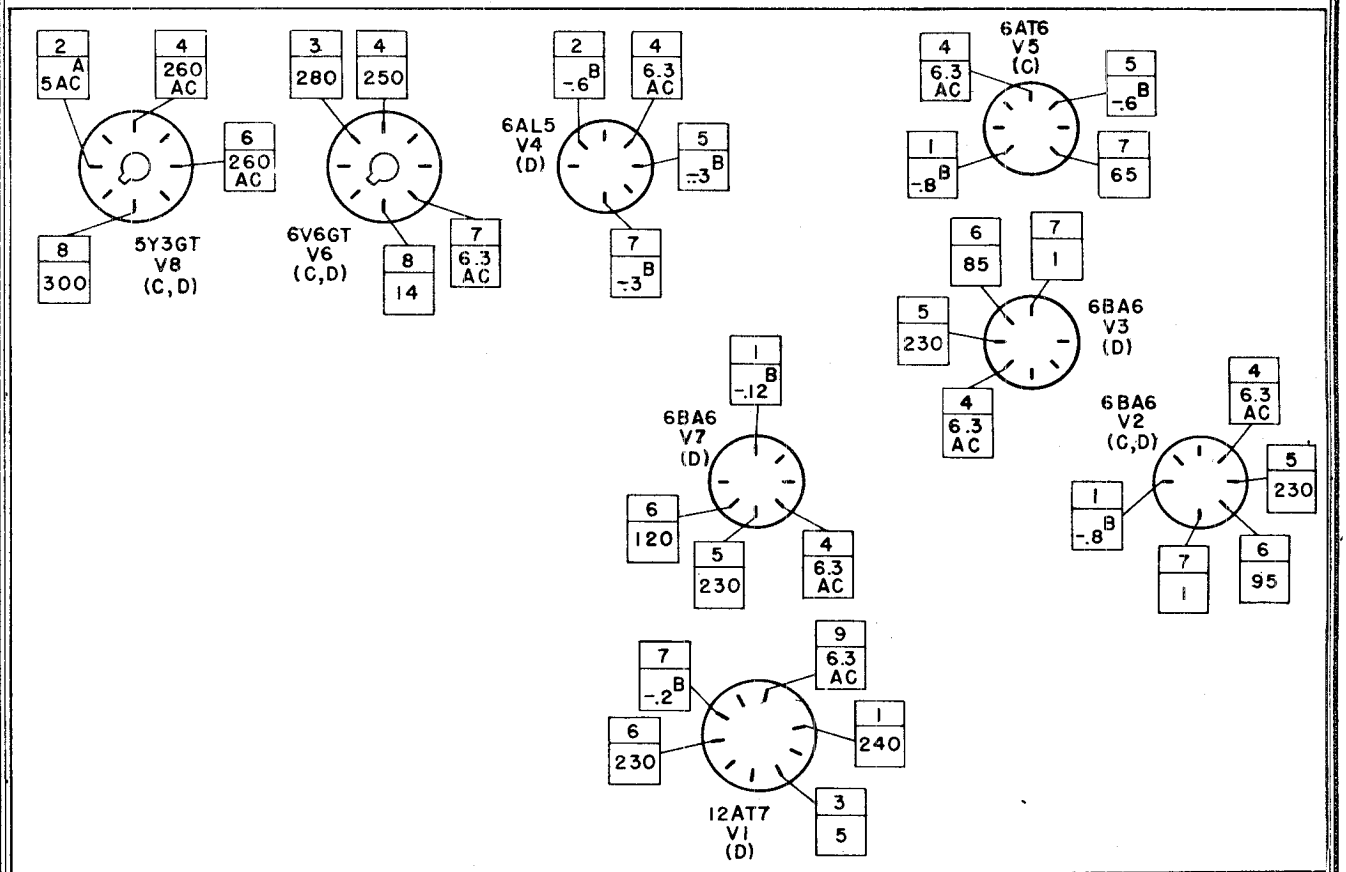


Figure 5. Bottom View, Tube Layout

All voltages measured to chassis unless otherwise noted.
DC voltages measured with 20,000 ohm/volt meter.
All voltages DC unless otherwise noted.
All measurements made with no signal input to receiver and receiver operated at rated line voltage.

A - Measured to pin 8
B - Measured with VTVM having insolating resistor in probe
C - Band switch in AM position
D - Band switch in FM position

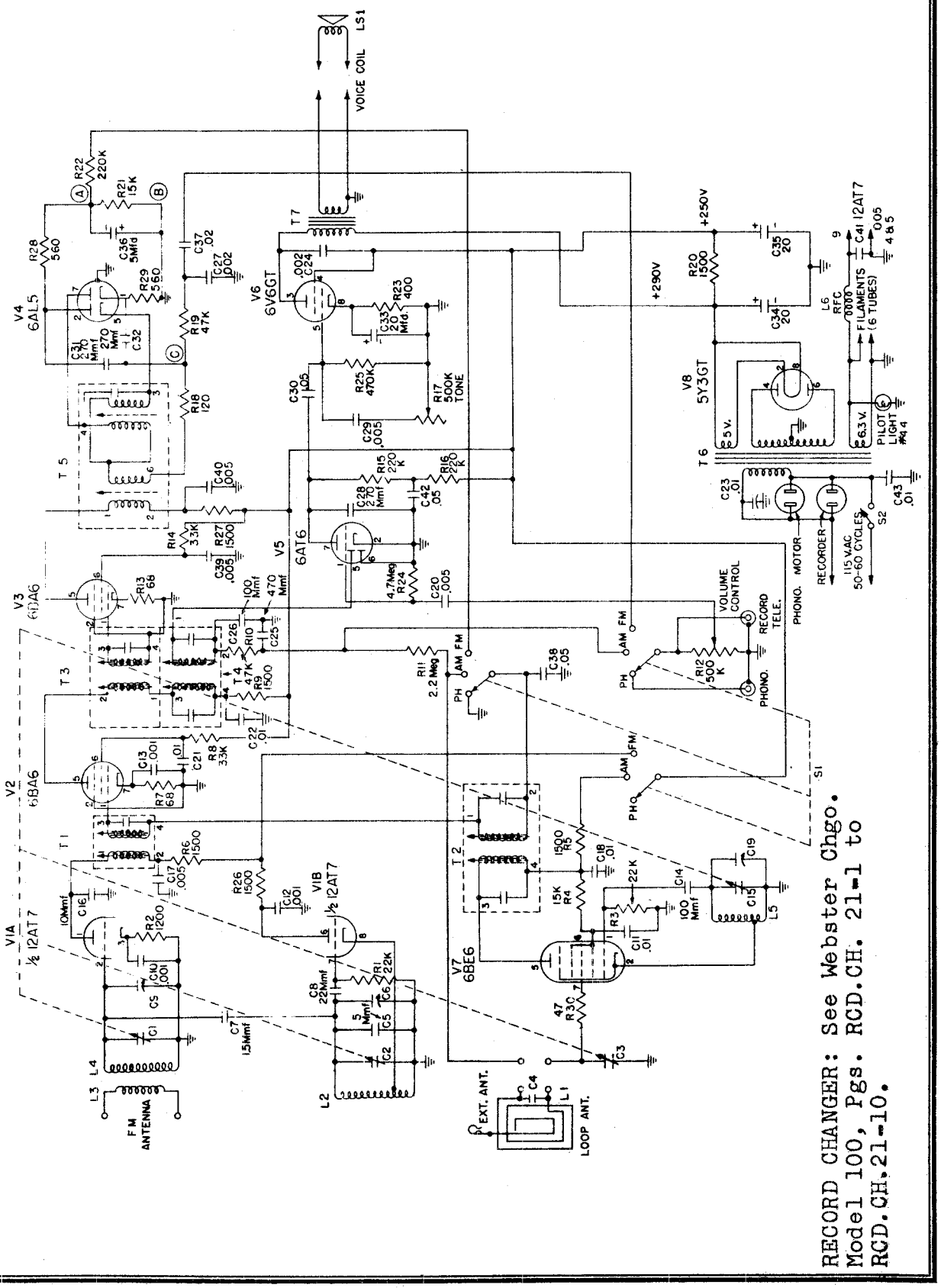
MODELS 533, 534, Ch. 167

Procedure:

The AM section should be completely aligned before beginning the FM alignment. For AM alignment the generator is coupled to the receiver by placing the "hot" lead next to the antenna loop so that lead and loop wire form a condenser. The voltmeter is connected across the voice coil and switched to a low AC scale. The coupling for FM alignment is two 150 ohm composition resistors, one in series with each generator lead. Before tuning the ratio detector transformer, solder two 100K ohm composition resistors in series from point "A", shown in figure 6, to ground. Remove them before aligning the FM RF section.

Step No.	Band Switch Position	Signal Generator Frequency	Connect Signal To	Condenser Setting (See Fig. 3)	Voltmeter	Adjust	Instructions
1	AM	455 KC Mod.	6BE6 V7 Pin 7	Full Open	Across Voice Coil	T2 Pri., Sec. T4 Pri., Sec.	Adjust for max. output. Use as low a signal input as possible.
2	"	1650 KC Mod.	Antenna Loop as described above.	"	"	C19 AM Osc. Trimmer	"
3	"	1410 KC	"	F	"	C4 AM RF Trimmer	"
4	"	600 KC	"	B	"	Plates of C3	Bend plates as required. Adjust for max. reading.
5	FM	10.7 MC CW	FM Ant. Terminals	Full Open	Between point A and ground.	T1 Pri., Sec. T3 Pri., Sec. T5 Pri. only	Adjust for max. voltmeter reading.
6	"	"	"	"	Between junction of two 100K resistors added and point C.	T5 Sec.	Adjust for zero reading,using a low signal input to avoid overloading.
7	"	107 MC CW	"	G	Point A to ground.	C6 FM Osc. Trimmer	Remove the two 100K resistors. Adjust for max. reading. Make certain receiver oscillator freq. is 10.7 MC above incoming signal freq.
8	"	"	"	"	"	C9 FM RF Trimmer	"
9	"	98 MC CW	"	D	"	Plates of C1	Bend plates as required. Adjust for max. reading.
10	"	90 MC CW	"	C	"	"	"

MODELS 533, 534, Ch. 167



PARTS LIST

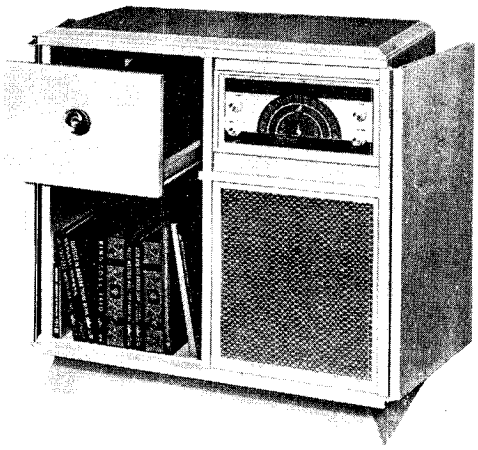
NOTES:
All values of capacity are microfarads unless otherwise noted.
All resistors are 1/2 watt composition type with values given in ohms unless otherwise specified.

Symbol	Part No.	Value	Tol.	Watts or Volts	Type
C1					
C2	4410	4 Section Variable			
C3					
C4	4313	Trimmer (AM Section)			
C5	4028	5 mmf	10%		Ceramic N750
C6	4318	Trimmer (FM Section)			
C7	4024	1.5 mmf	10%		Mica
C8	4021	22 mmf	10%		Ceramic N150
C9	4318	Trimmer (FM Section)			
C10	4025	1000 mmf	20%		Ceramic Hi-K
C11	4112	.01	20%	400 V	Paper
C12	4025	1000 mmf	20%		Ceramic Hi-K
C13	4025	1000 mmf	20%		Ceramic Hi-K
C14	4000	100 mmf	20%		Mica
C15	4410	Part of 4 Section Variable			
C16	4027	10 mmf	10%		Ceramic
C17	4029	5000 mmf			Ceramic Hi-K
C18	4112	.01	20%	400 V	Paper
C19	4313	Trimmer (AM Section)			
C20	4029	5000 mmf			Ceramic Hi-K
C21	4112	.01	20%	400 V	Paper
C22	4112	.01	20%	400 V	Paper
C23	4105	.01		600 V	Molded Phenolic
C24	4118	.002	20%	600 V	Paper
C25	4003	470 mmf	20%		Mica
C26	4000	100 mmf	20%		Mica
C27	4118	.002	20%	600 V	Paper
C28	4001	270 mmf	20%		Mica
C29	4102	.005	20%	600 V	Paper
C30	4101	.05	20%	400 V	Paper
C31	4001	270 mmf	20%		Mica
C32	4001	270 mmf	20%		Mica
C33		20		25 V	Electrolytic
C34	4200	20		450 V	Electrolytic
C35		20		450 V	Electrolytic
C36	4209	5		50 V	Electrolytic
C37	4106	.02	20%	400 V	Paper
C38	4100	.05	20%	200 V	Paper
C39	4029	5000 mmf			Ceramic Hi-K
C40	4029	5000 mmf			Ceramic Hi-K
C41	4029	5000 mmf			Ceramic Hi-K
C42	4101	.05	20%	400 V	Paper
C43	4105	.01		600 V	Molded Phenolic
R1	4501	22K	20%		
R2	4553	1.2K	10%		
R3	4501	22K	20%		
R4	4539	15K	20%	1 W	
R5	4534	1.5K	20%		
R6	4534	1.5K	20%		
R7	4524	68	20%		
R8	4556	33K	20%	1 W	
R9	4534	1.5K	20%		
R10	4504	47K	20%		
R11	4502	2.2 meg	20%		
R12	4842	.5 meg Pot.	(Volume Control)		
R13	4524	68	20%		
R14	4556	33K	20%	1 W	
R15	4500	220K	20%		
R16	4500	220K	20%		
R17	4841	.5 meg Pot. w/Switch (Tone Control)			
R18	4546	120	10%		
R19	4504	47K	20%		
R20	4701	1.5K	5%	6-1/2 W	Wire Wound
R21	4521	15K	20%		
R22	4500	220K	20%		
R23	4587	400	10%	1 W	
R24	4544	4.7 meg	20%		
R25	4506	470K	20%		
R26	4534	1.5K	20%		
R27	4534	1.5K	20%		
R28	4507	560	10%		
R29	4507	560	10%		
R30	4508	47	20%		

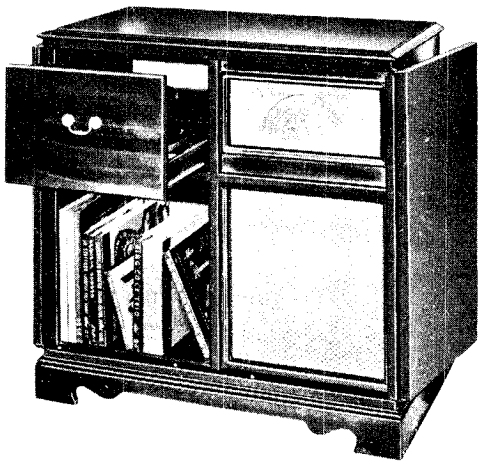
Symbol	Description	Part No.
L1	Loop Antenna (AM) Assembly with mounting bracket	55214
L2	Oscillator Coil (FM)	5247
L3	Antenna Primary (FM)	5258
L4	Antenna Secondary (FM)	5248
L5	Oscillator Coil (AM)	5282
L6	Filament Choke	5266
T1	1st FM IF Transformer	5284
T2	1st AM IF Transformer	5286
T3	2nd FM IF Transformer	5285
T4	2nd AM IF Transformer	5287
T5	Ratio Detector Transformer	5288
T6	Power Transformer	5012
T7	Output Transformer	5122
S1	Band Switch	6024
S2	Off-On Switch	(Part of R17)

Dial Glass	747	Socket, Miniature	6123
Dial Background Plate	2217C	Socket, Octal	6103
Knob, Indicator	3654C	Socket, Phono	6121
Knob, Plain	3654A	Socket, Pilot Lamp	6110
Plug, Phono	6203	Socket, AC Power	6108
Pointer, Dial	518	Spring, Dial Cable	9507
Socket, 9 pin	6134	Strip, Antenna Terminal	424

MODELS 537, 538, Ch. 168



MODEL 537
Modern Style
Oak Cabinet



MODEL 538
Traditional Style
Mahogany Cabinet

SPECIFICATIONS

Line Voltage	115V AC 60 cps	Record Changer	Automatically plays 1" stack of 7", 10", or 12" records at 33-1/3 rpm, 45 rpm, or 78 rpm.
Power Consumption	150 Watts		
Tuning Ranges			
AM	535 KC to 1650 KC		
FM	88 MC to 108 MC	Cabinet*	
Number of Tubes	14	Height	35"
Audio Power Output	15 Watts	Width	33-1/4"
Speaker Type	12" PM	Depth	17-1/2"

* Where there are slight variations in certain of the dimensions for the two models, the largest value is listed.

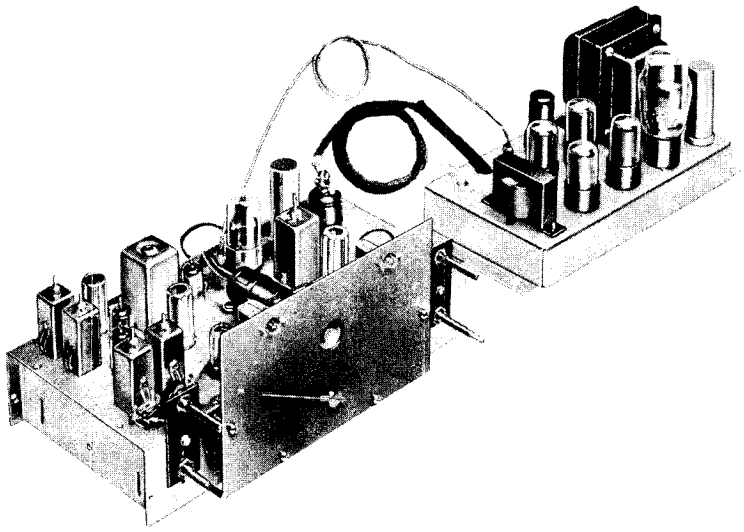


Figure 1. Chassis 168

MAJOR COMPONENTS

Cabinet	
Model 537	7593
Model 538	7592
Radio Chassis	168
Speaker	9070
Antenna	
AM	55213
FM Assembly	55218
Record Changer	9078
Dial Glass	748
Backboard	3715
Record Changer Drawer	6659
Knobs	
Tuning	33517A
Off-On Treble Assembly	33516A
Volume	33517A
Band Switch	33517C
Bass	3656A

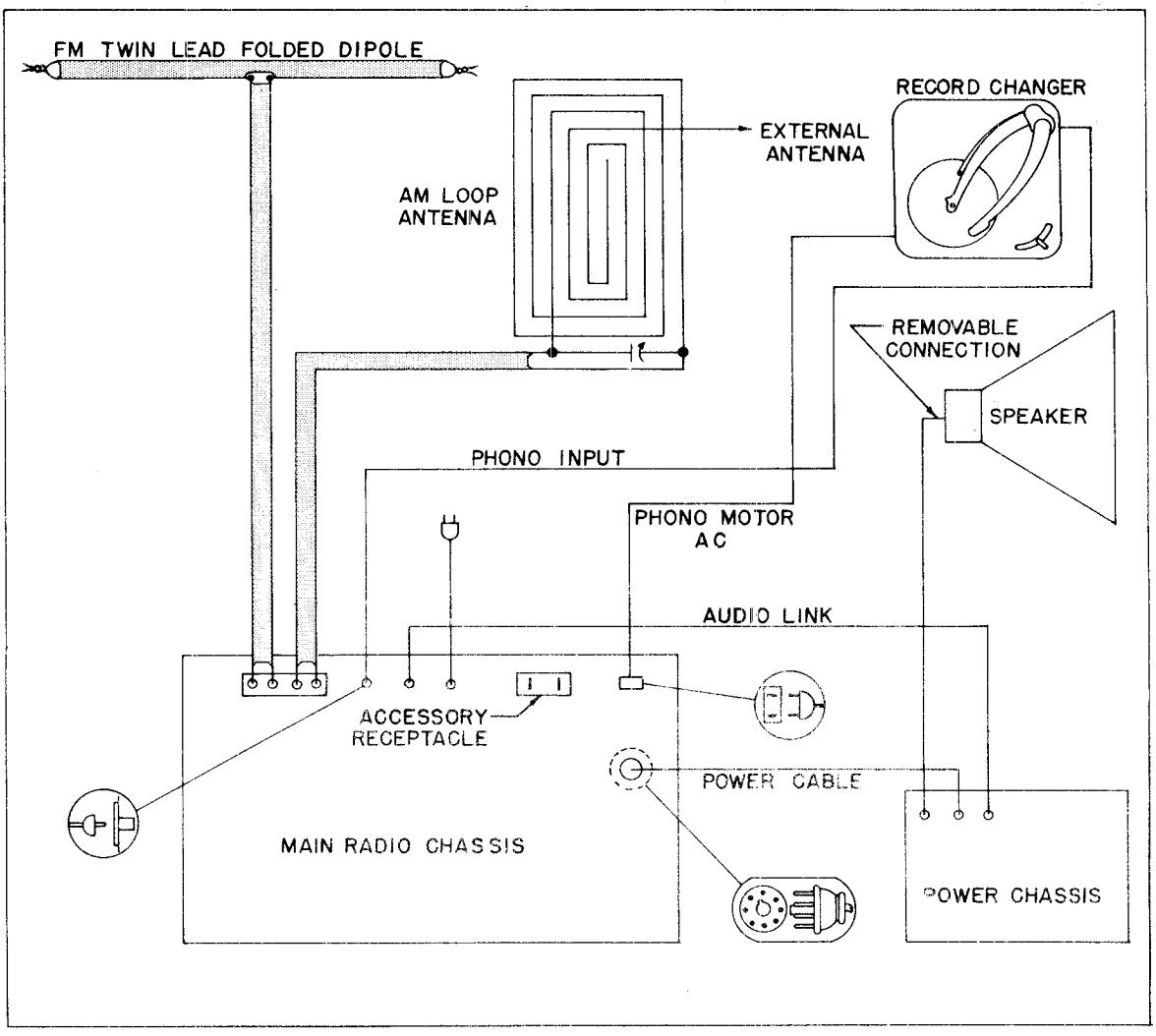
MODELS 537, 538, Ch. 168

ELECTRICAL AND MECHANICAL DATA

Power Requirements:	
Operating Voltage	115 V AC 60 cps
Watts	150
Tuning Range:	
AM	535 KC to 1650 KC
FM	88 MC to 108 MC
Audio Power Output	15 Watts
Output Impedance	3.2 ohms at 400 cps
Intermediate Frequencies:	
AM	455 KC
FM	10.7 MC
FM Antenna Input Impedance	300 ohms, balanced

TUBE COMPLEMENT

1	6BA6	AM RF Amplifier	V1
1	6BE6	AM Oscillator-Converter	V2
1	12AT7	FM Oscillator-Converter	V3A, V3B
1	6BA6	AM-FM 1st IF Amplifier	V4
1	6BA6	FM 2nd IF Amplifier	V5
1	6AL5	FM Ratio Detector	V6
1	6AT6	AM 2nd Detector, AVC, 1st Audio (AM and FM)	V7
1	6J5	2nd Audio Amplifier	V8
1	6J5	Audio Phase Inverter	V9
4	6K6GT	Audio Power Amplifiers	V10, V11, V12, V13
1	5U4G	Rectifier	V14
1	6E5	Tuning Indicator	V15



BLOCK DIAGRAM

Chassis 168 is a fifteen-tube combination AM-FM radio receiver, including tuning indicator and rectifier. The receiver uses an indoor loop antenna for normal AM reception; an external antenna may be used in very weak AM areas. It is designed to be used with an indoor FM antenna in normal signal areas and an outside FM antenna and a 300 ohm, balanced transmission line in weak signal areas. The indoor FM antenna is located in the receiver cabinet,and it should be disconnected from the FM antenna terminal posts when an outside antenna is used.

The physical make-up of chassis 168 consists of two units, as shown in figure 1. The unit on the right contains the power supply and power amplifier stages. The main unit, shown on the left side of the figure, contains the AM RF stage, AM and FM oscillator-converter stages, AM and FM IF stages, voltage amplifier stages, and tuning indicator. The main unit contains the dial mechanism. Dial stringing details are indicated in figure 3. Dial calibration appears on the dial glass mounted on the front of the cabinet. Calibration points needed during alignment are included on the dial background plate. These calibration points are indicated in figure 4.

The main unit is mounted in place horizontally on rubber shock mounts which rest on wooden blocks that are bolted in the cabinet from below the unit. The power unit is mounted horizontally below the main unit. It is shock mounted and held in place by a bolt at each corner.

CONTROLS

Operation of the VOLUME and TUNING controls is conventional. The BAND SWITCH has three positions for selecting one of the following: PHONO, AM radio, or FM radio. The PHONO position is selected with the switch in the extreme counterclockwise position, and the other two positions are selected in the order listed by clockwise rotation of the band switch control shaft.

The BASS and TREBLE controls are the dual type with the OFF-ON switch coupled to the TREBLE control. When the TREBLE control is in its extreme counterclockwise position, the receiver is turned off. Clockwise rotation of the TREBLE control shaft turns the receiver on and increases the treble tone. Extreme counterclockwise rotation of the BASS control shaft gives minimum bass, clockwise rotation giving increase in bass tone. Location of the controls is shown in figure 4.

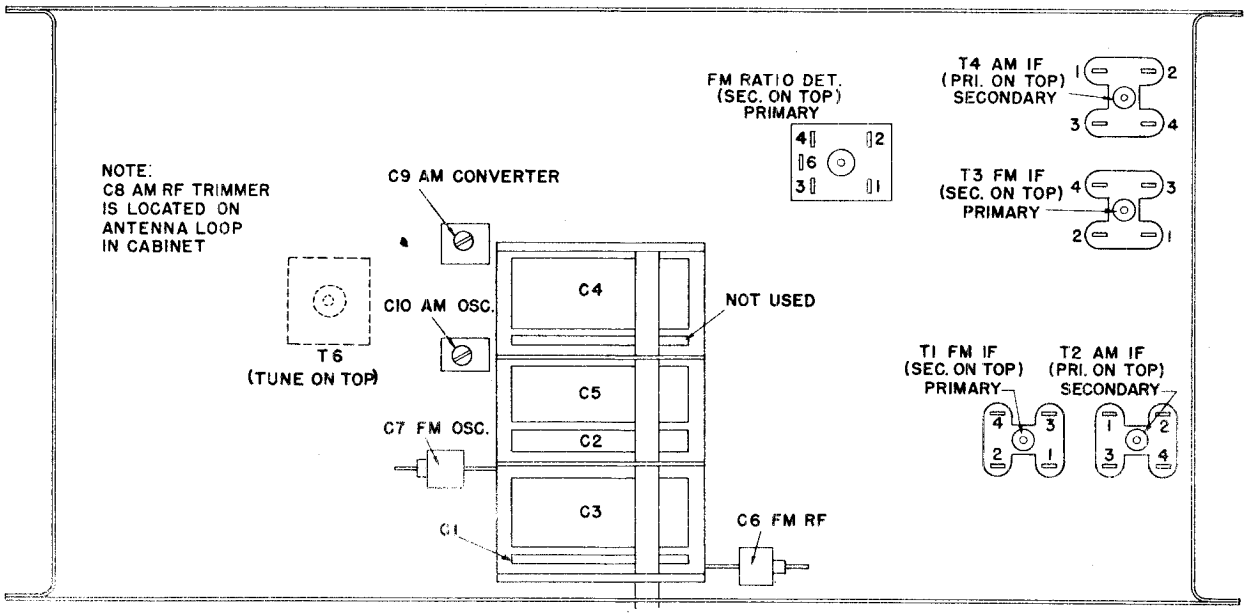


Figure 2. Trimmer Condenser Location - Bottom View

ALIGNMENT

This section describes the minimum equipment and procedure that is required to align the receiver satisfactorily. Before beginning alignment, the tuning condenser must be fully open, and the set should be allowed to warm up about 15 minutes. It is suggested that the alignment be performed on a metal-topped bench with generator, receiver, and voltmeter well bonded together. The bench area should be free of strong extraneous radiation.

Equipment:

CW Signal Generator capable of providing the frequencies listed in the table below. Must include audio modulating signal for AM alignment.

A voltmeter with at least a sensitivity of 20,000 ohms per volt (V.T.V.M. preferable). Should have AC scale.

MODELS 537, 538, Ch. 168

Two 100K ohm composition resistors.

Two 150 ohm composition resistors.

Procedure:

The AM section should be completely aligned before beginning the FM alignment. For AM alignment the generator is coupled to the receiver by placing the "hot" lead next to the antenna loop so that lead and loop wire form a condenser. The voltmeter is connected across the voice coil and switched to a low AC scale. The coupling for FM alignment is two 150 ohm composition resistors, one in series with each generator lead. Before tuning the ratio detector transformer, solder two 100K ohm composition resistors in series from point "A", shown in figure 7, to ground. Remove them before aligning the FM RF section.

ALIGNMENT TABLE

Step No.	Band Switch Position	Signal Generator Frequency	Connect Signal To	Condenser Setting (See Fig. 4)	Voltmeter	Adjust	Instructions
1	AM	455 KC 400 cps Mod.	6BE6 V2 Pin 7	Full Open	Across Voice Coil	T2 Pri., Sec. T4 Pri., Sec.	Adjust for max. output. Use as low a signal input as possible.
2	"	1650 KC 400 cps Mod.	Antenna Loop as described above.	"	"	C10 AM Osc. Trimmer	"
3	"	1410 KC 400 cps Mod.	"	F	"	C8, C9 AM RF Trimmer	"
4	"	600 KC 400 cps Mod.	"	B	"	T6	Adjust for max. output.
5	"	"	"	"	"	Plates of C3	Bend plates as required. Adjust for max. reading.
6	FM	10.7 MC CW	FM Ant. Terminals	Full Open	Between point A and ground.	T1 Pri., Sec. T3 Pri., Sec. T5 Pri. only	Adjust for max. voltmeter reading.
7	"	"	"	"	Between junction of two 100K resistors added and point C.	T5 Sec.	Adjust for zero reading, using a low signal input to avoid overloading.
8	"	107 MC CW	"	G	Point A to ground.	C7 FM Osc. Trimmer	Remove 100K resistors. Adjust for max. reading. Make certain receiver osc. freq. is 10.7 MC above incoming signal freq.
9	"	"	"	"	"	C6 FM RF Trimmer	"
10	"	98 MC CW	"	D	"	Plates of C1	Bend plates as required. Adjust for max. reading.
11	"	90 MC CW	"	C	"	"	"

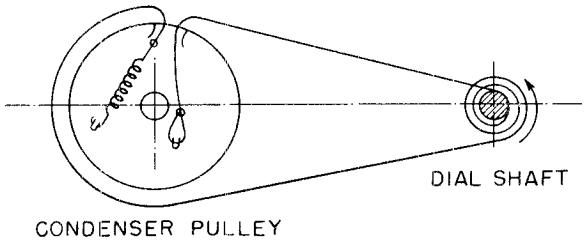


Figure 3. Dial Stringing

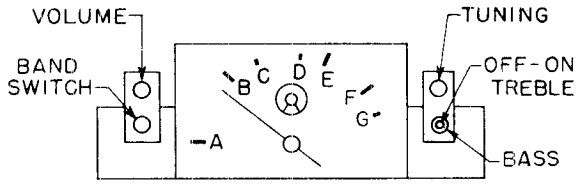


Figure 4. Location of Controls

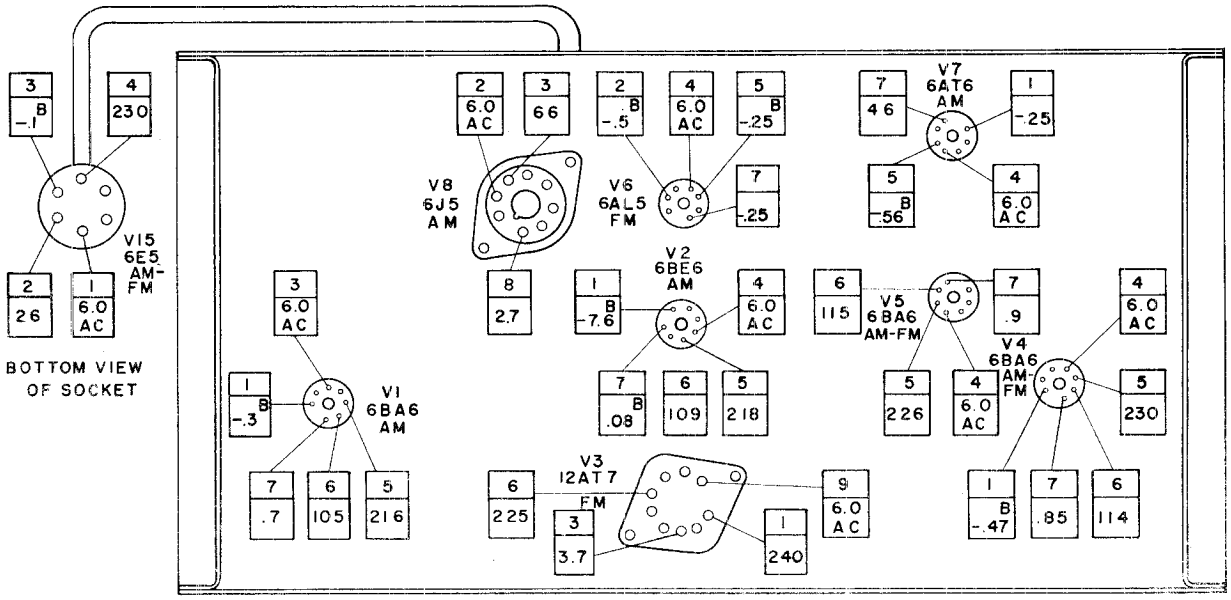


Figure 5. Pin Voltages of Main Unit

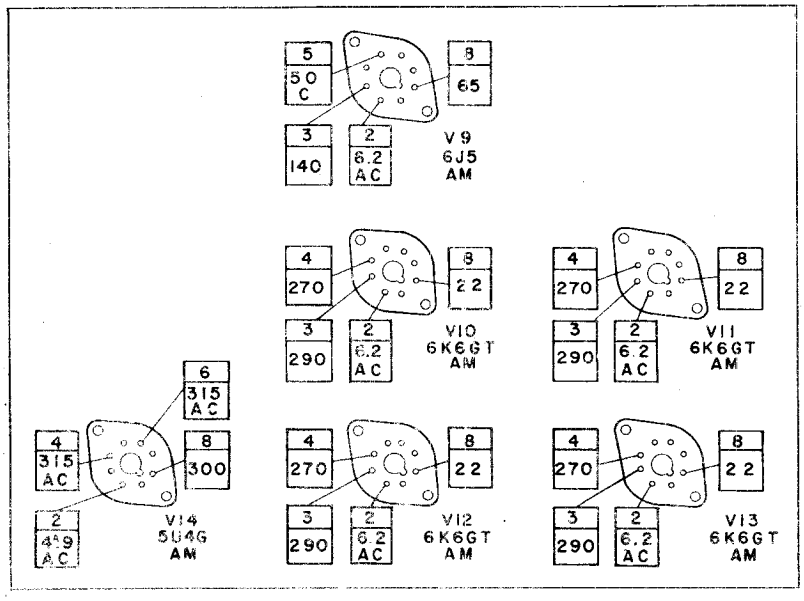


Figure 6. Pin Voltages of Power Unit

NOTES:

All voltages measured to chassis unless otherwise noted.

DC voltages measured with 20,000 ohm/volt meter.

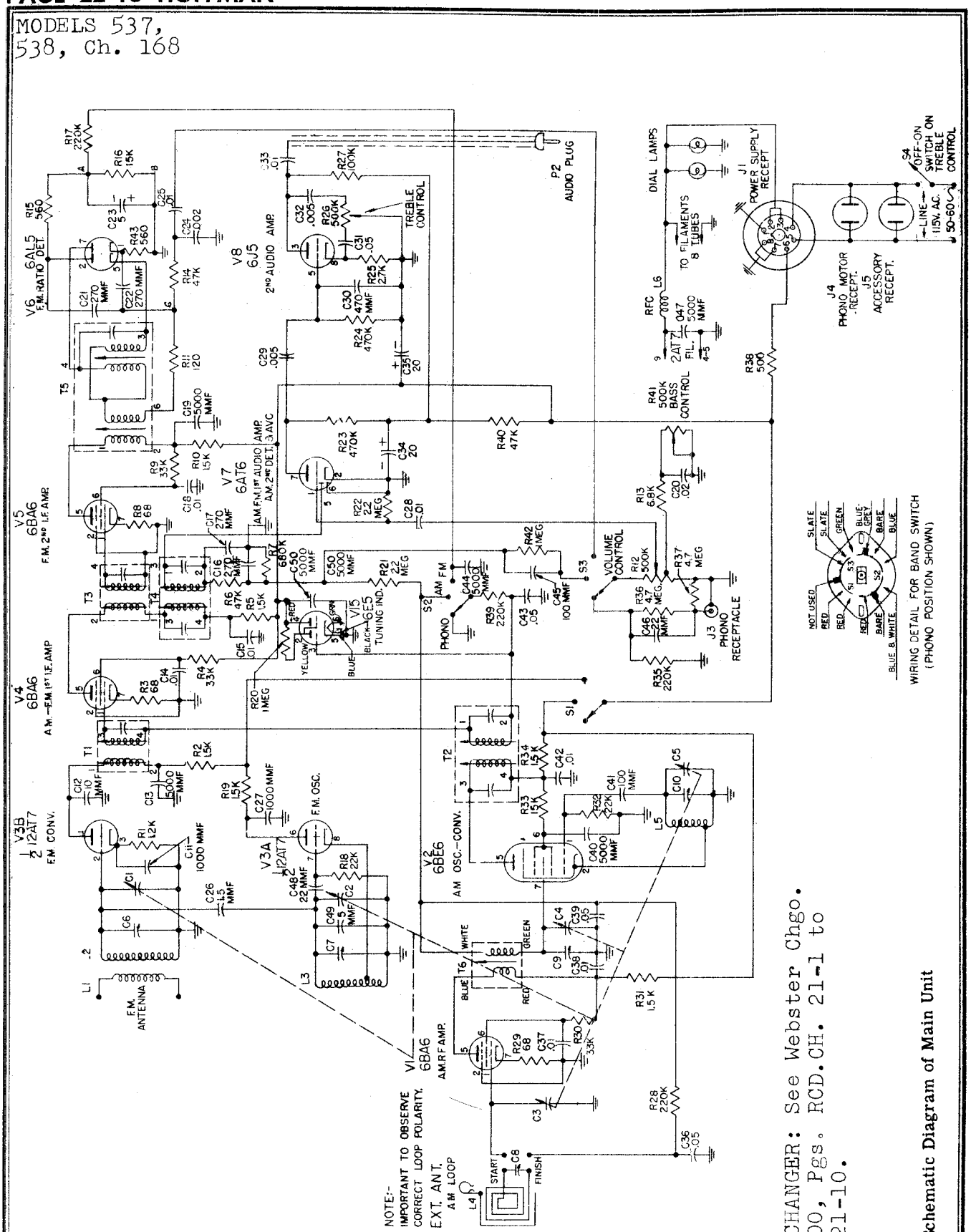
AC voltages measured with 1000 ohm/volt meter.

All measurements made with no signal input to receiver.

All pin voltages not indicated on diagram are at ground potential for all practical purposes.

A Measured from pin 2 to pin 8
B VTVM
C 250 V. scale

MODELS 537,
538, Ch. 168



RECORD CHANGER: See Webster Chgo. Model 100, Pgs. RCD.CH. 21-1 to RCD.CH.21-10.

Figure 7. Schematic Diagram of Main Unit

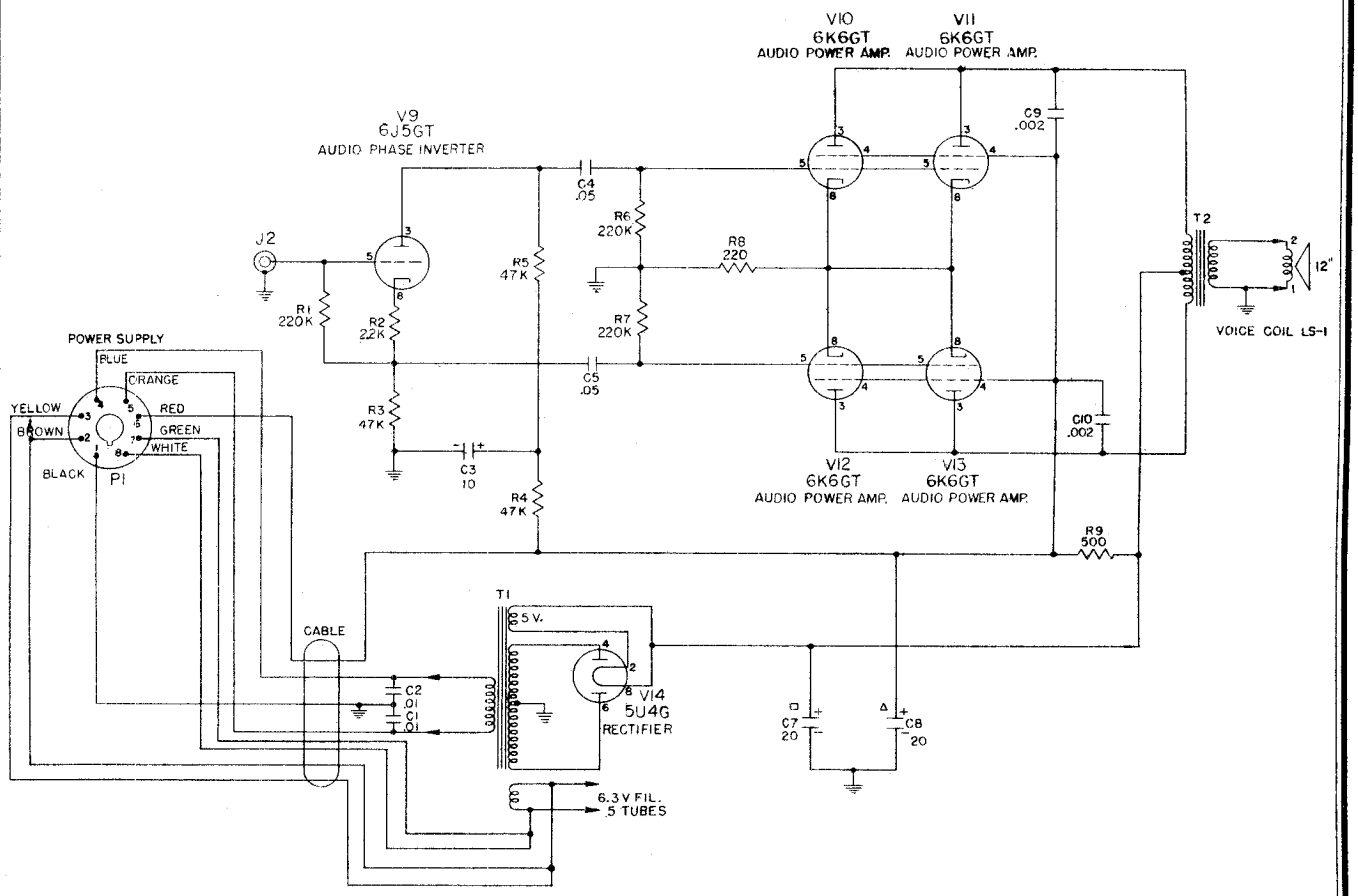


Figure 8. Schematic Diagram of Power Supply and Audio Section

PARTS LIST FOR POWER UNIT

SYMBOL	PART NO.	VALUE	TOL.	WATTS OR VOLTS	TYPE
C1	4105	.01		600 V	Paper
C2	4103	.01		600 V	Paper
C3	4203	10		450 V	Tubular Electrolytic
C4	4101	.05		400 V	Paper
C5	4101	.05		400 V	Paper
C6	(Not Used)				
C7, C8	4231	20-20		450 V	Electrolytic
C9	4118	.002		600 V	Paper
C10	4118	.002		600 V	Paper
R1	4500	220K	20%		
R2	4512	2.2K	20%		
R3	4559	47K	10%		
R4	4504	47K	20%		
R5	4559	47K	10%		
R6	4500	220K	20%		
R7	4500	220K	20%		
R8	4706	220	20%	3 W	
R9	4700	500	10%	5 W	
T1	5001-4	Power Transformer			
T2	5108	Output Transformer			
P1	6212	Plug, Power Supply			

MODELS 537, 538, Ch. 168

PARTS LIST FOR MAIN UNIT

NOTES:
All values of capacity are microfarads unless otherwise noted.
All resistors are 1/2 watt composition type with values given in ohms unless otherwise specified.

SYMBOL	PART NO.	VALUE	TOL.	WATTS OR VOLTS	TYPE
C1, C2, C3, C4, C5	4411	3 Gang AM, FM (1 Section unused)			
C6	4318	Trimmer (FM Section)			
C7	4318	Trimmer (FM Section)			
C8	4313	Trimmer (Located on AM Antenna Loop)			
C9	4313	Trimmer (AM Section)			
C10	4313	Trimmer (AM Section)			
C11	4025	1000 mmf			Ceramic Hi-K
C12	4027	10 mmf	10%		Ceramic
C13	4029	5000 mmf			Ceramic Hi-K
C14	4112	.01		400 V	Paper
C15	4112	.01		400 V	Paper
C16	4001	270 mmf	20%		Mica
C17	4001	270 mmf	20%		Mica
C18	4112	.01		400 V	Paper
C19	4029	5000 mmf			Ceramic Hi-K
C20	4106	.02		400 V	Paper
C21	4001	270 mmf	20%		Mica
C22	4001	270 mmf	20%		Mica
C23	4209	5		50 V	Electrolytic
C24	4118	.002		600 V	Paper
C25	4112	.01		400 V	Paper
C26	4024	1.5 mmf	10%		Mica
C27	4025	1000 mmf			Ceramic Hi-K
C28	4112	.01		400 V	Paper
C29	4102	.005		600 V	Paper
C30	4003	470 mmf	20%		Mica
C31	4100	.05		200 V	Paper
C32	4102	.005		600 V	Paper
C33	4112	.01		400 V	Paper
C34, C35	4200	20-20		450 V	Electrolytic
C36	4100	.05		200 V	Paper
C37	4112	.01		400 V	Paper
C38	4112	.01		400 V	Paper
C39	4100	.05		200 V	Paper
C40	4029	5000 mmf			Ceramic Hi-K
C41	4000	100 mmf	20%		Mica
C42	4112	.01		400 V	Paper
C43	4100	.05		200 V	Paper
C44	4029	5000 mmf			Ceramic Hi-K
C45	4000	100 mmf	20%		Mica
C46	4021	22 mmf	10%		N150 Ceramic
C47	4029	5000 mmf			Ceramic Hi-K
C48	4021	22 mmf	10%		N150 Ceramic
C49	4028	5 mmf	10%		N750 Ceramic
C50	4029	5000 mmf			Ceramic Hi-K
R1	4553	1.2K	20%		
R2	4534	1.5K	20%		
R3	4524	68	20%		
R4	4556	33K	20%	1 W	
R5	4534	1.5K	20%		
R6	4504	47K	20%		
R7	4555	680K	20%		
R8	4524	68	20%		
R9	4556	33K	20%	1 W	
R10	4534	1.5K	20%		
R11	4546	150	10%		
R12	4843	.5 meg		Volume Control, tapped	

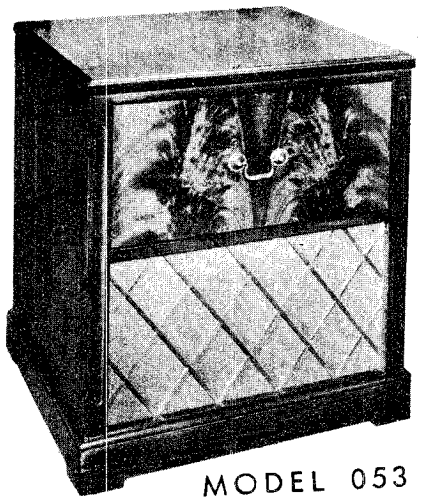
MODELS 537, 538, Ch. 168

SYMBOL	PART NO.	VALUE	TOL.	WATTS OR VOLTS	TYPE
R13	4557	6.8K	10%		
R14	4504	47K	20%		
R15	4507	560	10%		
R16	4521	15K	20%	1 W	
R17	4500	220K	20%		
R18	4501	22K	20%		
R19	4534	1.5K	20%		
R20	4513	1 meg.	20%		
R21	4502	2.2 meg.	20%		
R22	4502	2.2 meg.	20%		
R23	4506	470K	20%		
R24	4506	470K	20%		
R25	4519	2.7K	10%		
R26	4840	500K		Dual Bass and Treble Controls	
R27	4511	100K	20%		
R28	4500	220K	20%		
R29	4524	68	20%		
R30	4556	33K	20%	1 W	
R31	4534	1.5K	20%		
R32	4501	22K	20%		
R33	4539	15K	20%	1 W	
R34	4534	1.5K	20%		
R35	4500	220K	20%		
R36	4544	4.7 meg.	20%		
R37	4544	4.7 meg.	20%		
R38	4700	500	10%	5 W	
R39	4500	220K	20%		
R40	4504	47K	20%		
R41	4840	500K		Dual Bass and Treble Controls	
R42	4513	1 meg.	20%		
R43	4507	560	10%		

SYMBOL	PART NO.	DESCRIPTION
L1	5258	FM Antenna Primary
L2	5248	FM Antenna Secondary
L3	5247	FM Oscillator Coil
L4	5279	AM Loop Antenna
L5	5282	AM Oscillator Coil
L6	5266	RFC Filament Choke
T1	5284	FM 1st IF Transformer
T2	5286	AM 1st IF Transformer
T3	5285	FM 2nd IF Transformer
T4	5287	AM 2nd IF Transformer
T5	5288	FM Ratio Detector Transformer
T6	5289	AM RF Interstage Transformer
S1, S2, S3	6024	Band Change Switch (3 Pole - 3 Position Rotary)
S4		Power Switch on Bass and Treble Controls (Part of 4813)
P2	6203	Plug, Audio Output (Single Prong)
	518	Pointer, Dial
J3	6121	Receptacle, Phono
J4	6108	Receptacle, Phono Motor
J5	6108	Receptacle, Accessory
	6134	Socket, 9 Pin Miniature
	6123	Socket, 7 Pin Miniature
	6103	Socket, Octal
	6110	Socket, Pilot Lamp
	9507	Spring, Dial
	424	Strip, Antenna Terminal
	2224D	Plate, Dial Background
	6112	Socket, Tube with Cable (Eye Tube)
	9505	Pilot Lamp

MODELS 053, JP50-3, JP90-3, Ch.RP5L, RP5U

PARTS LIST



MODEL 053

COILS AND TRANSFORMERS

REF. NO.	PART NO.	DESCRIPTION
L_1	A-1493-10	Loop Antenna
L_2	A-1492-10	Oscillator Coil
T_1	A-1490-10	Input IF Transformer
T_2	A-1491-10	Output IF Transformer
T_3	A-1656-13	Audio Output Transformer 2500Ω to 3.2

MISCELLANEOUS

C-2500-14	Record changer - VM
A-1059-4	Control knob
A-1060-4	Pointer knob
100-84	Record Changer - Webster

CAPACITORS

REF. NO.	PART NO.	DESCRIPTION
C_1	A-1200-6	TUNING CAPACITOR
C_2	CWZ 04203 M	.02 Mfd 400 volts
C_3	CWZ 04503 M	.05 Mfd 400 volts
C_4	CWZ 06502 M	.005 Mfd 600 volts
C_5	CWZ 04203 M	.02 Mfd 400 volts
C_6	CED-4415	DUAL 40 Mfd 150 volt electrolytic capacitor
C_7	CWR-04503 M	.05 Mfd resonant
C_8	CCC, 05050 M	5 Mmf ceramic or mica

RESISTORS

REF. NO.	PART NO.	DESCRIPTION
R_1	RCC 224 M	220,000 ohms ± 20% ½ watt Resistor
R_2	RCC 105 M	1.0 megohms ± 20% ½ watt Resistor
R_3	RCC 223 M	22,000 ohms ± 20% ½ watt Resistor
R_4	RCC 106 M	10 megohms ± 20% ½ watt Resistor
R_5	RVC-301S	500,000 ohms volume control audio taper with switch
R_6	RCC 151 M	150 ohms ± 20% ½ watt
R_7	RCC 154 M	150,000 ohms ± 20% ½ watt
R_8	RCC 154 M	150,000 ohms ± 20% ½ watt
R_9	RCF 222 M	2,200 ohms ± 20% 1 watt
R_{10}	RCC 150 M	15 ohms ± 20% ½ watt

VOLTAGE CHART

PIN	#1	#2	#3	#4	#5	#6	#7
12BE6	-7.5	0	12AC	23AC	90	90	0
12BA6	-0.8	0	23AC	35AC	90	90	0
12AT6	-0.8	0	0	12AC	-0.8	-0.5	45
50C5	6	0	35AC	83AC	0	90	120
35W4	0	0	83AC	117AC	115AC	0	130

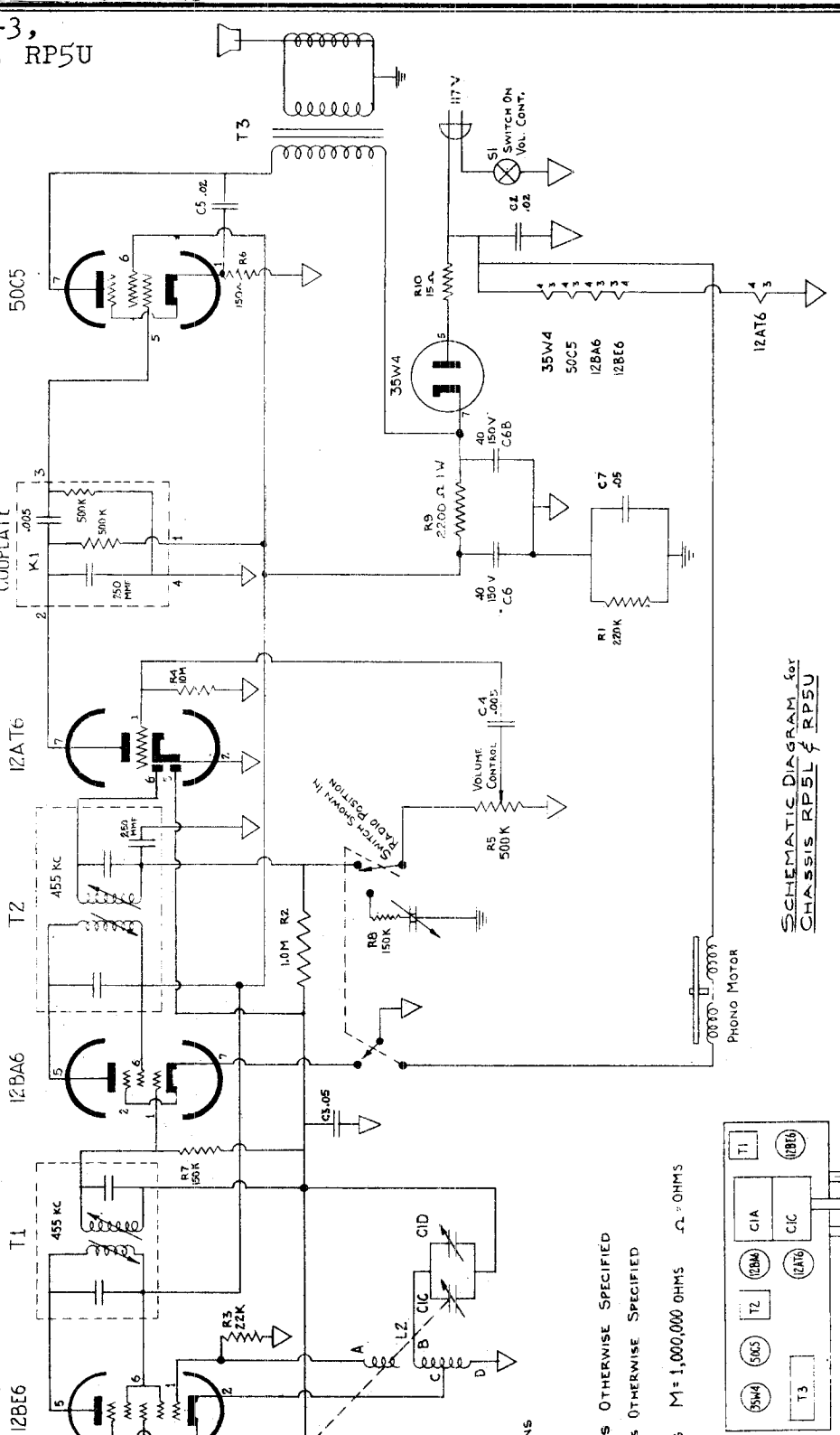
NOTES:
1. Measured with VTVM from indicated pin to B- line.
2. Phono-radio switch in radio position.
3. Line voltage set at 117V 60~AC.
4. Voltages may vary considerably due to variations in line voltage and components.

MODELS 053, JP50-3,
JP90-3, Ch. RP5L, RP5U

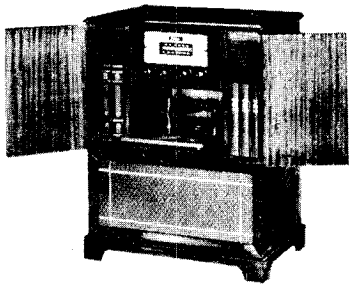
ALIGNMENT PROCEDURE

Feed a 455 K.C. modulated signal from grid (pin No. 7 12BE6 through a .01 M.F.D. condenser) and B-. Connect an output meter across the voice coil. Tune slugs on first and second I.F. transformers for maximum indication on meter. Set signal generator to 1600 KC modulated signal and couple loosely to loop antenna. Set dial to 1600 K.C. and tune oscillator trimmer for maximum indication on meter.

Set signal generator and dial to 1400 K.C. and tune R.F. trimmer, for maximum indication on meter. Check tracking at 600 K.C., knife gang if necessary. Repeat these adjustments until the receiver tracks correctly.



MODELS 153,
3170, Ch. AM7A



MODEL 153

HOW TO OPERATE THE RADIO:

This radio is equipped with four controls, the left hand control is the combined off-on switch and volume control. The second knob from the left is the phono-radio switch, the third knob is the tone control, the fourth control is used for tuning the desired station. To place the set in operation, rotate on-off volume control knob to right and allow 30 seconds for set to warm up. Rotate tuning control to desired station. Adjust volume control to desired volume, set tone control to treble or base response. To use phonograph follow above steps, except turn phono-radio switch, to phono position. Place records on changer in sequence desired, push reject button, and allow changer to cycle.

VOLTAGE CHART

PIN	#1	#2	#3	#4	#5	#6	#7
12BE6	—7.3	0	24*	24*	78	78	0
12BA6	—8.	0	24*	12*	89	89	0
12AT6	—1.8	0	0	—8. *	—8.	—2.3	34
12AT6	—.45	0	0	12*	0	0	45
50C5	—7.2	0	60*	12*	0	89	120
50C5	—7.2	0	80*	36*	0	89	120
35W4	—0	0	86*	120*	115*	115*	120

Measured with V.TVM from Pin to B- line.

Set in radio position.

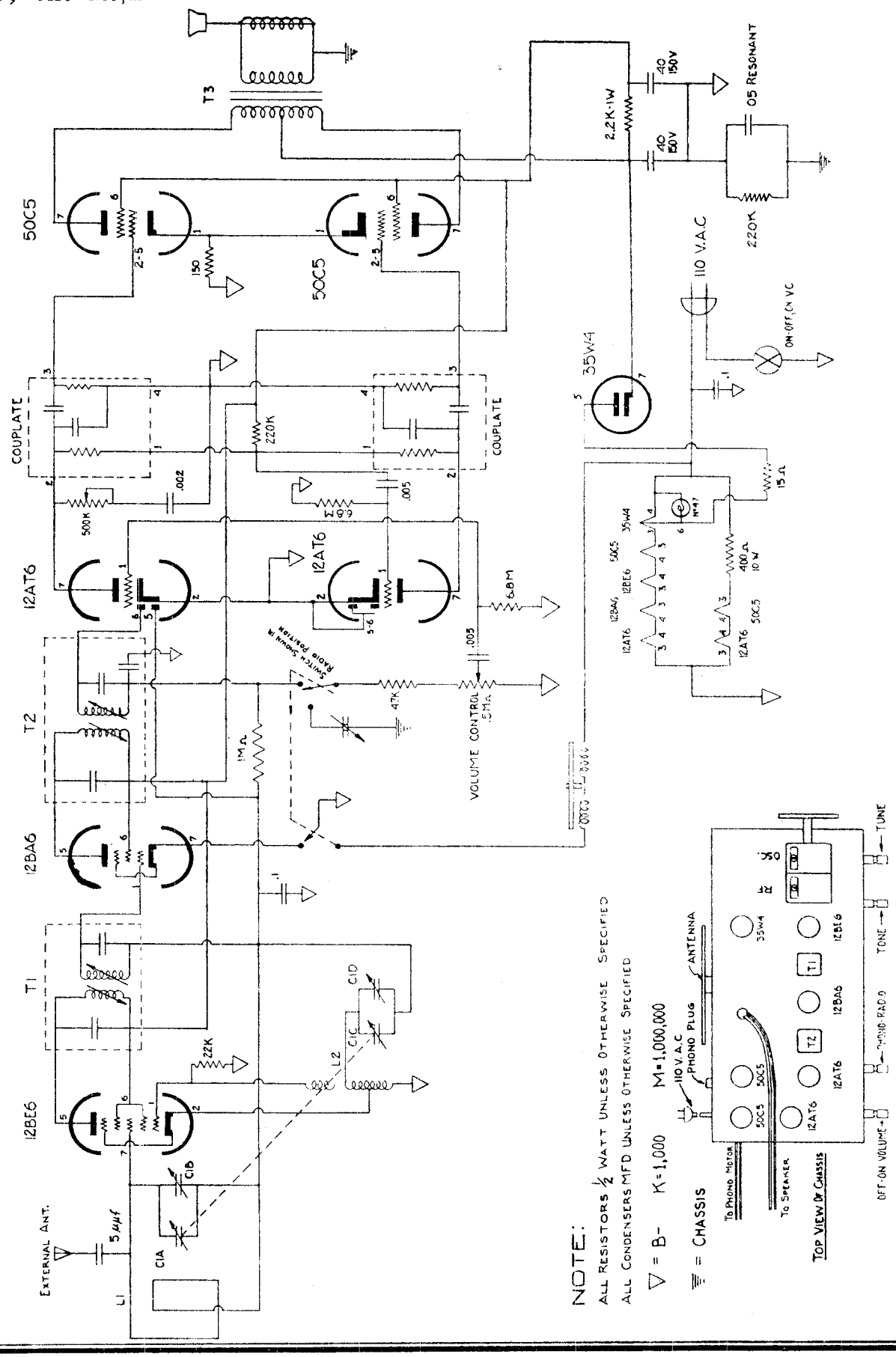
* A.C. Volts.

ALIGNMENT PROCEDURE

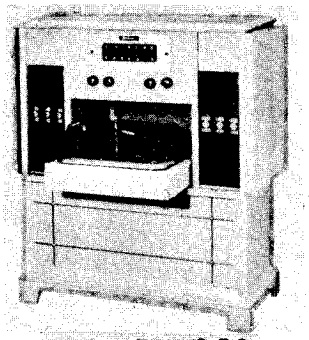
Feed a 455 K.C. modulated signal from grid to ground (pin No. 7 12BE6). Connect A output meter across the voice coil. Tune slugs on first and second I.F. transformers for maximum indication on meter. Set signal generator to 1600 K.C. Modulated signal and couple loosely to loop antenna. Set dial to 1600 K.C. and tune oscillator trimmer for maximum indication on meter.

Set signal generator and dial to 1400 K.C. and tune R.F. trimmer, for maximum indication on meter. Check tracking at 600 K.C., knife gang if necessary. Repeat these adjustments until the receiver tracks correctly.

MODELS 153,
3170, Ch. AM7A



MODELS 350, 5120, Ch. FA8A



MODEL 350

SPECIFICATIONS

Power Supply.....105-125 volts 60 cycle AC only.
Power Consumption.....65 Watts.
Frequency Range FM.....88 to 108 MC.
Frequency Range AM.....540 to 1600 KC.
I.F. Frequency FM.....10.7 MC.
I.F. Frequency AM.....455 KC.
Band width, FM, Ratio Detector.....330 KC.
Band width, FM, 1st I.F.....280 KC.
Band width, FM, Converter.....220 KC.

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

VOLTAGE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	0	0	0	6 AC	155	125	0		
12AT7 FM RF AMP & CONV	170	0	1.5	0	0	155	0	1	6 AC
6BA6 1st IF AM & FM	0	0	6 AC	0 AC	150	100	0		
6BA6 2nd IF FM	0	0	6 AC	0 AC	155	110	1		
6AL5 FM DETECTOR	0	0	6 AC	0 AC		0	0		
6AT6 AM DETECTOR, AVC, AUDIO	—.5	0	6 AC	0 AC	0	0	60		
6AQ5 POWER OUTPUT	0	7.5	6 AC	0 AC	215	170	0		
6x4 POWER RECTIFIER	230 AC		6 AC	0 AC	235	230 AC	235		

Band Switch on AM position. Dial 1600 KC. No Signal.

SERVICE NOTES

GENERAL

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5.

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and oscilloscopes. All R.F. and I.F. circuits have been accurately adjusted at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

EQUIPMENT USED FOR ALIGNMENT

Vacuum tube voltmeter.
AM Signal generator
FM Sweep generator.
Oscilloscope.
Insulated screw driver.
Dummy antenna:
.1 MFD condenser
.00025 MFD mica condenser
150 ohm resistor (2)
Output meter.

The tubes used are as follows:

12AT7 FM RF Amplifier, Converter
6BE6 FM Osc, AM Osc, Converter
6BA6 FM-AM, 1st I.F. Amplifier
6BA6 FM, 2nd I.F. Amplifier
6AL5 FM Detector
6AT6 AM Detector, AVC, Audio
6AQ5 Power Output
6X4 Power Rectifier
No. 44 Pilot Lights (2)

MODELS 350,
5120, Ch. FA8A

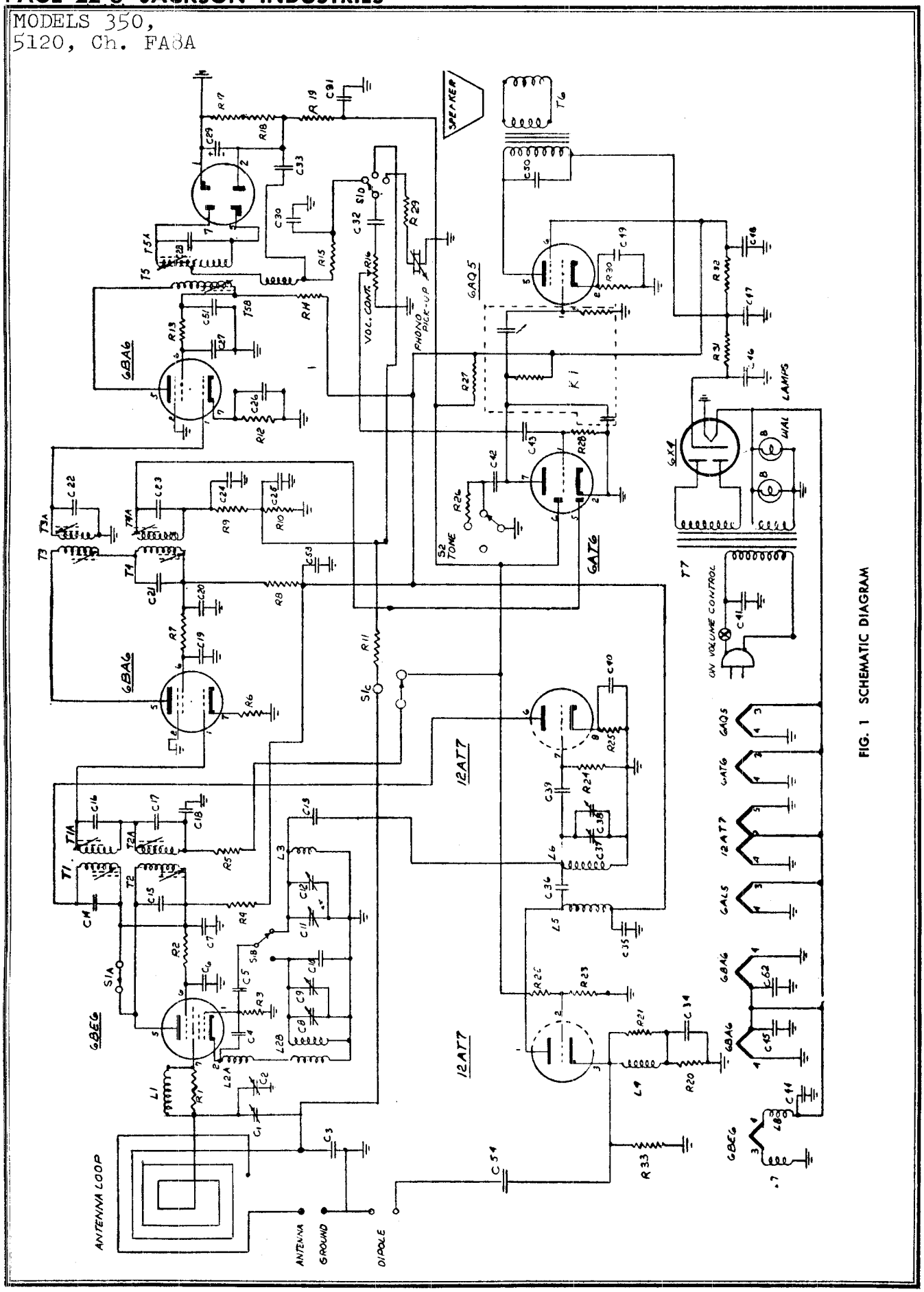


FIG. 1 SCHEMATIC DIAGRAM

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—grid of AM converter tube (6BE6) Low side—chassis	Output Meter across voice coil	T2 & T4	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	"	"	"	AM OSC	AM Oscillator	"
3	1400 KC	"	1400 KC 400 cycle AM	.00025 MFD	High side—One ant. terminal Low side—Other ant. terminal	"	Ant Loop	AM Antenna	"
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—grid of 2nd I.F. amplifier tube (6BA6) Low side—chassis	Connect V.T.V.M. to plate of Ratio Detector tube, pin 2 (6AL5)	Top T5	Ratio detector primary	Adjust for maximum negative voltage.
5	"	"	10.7 MC 400 cycle 250 KC Deviation	"	"	Connect scope to audio take-off point (across vol. cont.)	Bottom T5	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 2
6	"	"	10.7 MC 400 cycle 80 KC Deviation	"	High side—grid of 1st I.F. amplifier tube (6BA6) Low side—chassis	"	T3	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 2
7	"	"	"	"	High side—grid (pin 7) of FM converter tube (12AT7) Low side—chassis	"	T1	FM 1st I.F.	"
8	108.5 MC	"	108.5 MC 400 cycle 30% modulation (22.5 KC deviation)	300 ohms in high side	High side—ant. terminal Low side—chassis	Connect output meter across voice coil	FM OSC.	FM oscillator	Adjust for maximum output
9	105 MC	"	105 MC 400 cycle 30% modulation (22.5 KC deviation)	"	"	"	FM RF	FM R.F.	"

NOTE A: When aligning the FM I.F. circuits, keep the out put from the signal generator as low as possible.

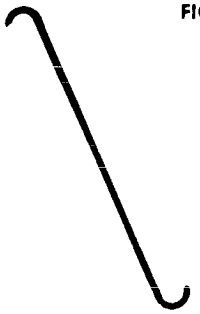
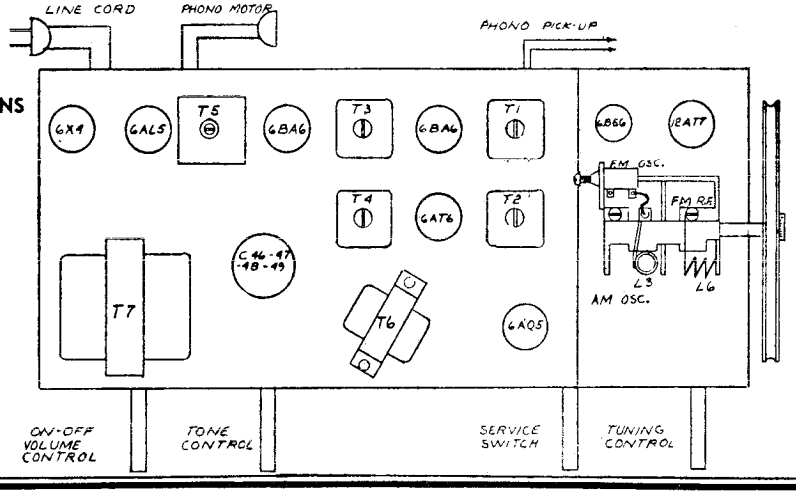


FIGURE 2

FIG. 3 TUBE AND TRIMMER LOCATIONS



MODELS 350,
5120, Ch. FA8A

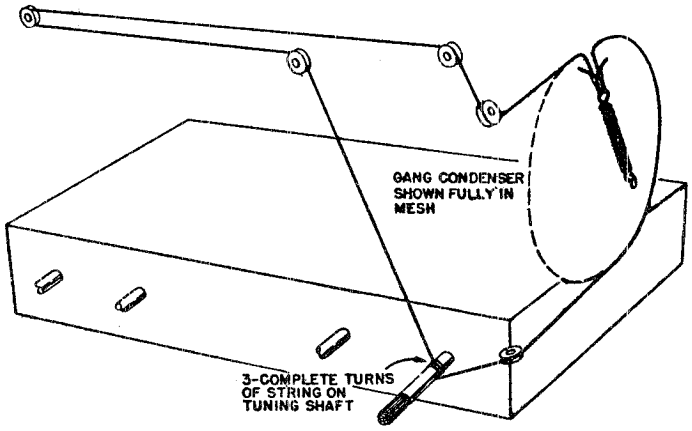


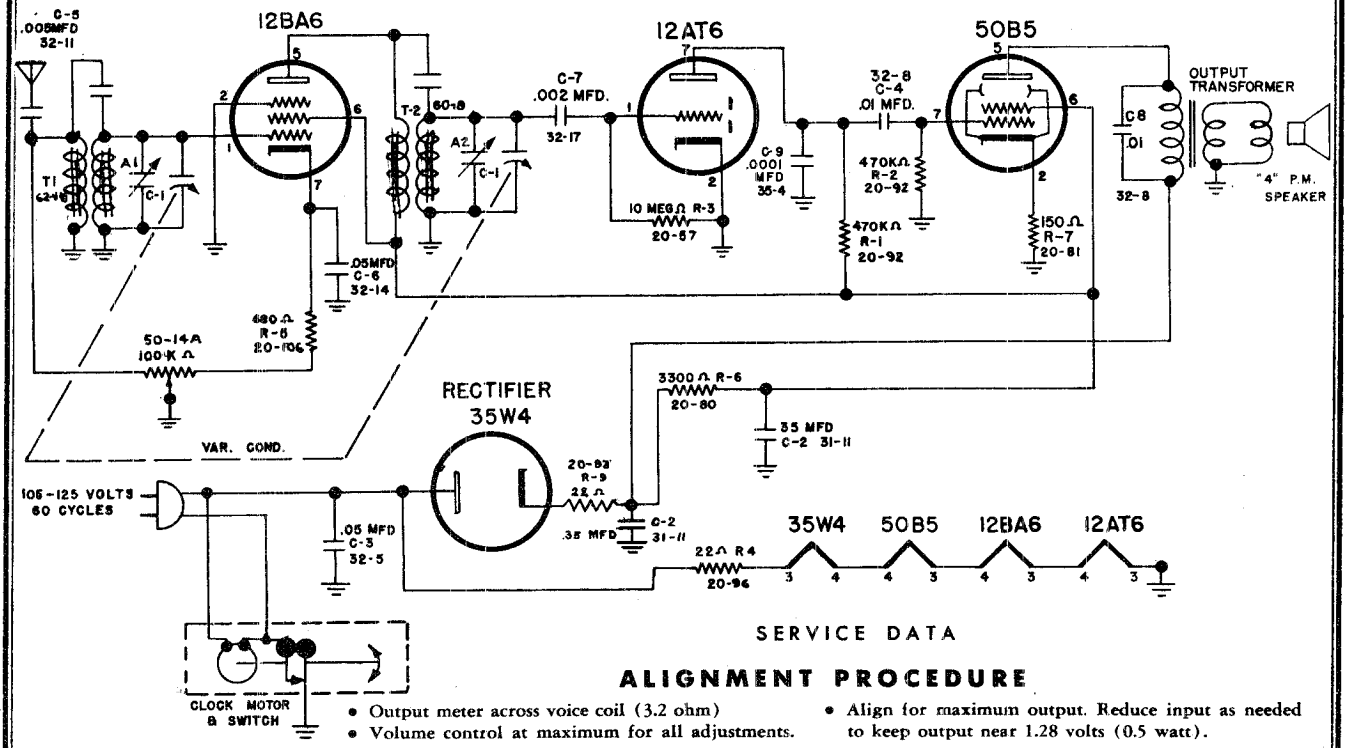
FIG. 4 DIAL CORD STRINGING

PARTS LIST

Schematic Diagram Reference	Description
C1	Loop Trimmer
C2	Variable Cond.
C8, C9	
C11, C37	
C38	.05-200V Condenser
C3	
C4	2.2 MMF Gimmick Cond.
C5	33 MMF (Erie Style A N14004)
C6, 18	
C19, 27	
C26	5000 MMFD GMV
C42, C45, 51	
C50, C52	
C10	15 MMFD + or − 10% O° T.C. (Erie)
C12	FM Osc Trimmer
C13	1.5 MMFD (Erie Style "A")
C14, 15, 16, 17 21, 22, 23, 24, 28	Integral part of respective IF—XFMRS
C31, 32, 53, 7, 20	10,000 MMFD GMV
C25 36, 39, 54	100 MMF ceramic cond.
C29	4 - 50V Lytic condenser
C30	2000 MMFD Condenser
C33	470 MMFD Condenser
C34, 35 40, 44, 53	1000 MMFD GMV condenser
C41	.1 - 400V condenser
C43	.01 - 200V condenser
C46, 47 48, 49	40-350V, 30-300V FP Lytic Condenser 30-300V, 10-25V
R2	4.7K ohm Resistor
R3, R15	22K ohm Resistor
R4, R8, R14	1K ohm Resistor
R5, R19	100K ohm Resistor
R6, R12	68 ohm Resistor
R7, R13	10K ohm Resistor
R9, R26	47K ohm Resistor
R10, R23, R24	470K ohm Resistor
R11, R22	2.2M ohm Resistor
R16	.5M Vol. Cont. — SPST
R17, R18	12K Resistor
R20	220 ohm Resistor
R25	2.2K ohm
R27	3.3M ohm
R28	6.8M ohm
R30	270 ohm — 1 Watt
R31	100 ohm — 1 Watt
R32	1000 ohm — 5 Watt
R33	560 ohm
K1	CRL Triode couplate
L1	AM Grid Choke on R1
L2A, B	AM Osc. Coil
L3	FM Osc. Coil
L4	FM Cathode choke on R21
L5	FM plate choke
L6	FM RF Coil
D-1	Dial Scale
L7, 8	Filament choke
T1	1st FM IF
T2	1st AM IF
T3	2nd FM IF
T4	2nd AM IF
T5	Ratio Detector
T6	Out Put XFMR
T7	Power XFMR
	Loop Ant.
B	No. 44 Pilot Light
	Line cord
	300 ohm Line Di-Pole Ant.

K=1000
M=1,000,000
All Resistors ½ Watt unless otherwise noted.
Values of Capacitors in MFD. unless otherwise stated.
Tolerance on Capacitors and Resistors + or − 20% unless otherwise stated.

MODELS 910, 915, 985



SERVICE DATA

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				Tuner Adjustment	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
1650 kc	50 mmf	Antenna**	B—	Rotor full open (Plates out of mesh)	RF trimmer A2 Antenna trimmer A1
1500 Kc	50 mmf	Antenna**	B—	1500 Kc*	RF Trimmer A2 Antenna Trimmer A1

* Seven markings on the dial bracket represent respectively 550 kc, 600 kc, 700 kc, 900 kc, 1100 kc, 1400 kc, and 1600 kc reading from left to right. These points are to be used for the alignment of the receiver.

** Disconnect antenna bank by unsoldering

WAKE MASTER "JEWEL"

MODEL 910-915-985

105—125 VOLTS, 60 CYCLES

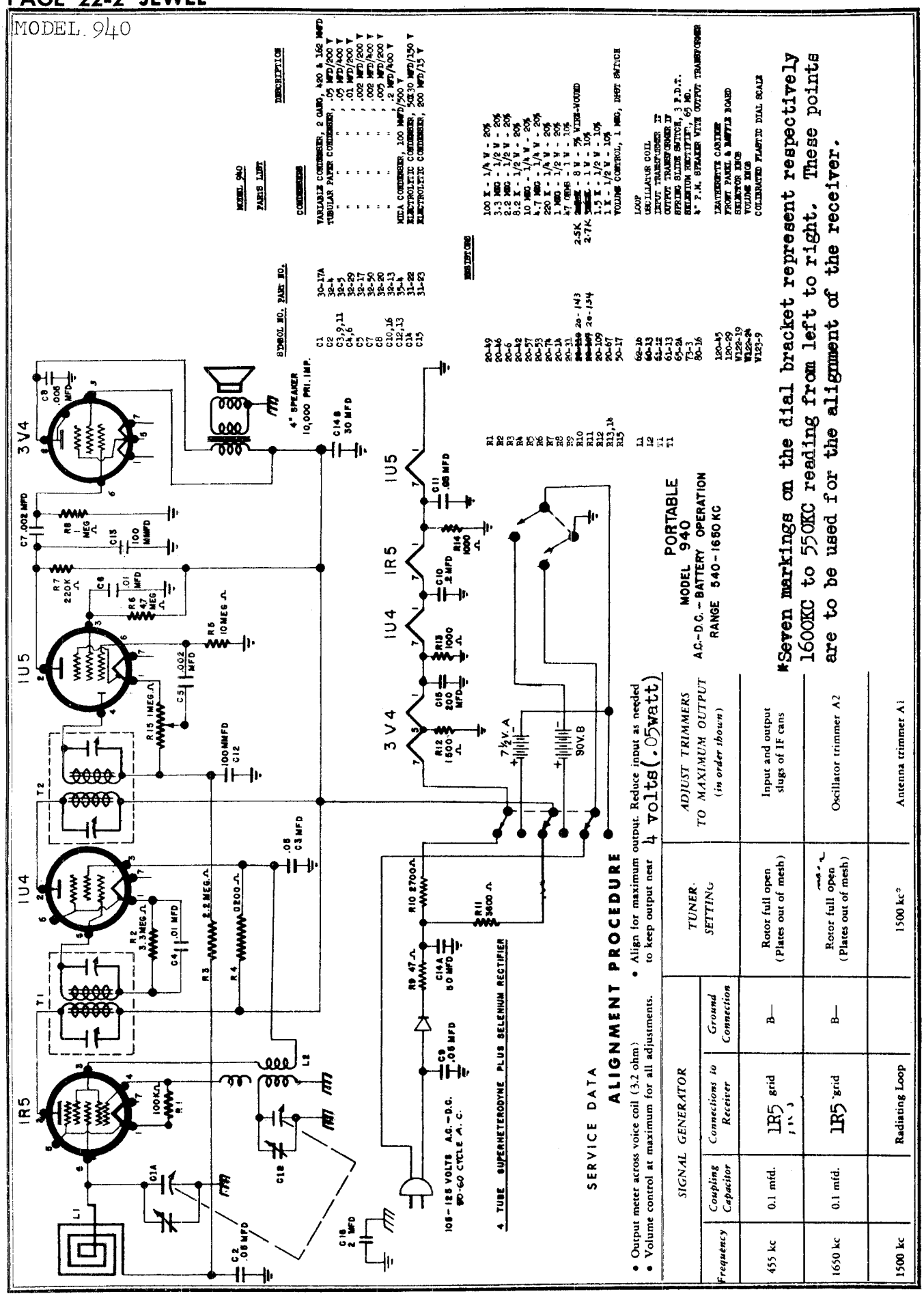
RANGE 540-1650 KC

PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
		VARIABLE CONDENSER, 2 GANG, 420 & 420 MMF
		ELECTROLYTIC CONDENSER, 35 & 35 MFD/150 V
C1	30-16	TUBULAR PAPER CONDENSER, .05 MFD/400 V
C2	31-11	" " " .01 MFD/150 V
C3	32-5	" " " .005 MFD/150 V
C4,8	32-8	" " " .05 MFD/200 V
C5	32-11	" " " .002 MFD/150 V
C6	32-14	MICA CONDENSER, .0001 MFD
C7	32-17	
C9	35-4	

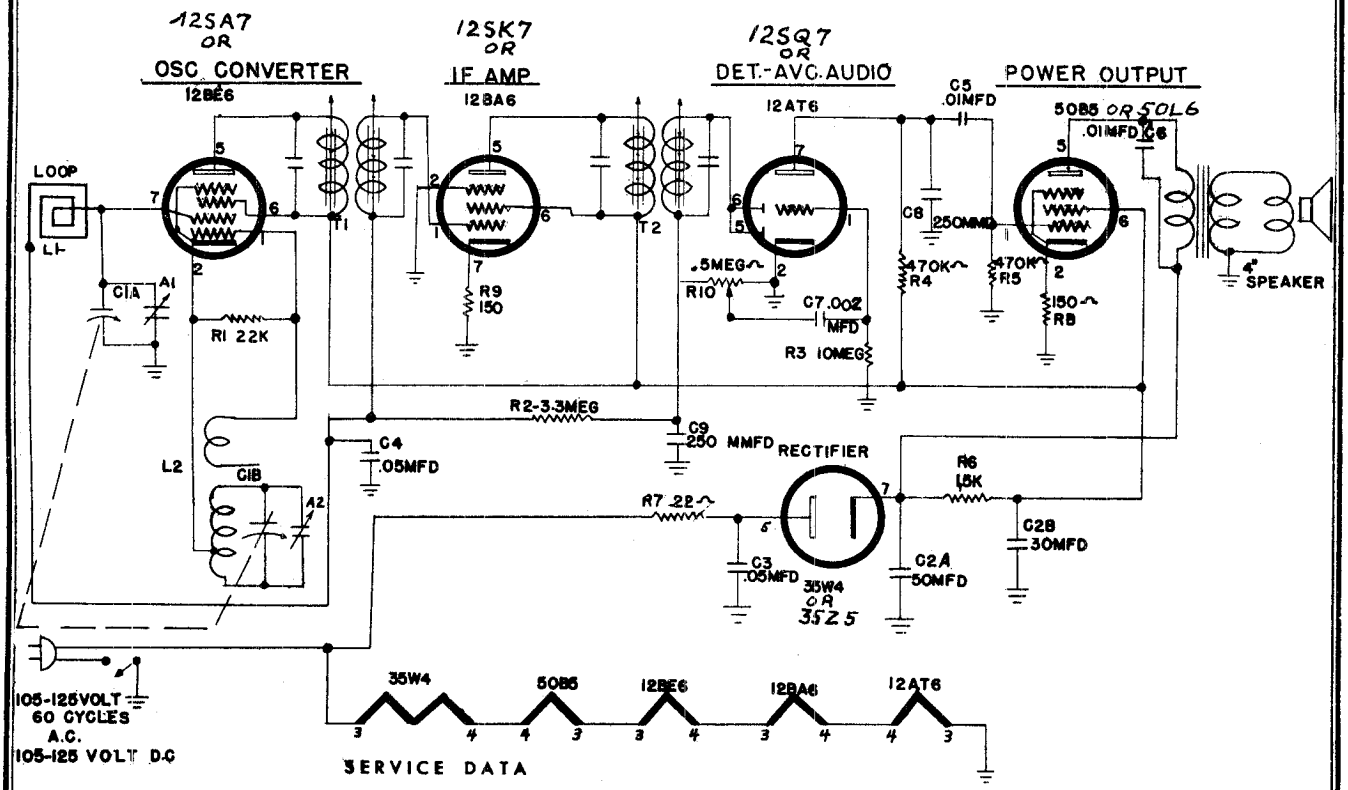
		RESISTORS
R1,2	20-92	470 K - 1/4 W - 20%
R3	20-57	10 MEGS 1/4 W - 20%
R4	20-96	22 OHMS 1 W - 20%
R5	20-106	680 OHMS - 1/4 W - 20%
R6	20-80	3300 OHMS- 1 W - 20%
R7	20-81	150 OHMS - 1/2 W - 20%
R8	50-14A	VOLUME CONTROL, 100 K, WITHOUT SWITCH
R9	20-93	22 OHMS - 1/2 W - 20%
T1	62-14	ANTENNA COIL
T2	60-8	R.F. COIL
	80-12	4" P.M. SPEAKER WITH OUTPUT TRANSFORMER
	140-4	CLOCK
	120-25E	CABINET
	122-19	SELECTOR KNOB (IVORY)
	122-15	VOLUME KNOB (IVORY)

MODEL 940



SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	IR5 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	IR5 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

MODEL 956



ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

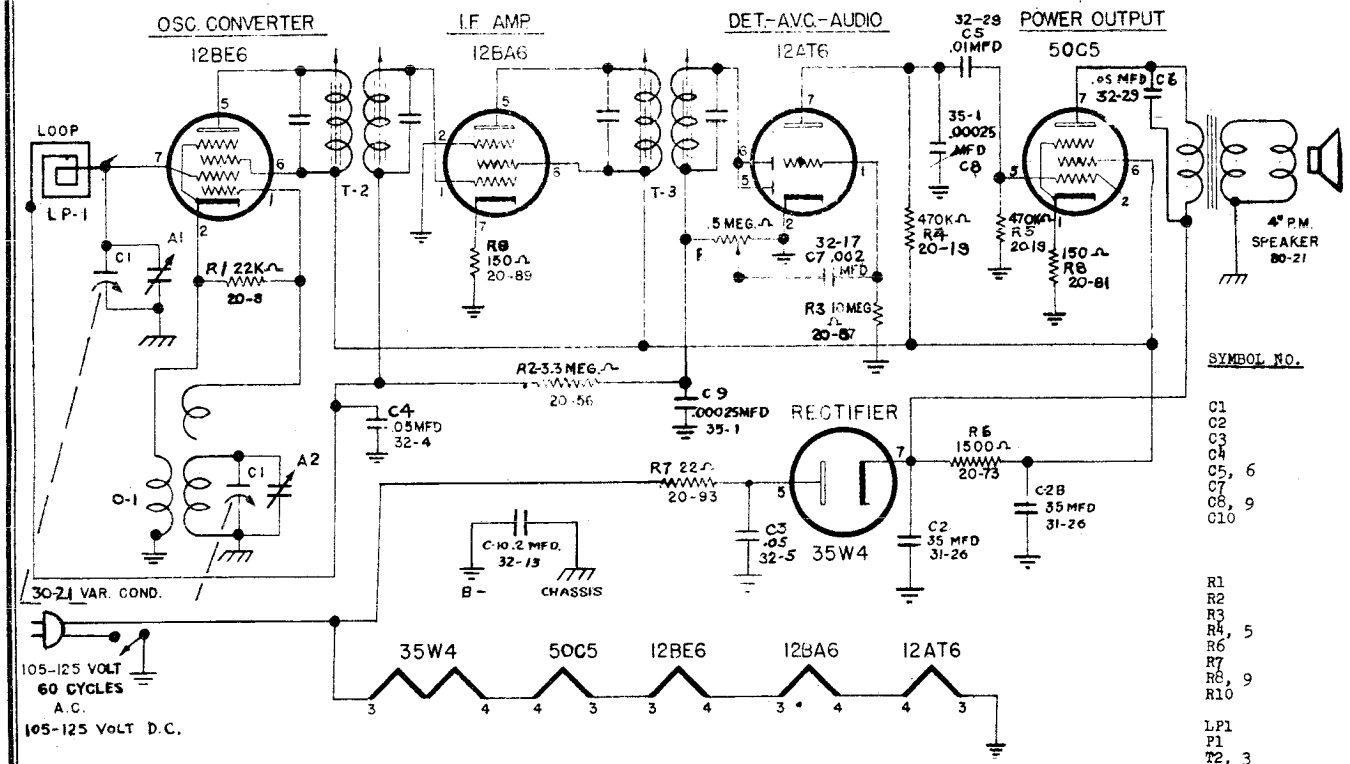
SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

* Ten markings on the dial represent respectively 550Kc, 650Kc, 750Kc, 850Kc, 950Kc, 1050Kc, 1200Kc, 1350Kc, 1500Kc, & 1600Kc, reading from top to bottom. These points are to be used for the alignment of the receiver

MODEL 956

PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-21	VARIABLE CONDENSER, 2 GANG, 420 & 162 MMFD
C2	31-20	ELECTROLYTIC CONDENSER, 50X30 MFD/150 V
C3	32-5	TUBULAR PAPER CONDENSER, .05 MFD/400 V
C4	32-4	" " " , .05 MFD/200 V
C5	32-29	" " " , .01 MFD/200 V
C7	32-17	" " " , .002 MFD/200 V
C8,9	35-1	MICA CONDENSER, 250 MMFD/200 V
		RESISTORS
R1	20-3	22 K - 1/2 W - 20%
R2	20-56	3.3 MEG1/4 W - 20%
R3	20-8	10 MEG 1/2 W - 20%
R4,5	20-19	470K - 1/2 W - 20%
R6	20-73	1500 OHMS - 1W - 20%
R7	20-93	22 OHMS 1/2 W - 20%
R8,9	20-81	150 OHMS - 1/2 W - 20%
R10	50-18 A	VOLUME CONTROL, 0.5 MEG, WITH S.P.S.T. SWITCH
L1	62-19	LOOP, BOX TYPE
L2	60-12	OSCILLATOR COIL
T1,2	61-11	I.F. TRANSFORMER
	80-17	4" P.M. SPEAKER WITH OUTPUT TRANSFORMER
	120-4CB	CABINET (SPECIFY COLOR)
	T122-29	SELECTOR KNOB
	T122-30	VOLUME KNOB
	142-9	DIAL CRYSTAL WITH CALIBRATION
	53-7	POINTER



ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

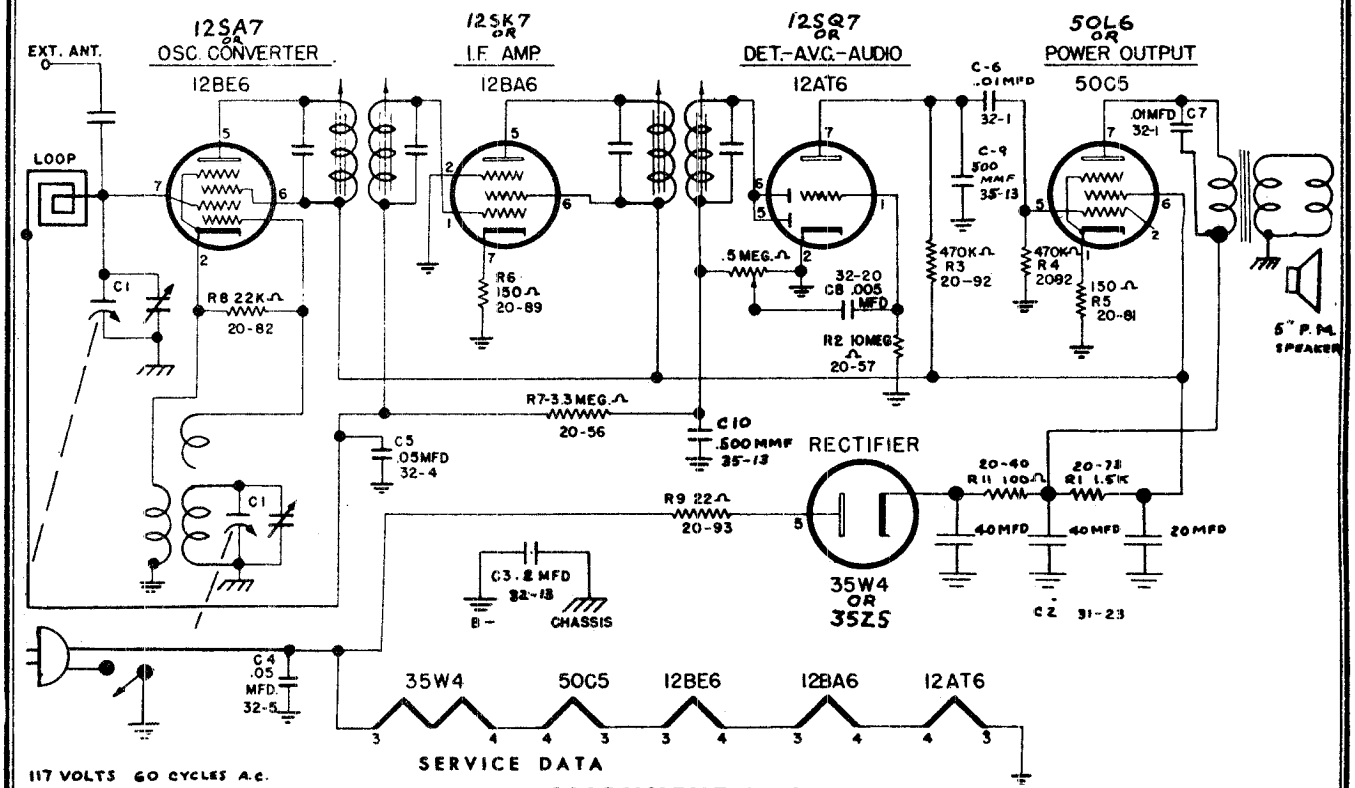
* Ten markings on the dial represent respectively 550Kc, 650Kc, 750Kc, 850Kc, 950Kc, 1050Kc, 1200Kc, 1350Kc, 1500Kc, & 1600Kc, reading from top to bottom. These points are to be used for the alignment of the receiver

DATE 6-13-50
DRAWING NO. 130-77

REPLACEMENTS PART LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-21	Variable Condenser, 2Gang, 420 E162 mmf.
C2	31-26	Electrolytic Condenser, 35x35 mfd/150V.
C3	32-5	Tubular Paper Condenser, .05mfd/400V.
C4	32-4	" " " .05mfd/200V.
C5, 6	32-29	" " " .01mfd/200V.
C7	32-17	" " " .002mfd/200V.
C8, 9	35-1	Mica Condenser, 250mmf/500V.
C10	32-13	Tubular Paper Condenser, .2mfd/400V.
		RESISTORS
R1	20-3	22K ½W 20%
R2	20-56	3.3Meg ½W 20%
R3	20-8	10Meg ½W 20%
R4, 5	20-19	470K ½W 20%
R6	20-73	1.5K 1W 20%
R7	20-93	22 OHMS ½W 20%
R8, 9	20-81	150 OHMS ½W 20%
R10	50-18A	Volume Control, 0.5Meg with SPST Switch
LP1	62-21	Loop
P1	60-17	Oscillator Coils
T2, 3	61-11	I.F. Transformers
	80-21, 22	4"P.M. Speaker with Output Transformer
	120-40B	Cabinet
	Y122-29	Selector Knob
	Y122-30	Volume Knob
	142-9	Dial Crystal

MODELS 960, 960U, 961



117 VOLTS 60 CYCLES A.C.
117 VOLTS D.C.

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.

Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

***Nine markings on the dial represent respectively 550KC, 600KC, 650KC, 750KC, 900KC, 1200KC, 1350KC, 1550KC, and 1650KC reading from left to right. These points are to be used for the alignment of the receiver.**

REPLACEMENT PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION	U. L.	PART NO.
		CAPACITORS		
C1	32-20A	VARIABLE CONDENSER, 2 GANG, 420 MMF - 162 MMF		
C2	31-24 (UL 31-25)	40M40M20 MFD. 150 VOLT ELECTROLYTIC COND.		
C3	32-32 (UL 32-13)	.2 MFD - 200 V. TUBULAR		
C4	32-5 (UL 32-55)	.05 MFD - 400 V. "		
C5	32-4	.05 MFD - 200 V. "		
C6,7	32-1	.01 MFD - 400 V. "	60-18	60-16
C8	32-20 (UL 32-45)	.005 MFD- 200 V. "	61-11	61-17
C9	35-13	500 MMF - 500 V. MICA	61-11	61-17
C10	35-13	500 MMF - 500 V. MICA		62-20
		RESISTORS		
R1	20-73	1.5 K, 1 WATT 20%		
R2	20-57	10 MEGOHM - 1/4 WATT - 20%	80-23	80-20
R3,4	20-92	470,000 OHM 1/4 WATT - 20%		120-41
R5	20-81	150 OHM - 1/2 WATT - 20%		122-26
R6	20-89	150 OHM - 1/4 WATT - 20%		122-31
R7	20-56	3.3 MEGOHM 1/4 WATT- 20%		122-31
R8	20-82	22,000 OHM 1/4 WATT- 20%		
R9	20-93	22 OHM 1/2 WATT - 20%		
R10	50-19A	1/2 MEG. VOLUME CONTROL WITH SWITCH		
R11	20-40	100 OHM - 1/2 WATT - 20%		

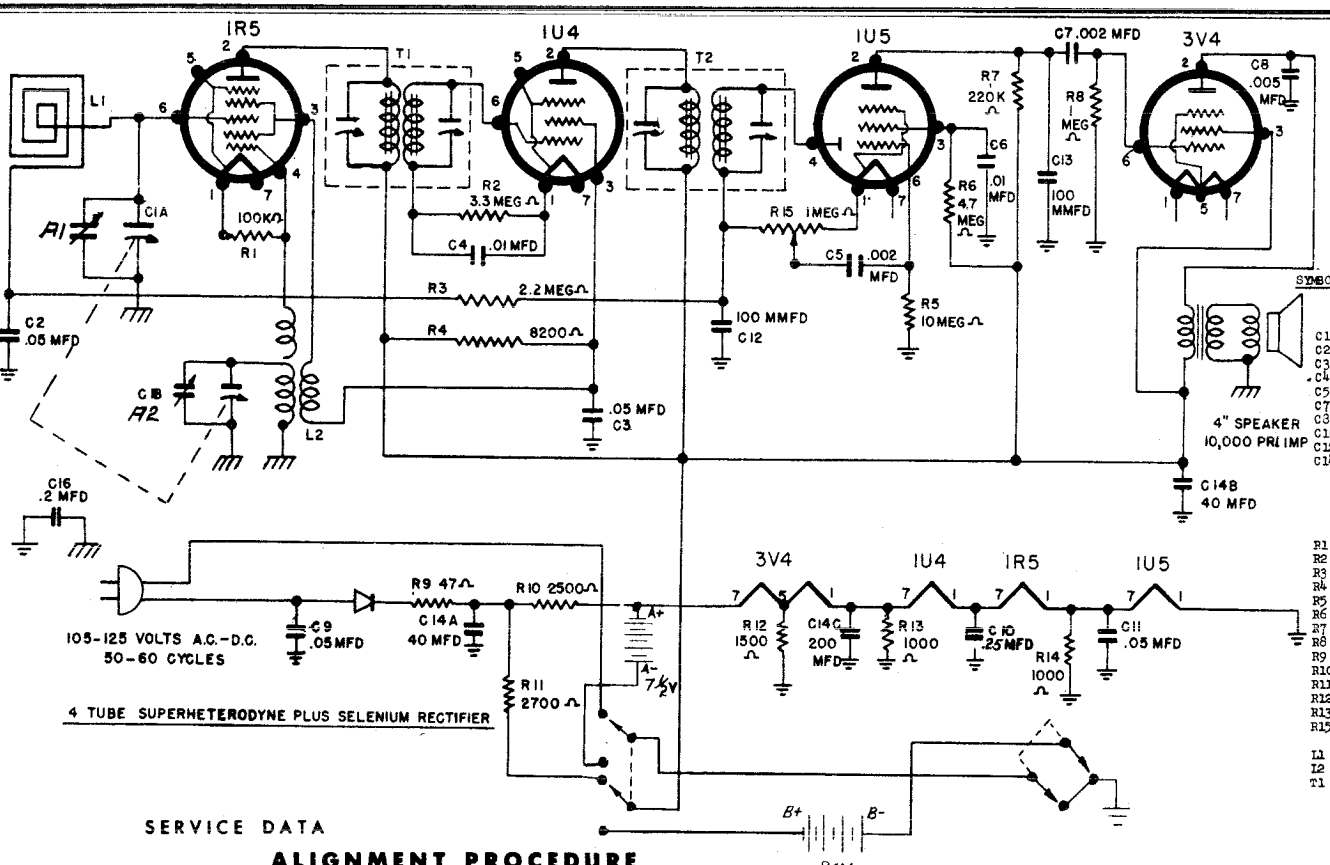
COILS

OSCILLATOR COIL
INPUT I.F. TRANSFORMER
OUTPUT IF TRANSFORMER
LOOP ANTENNA

MISC.

5 INCH P.M. SPEAKER WITH OUTPUT TRANSFORMER
CABINET (SPECIFY COLOR)
KNOB POINTER
SELECTOR KNOB
VOLUME KNOB

FREQ RANGE:
ALIGN AT
TRACK AT



4 TUBE SUPERHETERODYNE PLUS SELENIUM RECTIFIER

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-17A	VARIABLE CONDENSER, 2 GANG, 420 & 162 MMFD
C2	32-4	TUBULAR PAPER CONDENSER, .05 MFD/200 V
C3,9,11	32-5	" " " , .05 MFD/400 V
C4,6	32-29	" " " , .01 MFD/200 V
C5	32-17	" " " , .002 MFD/200 V
C7	32-50	" " " , .002 MFD/400 V
C8	32-20	" " " , .005 MFD/200 V
C10,16	32-13	" " " , .2 MFD/400 V
C12,13	35-4	MICA CONDENSER, 100 MMFD/500 V
C14	31-32	ELECTROLYTIC CONDENSER 40MA0 MFD/150V X 200 MFD/15 V
		RESISTORS
R1	20-49	100 K - 1/4 W - 20%
R2	20-46	3.3 MEG - 1/2 W - 20%
R3	20-6	2.2 MEG - 1/2 W - 20%
R4	20-42	8.2 K - 1/2 W - 20%
R5	20-57	10 MEG - 1/4 W - 20%
R6	20-53	4.7 MEG - 1/4 W - 20%
R7	20-74	220 K - 1/4 W - 20%
R8	20-14	1 MEG - 1/2 W - 20%
R9	20-31	47 OHMS - 1 W - 10%
R10	20-143	2.5K - 8 W - 5%
R11	20-134	2.7 K - 1 W - 10%
R12	20-109	1500 OHMS - 1/2 W - 10%
R13,14	20-67	1000 OHMS - 1/2 W - 10%
R15	50-17	VOLUME CONTROL, 1 MEG, D.P.S.T. SWITCH
L1	62-16	LOOP
L2	60-13	OSCILLATOR COIL
T1	61-23	I.F. TRANSFORMER
	65-2A	SPRING SLIDE SWITCH, 3 P.D.T.
	73-3	SELENIUM RECTIFIER, MA.
	80-16	4" PM SPEAKER WITH OUTPUT TRANSFORMER
	120-50	CABINET
	121-7	FRONT PANEL AND BAFFLE BOARD
	Y122-25	SELECTOR KNOB
	Y122-24	VOLUME KNOB
	123-23	METAL DIAL PLATE

SERVICE DATA

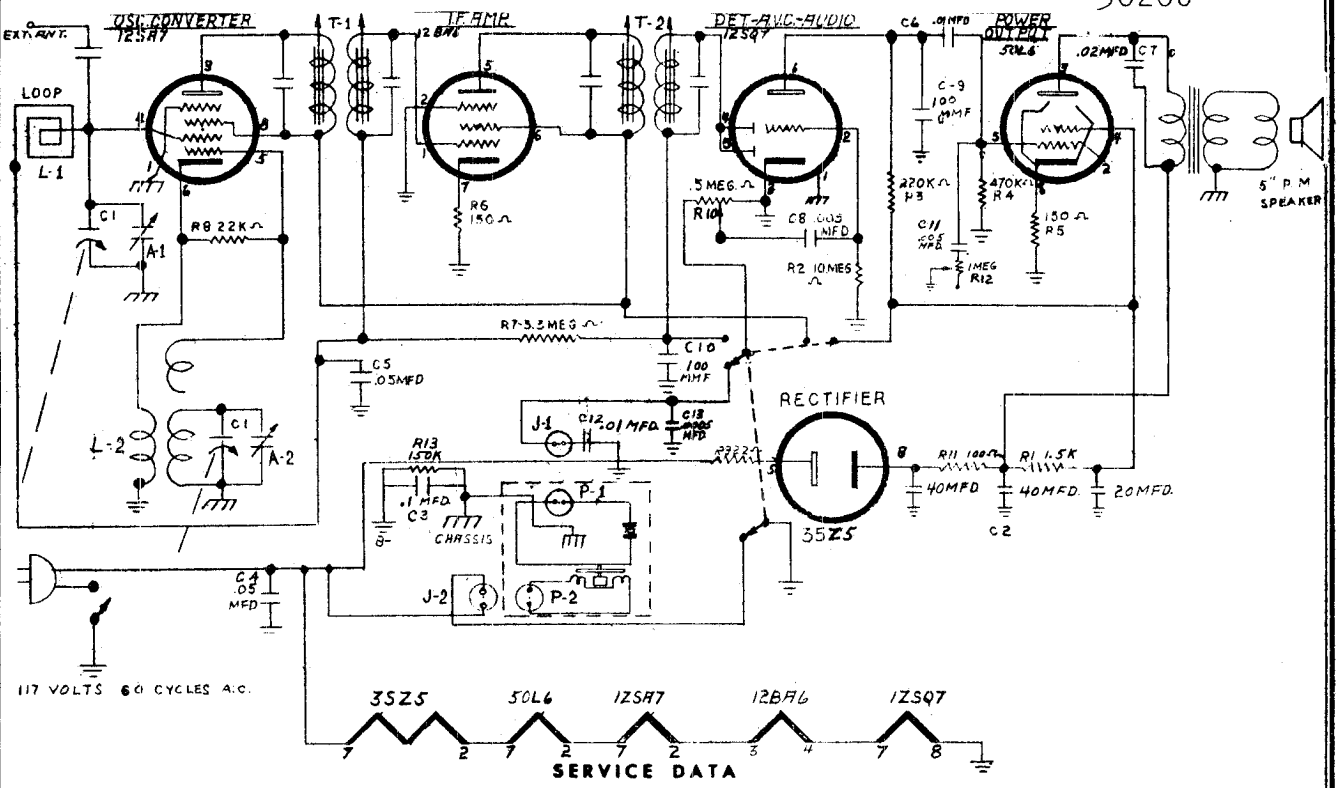
ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near .4 volts(.05watt)

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	1R5 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	1R5 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

*Seven markings on the dial bracket represent respectively 1600KC, 1400KC, 1100KC, 900KC, 700KC, 600KC, and 550KC reading from left to right. These points are to be used for the alignment of the receiver.

MODELS 5020, 5020U



ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	GRID 12SA7	B—	Rotor full open (Plates out of mesh)	Input and output trimmer of IF cans
1650 kc	0.1 mfd.	GRID 12SA7	B—	Rotor full mesh (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop	B—	1500 kc*	Antenna trimmer A1

* Nine markings on dial represent respectively 550 Kc, 600 Kc, 700 Kc, 800 Kc, 900 Kc, 1100 Kc, 1250 Kc, 1450 Kc, and 1600 Kc reading from left to right. These points are to be used for the alignment of the receiver.

MODEL 5020, 5020U

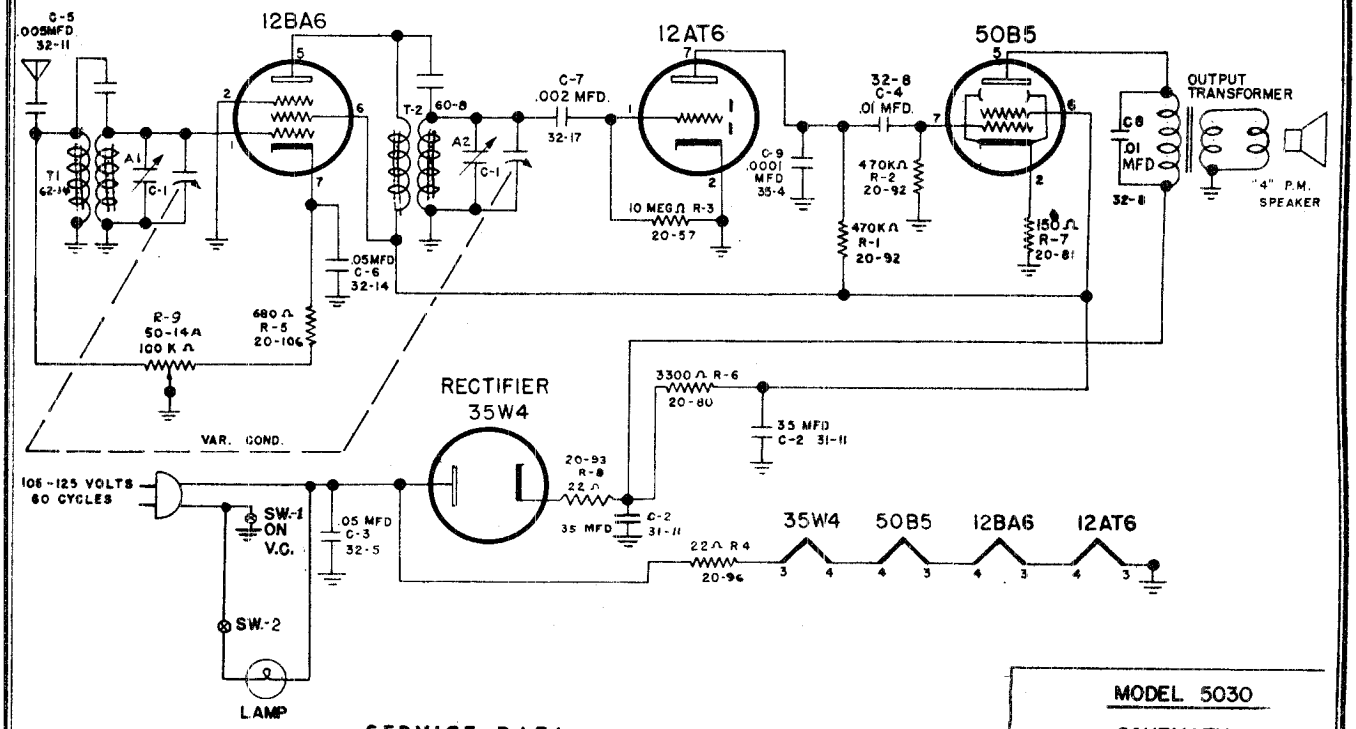
REPLACEMENT PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CAPACITORS
C1	30-20A	VARIABLE CONDENSER, 2 GANG, 420 MMF and 162 MMF
C2	31-30A	ELECTROLYTIC COND., 40x40x20 MFD, 150 V.
C3	32-57	.1 MFD - 400 V TUBULAR PAPER
C4	32-55	.05 MFD - 400 V MOULDED PHENOLIC
C5	32-4	.05 MFD - 200 V TUBULAR PAPER
C6, 12	32-1	.01 MFD - 400 V " "
C7	32-3	.02 MFD - 400 V " "
C8	32-35	.005 MFD - 600 V " "
C9, 10	35-4	100 MMF - 500 V MICA
C11	35-28	.005 MFD DISC CERAMIC G. P.
C13	35-13	.0005 MFD MICA
		RESISTORS
R1	20-73	1.5 K - 1 WATT - 20%
R2	20-57	10 MEG - 1/4 WATT - 20%
R3	20-74	220 K - 1/4 WATT - 20%
R4	20-92	470 K - 1/4 WATT - 20%
R5	20-81	150 OHM - 1/2 WATT - 20%
R6	20-89	150 OHM - 1/4 WATT - 20%
R7	20-56	3.3 MEG. - 1/4 WATT - 20%
R8	20-82	22 K - 1/4 WATT - 20%
R9	20-93	22 OHM - 1/2 WATT - 20%
R10	50-19	VOLUME CONTROL, 1/2 MEG., S.P.S.T. SWITCH
R11	20-40	100 OHM - 1/2 WATT - 20%
R12	50-31	TONE CONTROL, 1 MEG., 3 P.D.T. SWITCH
R13	20-144	150 K - 1/3 WATT - 20%

		COILS
L1	62-20	LOOP ANTENNA
L2	60-18	OSCILLATOR COIL
T1, 2	61-11	I.F. TRANSFORMER
		MISC.
	80-23B	5 INCH. P. M. SPEAKER WITH OUTPUT TRANSFORMER
J-1	44-15A	PHONO PICKUP JACK WITH CABLE
J-2	44-14	PHONO MOTOR JACK WITH LEADS
	120-65	CABINET (COMPLETE)
	122-26	KNOB POINTER
	122-45	KNOB (SELECTOR, VOLUME)
	130-89	PLASTIC DIAL
	150-1	RECORD CHANGER

DATE 7-12-50 No. 130-96

MODEL 5030



MODEL 5030

SCHEMATIC

105-125 VOLTS, 60 CYCLES

RANGE 540-1650 K.C.

SERVICE DATA

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				Tuner Adjustment	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
1650 kc	50 mmf	Antenna**	Chassis	Rotor full open (Plates out of mesh)	RF trimmer A2 Antenna trimmer A1
1500 Kc	50 mmf	Antenna**	Chassis	1500 Kc*	RF Trimmer A2 Antenna Trimmer A1

* Seven markings on the tuning knob represent respectively 550 Kc, 600 Kc, 700 Kc, 900 Kc, 1100 Kc, 1400 Kc, and 1650 Kc. reading from right to left. These points are to be used for the alignment of the receiver.

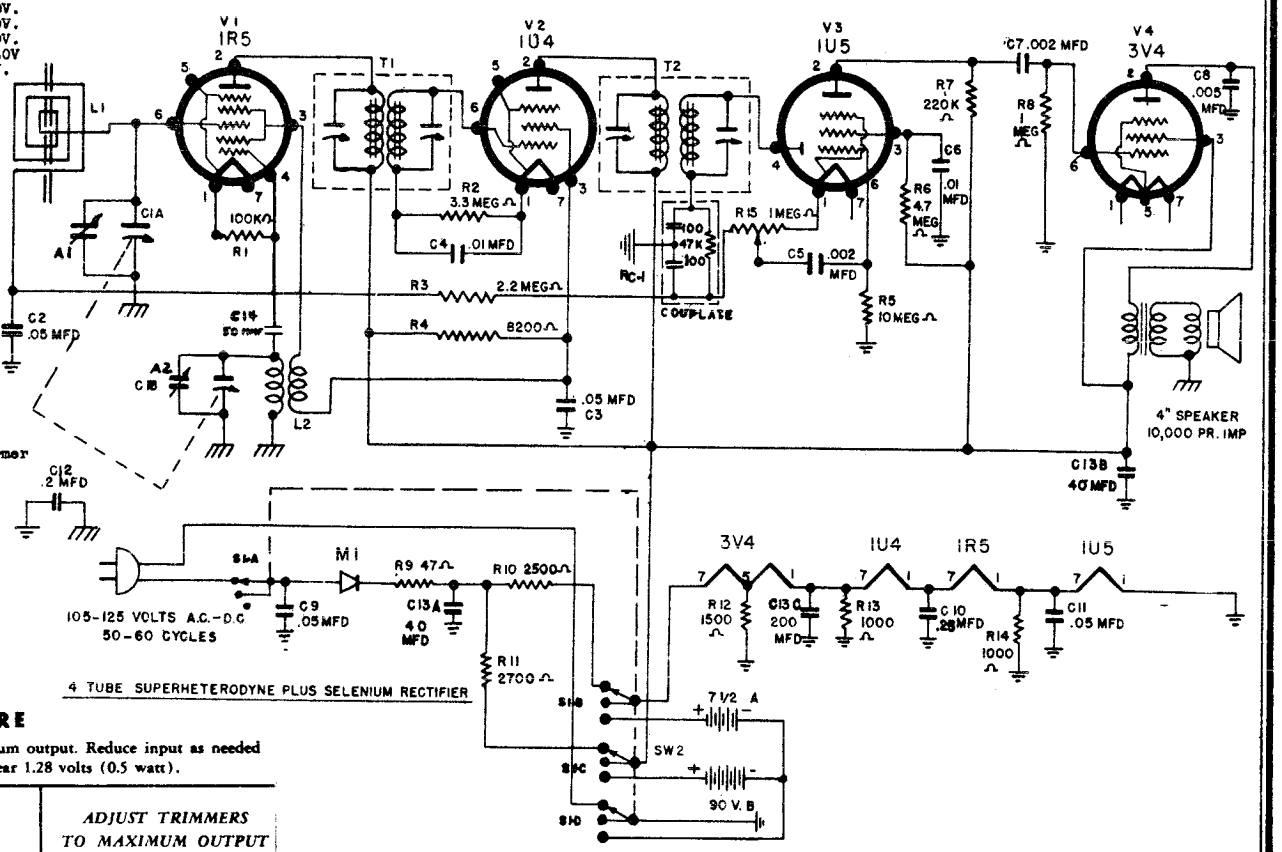
** Disconnect antenna bank by unsoldering

PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-36A	Variable Condenser, 2 Gang, 420 & 420 Med.
C2	31-11	Electrolytic Condenser, 35 35 MFD/150V
C3	32-5	Tubular Paper Condenser, .05MFD/400V
C4,8	32-8	" " " , .01MFD/150V
C5	32-11	" " " , .005MFD/150V
C6	32-4	" " " , .05MFD/200V
C7	32-17	" " " , .002MFD/150V
C9	35-4	Mica Condenser, .0001MFD/500V
		RESISTORS
R1,2	20-92	470 K - ½W - 20%
R3	20-57	10 Meg. - ½W - 20%
R4	20-96	22 Ohms - 1W - 20%
R5	20-106	680 Ohms - ½W - 20%
R6	20-80	3.3K - 1W - 20%
R7	20-81	150 Ohms - ½W - 20%
R8	20-93	22 Ohms - ½W - 20%
R9	50-33	Volume Control, 100K, with Switch

		Miscellaneous
T1	62-14	Antenna Coil
T2	60-8B	R.F. Coil
	80-17A or 80-18A	4" P.M. Speaker
SW2	65-14B	Switch, A.C. Plunger Type
	11-70	Light Socket
	10-117A	Window Retainers
	114-85	Felt Bumper Screws
	140-12	Frosted Window
	120-64D	Cabinet
	122-51	Selector Knob
	122-52	Volume Knob

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-32B	Variable Condenser, 2 gang, 420 E 162 mmf
C2, 3, 9, 11	32-5	Tubular Paper Condenser, .05mfd/400V.
C4, 6	32-29	" " " .01mfd/200V.
C5	32-17	" " " .002mfd/200V.
C7	32-50	" " " .002mfd/400V.
C8	32-20	" " " .005mfd/200V.
C10	32-56	" " " .25mfd/400V.
C12	32-13	" " " .2mfd/400V.
C13	31-31A	Electrolytic Condenser, 40x40mfd/150V x200mfd/25V.
C14	35-2	Mica Condenser, 50mmf/250V.
RC-1	35-24	Couplate, 100mmf, 100mmf, 47Kres.
		RESISTORS
R1	20-49	100K - ½W - 20%
R2	20-46	3.3Meg - ½W - 20%
R3	20-6	2.2 Meg - ½W - 20%
R4	20-42	8.2K ½W - 20%
R5	20-57	10 Meg - ½W - 20%
R6	20-53	4.7Meg - ½W - 20%
R7	20-74	220K - ½W - 20%
R8	20-14	1.0Meg - ½W - 20%
R9	20-31	47OHMS - 1W - 10%
R10	20-145	2.5K - 8W - 5%
R11	20-134	2.7K -1W - 10%
R12	20-109	1.5K - ½W - 10%
R13, 14	20-67	10000OHMS - ½W - 10%
R15	50-28	Volume Control, 1.0Meg
L1	62-24	Loop
L2	60-24	Oscillator Coil
S1	65-13	Switch, 4.P.D.T.
T1, 2	61-23	I.F. Transformer
	73-3	Selenium Rectifier
	80-26	4"P.M. Speaker with Output Transformer
	A120-6	Cabinet
	120-57A	Dial Crystal
	122-43	Volume Knob
	122-44	Switch Knob



4 TUBE SUPERHETERODYNE PLUS SELENIUM RECTIFIER

SERVICE DATA

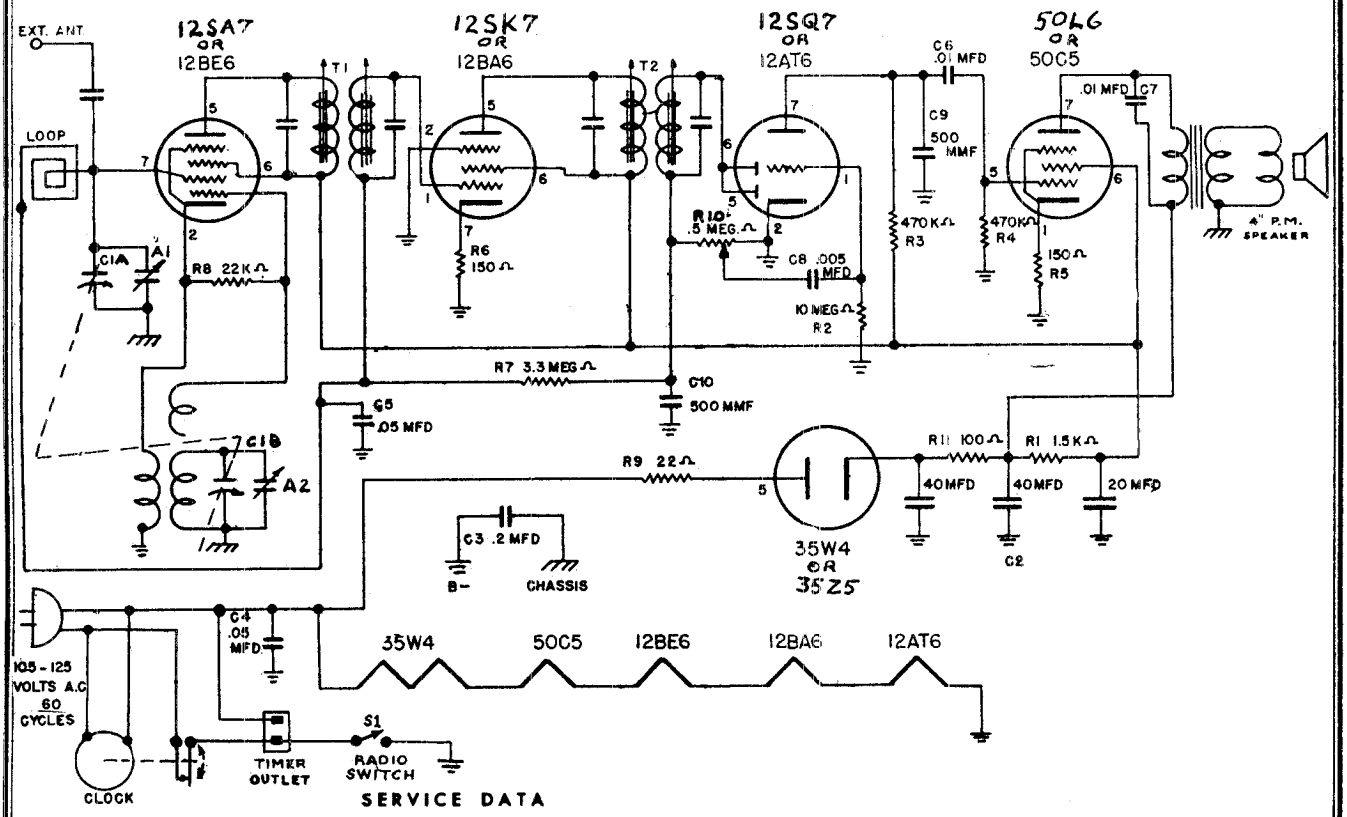
ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	1R5 grid	B	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	1R5 grid	B	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

*Eight markings on the dial bracket represent respectively 1600KC, and 1300KC, 1150KC, 1000KC, 850KC, 750KC, 650KC, and 550KC reading clockwise. These points are to be used for the alignment of the receiver.

MODEL 5057U



SERVICE DATA

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full mesh (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

*Nine markings on the dial represent respectively 540KC, 600KC, 700KC, 800KC, 900KC, 1100KC, 1300KC, 1500KC, and 1650KC reading from left to right. These points are to be used for the alignment of the receiver.

REPLACEMENT PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
		CONDENSERS
C1	30-26	VARIABLE CONDENSER, 2 GANG, 420 & 162 MMF.
C2	31-30A	ELECTROLYTIC CONDENSER, 40MFD/20 MFD/150 V
C3	32-13	TUBULAR PAPER CONDENSER, .2 MFD/400 V
C4	32-39	" " " , PHENOLIC, .05 MFD/400V
C5	32-4	" " " , .05 MFD/200 V
C6,7	32-1	" " " , .01 MFD/400 V
C8	32-20	" " " , .005 MFD/600 V
C9,10	33-13	MICA CONDENSER, 500 MMFD/500 V
		RESISTORS
R1	20-73	1500 OHMS - 1 W - 20%
R2	20-57	10 MEG. - 1/4 W - 20%
R3,4	20-92	470 K - 1/4 W - 20%
R5	20-81	150 OHMS - 1/2 W - 20%
R6	20-69	150 OHMS - 1/4 W - 20%
R7	20-56	3.3 MEG. - 1/4 W - 20%
R8	20-82	22 K - 1/4 W - 20%
R9	20-93	22 OHMS - 1/2 W - 20%
R10	50-27	VOLUME CONTROL, 0.5 MEG.
R11	20-40	100 OHMS - 1/2 W - 20%
	60-18	OSCILLATOR COIL
T1,2	61-11	IF TRANSFORMER
	A-125-34-B	BACK ASSEMBLY, INCL. LOOP
S1	65-11	RADIO SWITCH
	80-25A	4"P.M. SPEAKER WITH OUTPUT TRANSFORMER
	120-54	CABINET (WITHOUT CLOCK INSERT)
	120-48	CENTER CLOCK INSERT
	122-31	KNOB (2)
	140-7	CLOCK

DESCRIPTION

1. General

The new LEARAVIAN Model P-10B is a compact portable radio receiver employing six tubes in a highly sensitive superheterodyne circuit designed for reception in three bands - Marine Band - 2.0 to 5.5 MC - ship-to-shore communications, Coast Guard weather reports, universal radio service for aircraft, U.S. Standard Time Signals, 2.5 to 5.0 MC shortwave broadcasts; Standard Broadcast Band - 550 to 1600 K C - entertainment, newcasts and weather information; Airways Band - 200 to 400 KC - airport communications, weather reports via range stations and airways 4-course beacon signals (A/N).

A built-in loop antenna provides adequate reception on all bands. As an added feature a panel mounted jack offers a convenient connection for an external antenna which is useful under adverse receiving conditions or where the set is used as a direction finder.

The new LEARAVIAN is designed for operation on 105-125 volts, 50-60 cycles ac (alternating current) or 105-125 volts dc (direct current) or battery pack. Special "refresher battery charging" circuits are incorporated for appreciably extending the life of the battery pack.

A panel mounted jack is also provided for plugging in headphones. When the headphones are plugged in the loud speaker is automatically made inoperative.

2. Power Supplies (AC, DC and Battery Pack).

CAUTION

DO not plug in this radio receiver to any other power supply outlet than specified below or severe damage to the equipment may result.
If you are in doubt as to the voltage rating of the power supply, consult the building electrician or your local power company before inserting plug of electric attachment cord.

Any of the following sources of electrical power are suitable for operation of the LEARAVIAN Model P-10B:

a) Ac (alternating current) - 105 to 125 volts 50 to 60 cycle.
b) Dc (direct current) - 105 to 125 volts.
c) Battery packs (any one of the following types.)
   General - No. 60A6F6.
   Eveready - No. 753.
   Burgess - No. F6A60.
   Ray-O-Vac - No. 60A-6F.

3. Tube Complement

The LEARAVIAN Model P-10B is shipped from the factory with a complete set of fully tested tubes installed in their proper sockets. The tube complement is as follows:

1 Type 1U4 Radio-frequency amplifier
1 Type 1R5 Converter (r-f).
1 Type 1U4 Intermediate-frequency amplifier.
1 Type 1U5 Detector-AVC-1st Audio amplifier.
1 Type 3V4 Power Amplifier.
1 Type 11723 Rectifier

4. Frequency Bands.

The frequency bands are as follows:

Dial Identification		Band	Frequency
Marine	(Blue)	Short-Wave	1960 to 5750 KC
BC	(Red)	Broadcast	550 to 1650 KC
Range	(Green)	Long-wave	1.95 to 5.5 MC

MODEL P-10B

The color of each dial scale corresponds with the color of one of the positions on the rim type band switch knob located at the right hand edge of the dial. Changing from one band to another is accomplished simply by rotating the knob up or down so that the desired band is in line with the indicating arrow. The proper dial scale for that band will then be in position also and in line with the indicating arrow. This is the scale that would be observed for tuning stations in the desired band.

INSTALLATION

NOTE

Since the LEARAVIAN Model P-10B is designed primarily as a portable radio receiver, very little consideration need be given the subject of "Installation." However, this set is also highly adaptable for marine and aviation use where a combination entertainment and utility portable receiver is desired. For these applications, an external antenna (to be used in conjunction with the built-in loop antenna) may be used to advantage as described in the following paragraphs.

1. Connecting to AC or DC (105 to 125 volts only).

The electric attachment cord for AC or DC operation is contained inside the cabinet and is arranged so it can be withdrawn after the back of the cabinet is opened. A notch for clearing the cord then permits the cabinet back to be closed. When the receiver is to be used on battery power, the cord can be replaced inside the cabinet.

2. Installing Battery Pack.

Ample space is provided in the bottom of the cabinet for any one of the correct types of battery packs listed. With the cabinet back opened, the battery holding bracket will be found held to the bottom of the cabinet with two screws. Remove the screws and bracket, then place battery pack in position as shown in Fig. 2. The battery socket should be on the right so that the battery connecting plug can be inserted. Replace battery bracket and fasten firmly with the two screws. Insert battery connecting plug and close cabinet back.

3. Installing External Antenna.

An external antenna may be used with the LEARAVIAN P-10B to improve rec-reception under adverse conditions. The effectiveness of an outside (external) antenna depends largely on its location and length and no specific instructions can be given which will be found ideal under all circumstances.

In general the antenna should be about 20 to 40 ft. long. Small size insulated wire is usually most convenient. DO NOT USE SHIELDED WIRE. The insulation must be removed from the end of the lead-in to make connection to the INNER connector of a standard phone plug (PL-55) which is then plugged into the jack marked "ANT".

Marine or aircraft installations will be governed to a great extent by structural facilities. In all cases, however, the external antenna should be well constructed. Do not shield the lead-in. Be sure that neither the antenna proper nor the lead-in interferes with the existing controls or equipment of the boat or airplane. Secure lead-in at intervals throughout its length to prevent fouling.

In most cases, the LEARAVIAN performs well in a boat or airplane that does not have shielded ignition circuits. However, shielding of spark plugs, magnetos and generator, along with all ignition wires is very desirable. Complete shielding will remove all trace of background ignitionnoises which tend to reduce the effective receiving range of the radio.

1. Warning on Power Source.

Do not connect this receiver to any power supply other than 105-125 volts 50-60 cycles ac (alternating current) or 105-125 volts dc (direct current) or battery packs as specified previously.

2. Selecting Power Source.

Move Power Selector Switch Knob (at left end of dial) so that marking on knob ("BATT" of "AC") is opposite the indicating arrow, depending on whether battery operation or AC-DC operation is desired. DO NOT MOVE KNOB TO "CHARGE " UNTIL DIRECTIONS IN PARAGRAPH 10 HAVE BEEN NOTED CAREFULLY.

3. Applying Power.

With the Power Selector Switch knob in the correct position, turn the ON-OFF switch and Volume Control knob (at left of handle) clockwise until a click is heard. Further rotation increases volume. Power is now being applied to the radio. On "BATT" (Battery) operation, stations can be tuned in immediately, but on "AC" (AC or DC) operation allow a few moments for the tubes to heat up. Where the set is plugged in to dc (direct current) and no response is obtained after one minute, reverse the electric attachment plug in the socket.

4. Selecting Frequency Band.

Move Band Selector switch knob (at right end of dial) up or down so that marking on knob ("RANGE", "BC", or "MARINE") is opposite the indicating arrow, depending on which band is desired. The dial scales are so arranged that as the knob is moved to any of the three positions, the corresponding scale will move simultaneously and be in line with the indicating arrow.

5. Tuning in a Desired Station.

Turn Station Selector knob (at right end of handle) to right or left until dial pointer is over the approximate frequency reading of the desired station (as read on the dial scale opposite the indicating arrow).

Then advance (turn clockwise) the volume control knob until reception is audible. Turn station selector knob right or left slowly until desired station is perfectly tuned in (on the "center" of the station) and adjust volume as required. Never reduce the volume by tuning "off" the station since this will cause distorted reception.

6. Loop Antenna Directional Effects.

The built-in loop antenna provides a directional receiving effect which is noticeable when the LEARAVIAN is lifted by the handle and turned slowly first in one direction and then the other. The station will come in strongest when either end of the set faces the direction of the station, and the station will be weakest or fade out (null) when either the front(speaker) or back faces that same station.

This directional effect serves a three-fold purpose:

a) Weak or distant stations can be received better by rotating the set until they are best received.

b) Local noise interference can be minimized on a particular station by rotating the set until the signal-to-noise ratio is best.

c) Direction finding is possible since the fade out or null is comparatively "sharp" when the front or back of the set faces the station.

NOTE For direction finding applications of the LEARAVIAN, an external antenna plugged in and used as described in par. 7 is recommended.

MODEL P-10B

7. Direction Finding.

To determine the direction of a received station, slide the RECEIVING DIRECTION FINDING switch to the DIRECTION-FINDING positions and plug in the external antenna. Rotate set until station fades out, then unplug external antenna and slowly rotate set first in one direction and then the other so that the exact aural-null point is determined. At this point the speaker of the set is pointing to the station.

8. Headphone Reception.

To connect headphones to the LEARAVIAN, attach a Type PL-55 (or equivalent size) phone plug to the cord and plug in to the "PHONES" jack (to the left of the "RECEIVING-DIRECTION FINDING" switch).

When phones are plugged in, the loudspeaker is automatically cut out of the circuit and therefore silenced.

NOTE Headphones having 200 ohms resistance are recommended for use with the LEARAVIAN.

9. Shutting OFF Power.

Turn ON-OFF switch and Volume Control Knob counter-clockwise until a click is heard. This shuts off power, either from AC-DC or battery.

Be sure to shut off power when through using the set, especially, if the set is being operated on battery.

10. "Charging Battery"

The useful life of the battery pack may be extended appreciably by periodic "charging". This is conveniently done by plugging the attachment cord in to 105 to 125 volt, 50 to 60 cycle ac or 105 to 125 volt dc electric outlet and moving the Power Selector Switch Knob to "charge". Then apply power by turning ON-OFF switch to "ON" position.

For best results it is recommended that the battery be charged twice as long as it was discharged. For example, if the set has been battery operated for a period of four hours, the battery should be charged for approximately eight hours. It is desirable to charge the battery after each period of battery operation, rather than charging for a long time to cover several operative periods.

NOTE During the charge cycle, the radio is inoperative.

On completion of the charge cycle always return the Power Selector Switch to either "AC" or "BATT" positions, even if the ON-OFF switch is turned "OFF".

CARE AND MAINTENANCE

NOTE There are no adjustments of any king to be made on the chassis or speaker.

1. Battery Replacement.

After extended use of the pattery pack its reserve power may be weakendd sufficiently so that the "CHARGE" operation will no longer be effective and the performance of the set on "BATT" may not be satisfactory. The battery pack should then be replaced. Replacement battery packs may be obtained from your local Lear dealer or from radio supply houses. Be sure the number of the battery corresponds with one of the listed previously.

To replace battery, refer to par. "Installing Battery Pack". Carefully disconnect battery cable attachment plug from old battery and remove battery bracket permitting removal of battery.

2. Tube Replacement.

The Tubes in the set should be checked occassionally either by taking them out and having them tested or by obtaining a new set of tubes and inserting them in the sockets, one at a time, noting any difference in performance.

The type of tubes required and the position of these tubes are clearly shown in Fig. 2. The type number is etched or stamped on each tube. Should it be necessary to replace any tubes, gently rotate the tube until the pins drop into the socket. Then push down until tube is seated firmly in socket.

Alignment Chart
(See diagram Fig. 2)

Step	Alignment of	Generator Connected	Dummy Antenna	Generator Frequency	Receiver Dial Setting	Adjustment ***
1.	Set dial pointer to thin line at end of dial with tuning gang fully closed.					
2.	I.F.	r-f section of gang and ground	.01 mf	455 kc	1000 kc	T5 Bottom and top
3.						T4 Bottom and top
4.	Range Band	Ant. Jack and ground	30 mmf	400 kc	400 kc	C22 (osc. trimmer)
5.						C16 (r-f trimmer)
6.						C7 (Ant. trimmer)
7.				220 kc	220 kc*	C20 (osc. padder)
8.	Repeat steps 1,5,6 and 7 until no further improvement is obtained.					
9.	Broadcast Band	Ant. jack and ground	30 mmf	1500 kc	1500 kc	C21 (osc. trimmer)
10.						C15 (r-f trimmer)
11.						C6 (ant. trimmer)
12.				600 kc	600 kc*	C19 (osc. padder)
13.	Marine Band	Ant. jack & ground	30 mmf	5 mc	5 mc*	C13 (osc. trimmer)
14.						C12 (r-f trimmer)
15.						C4 (ant. trimmer)
16.		**	1 ft. lead	5 mc	5 mc	C4 (loop trimmer)

*Rock tuning gang rotor while adjusting.
** Place 1 ft. antenna lead from generator near loop.
The loop and antenna trimmer C4 is reached through hole in back cover of cabinet.
*** All adjustment are for maximum output.

MODEL P-10B

VOLTAGE MEASUREMENTS								
Tube		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
1U4	VT1	2.6	93	93	.3	-	-	4
1R5	VT2	0	93	55	-8	0	-	1.3
1U4	VT3	4	93	93	-	3.9	-.4	5.4
1U5	VT4	1.3	40	25	-	-	-	2.6
3V4	VT5	5.4	90	93	93	6.5	-	7.8
11723	VT6	-	117AC	0	0	115AC	120	-
RESISTANCE MEASUREMENTS								
1U4	VT1	45	*200	*0	2M	45	5M	60
1R5	VT2	-	*16	15 K	100K	.2	5M	28
1U4	VT3	60	*24	0	-	60	1.6	70
1U5	VT4	28	470 K	5M	1M	1M	10M	45
3V4	VT5	70	650	0	0	75	2.2	95
11723	VT6	-	-	700	0	725	2400	-

NOTES:

All resistance measurements are to artificial ground (indicated by symbol ⏚ on schematic diagram); those marked * are from the 90 volt positive pin on the battery plug (see schematic diagram no. 64165).

All voltage measurements are to artificial ground (indicated by symbol ⏚ on schematic diagram). All are DC unless otherwise indicated.

Measurements made with 20,000 ohm per volt meter.

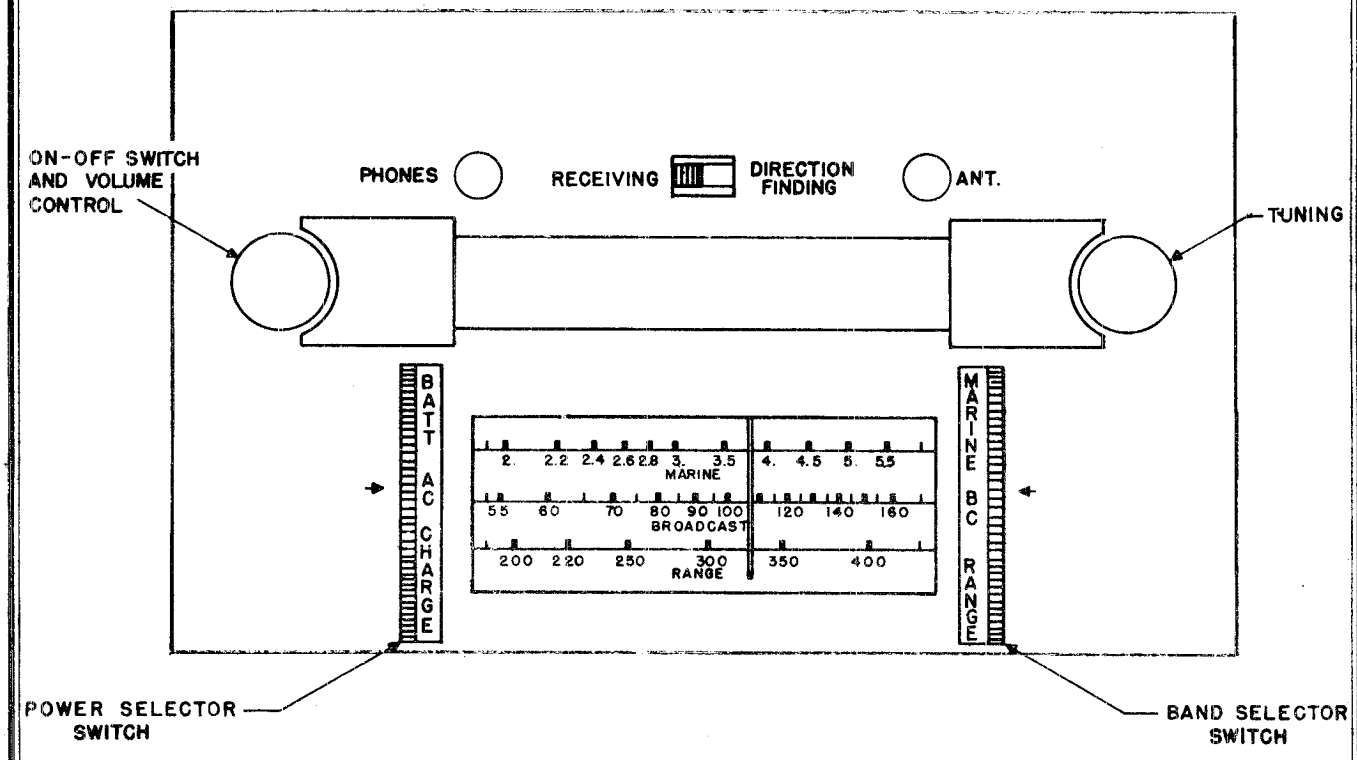


FIG. 1 OPERATING CONTROLS

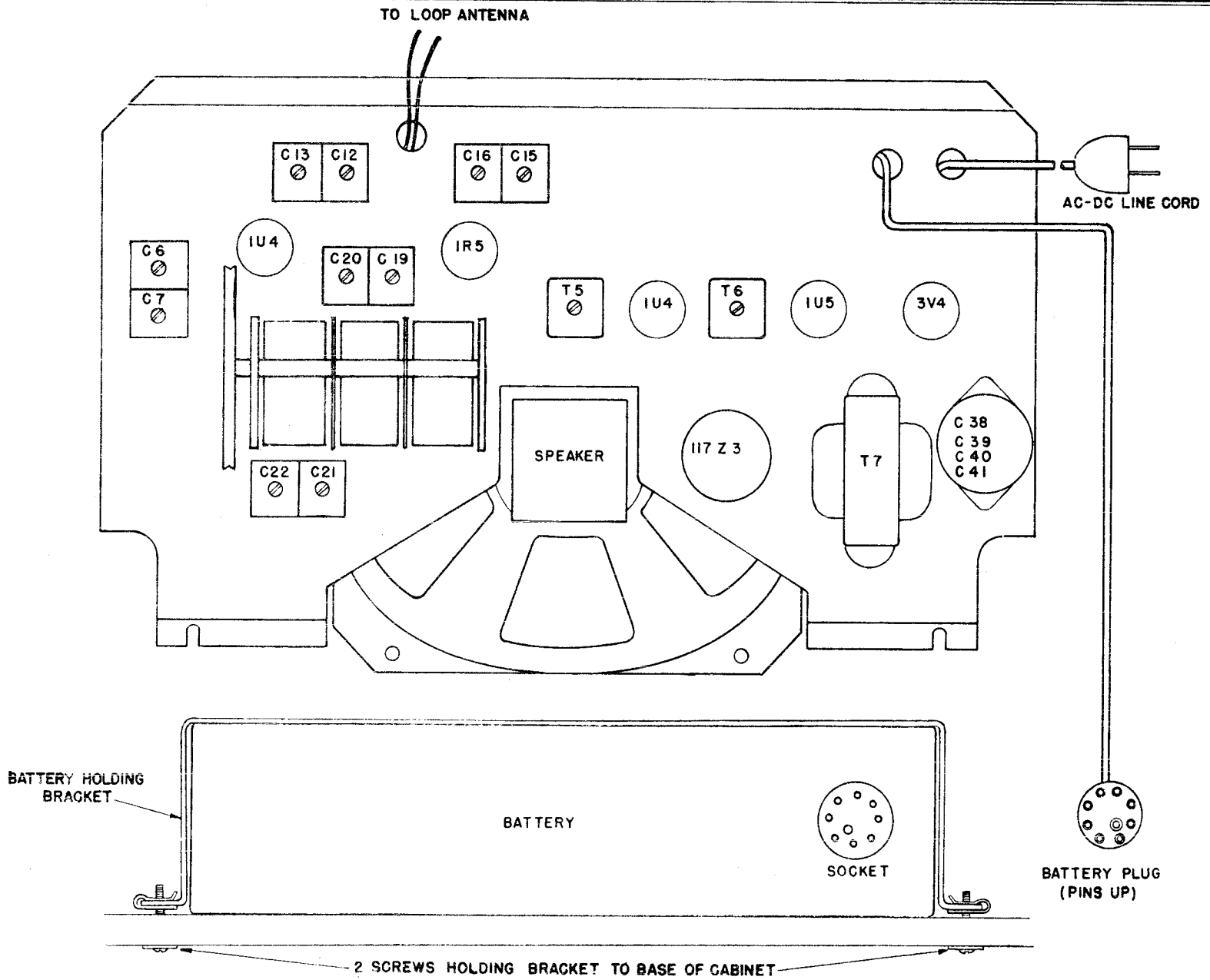
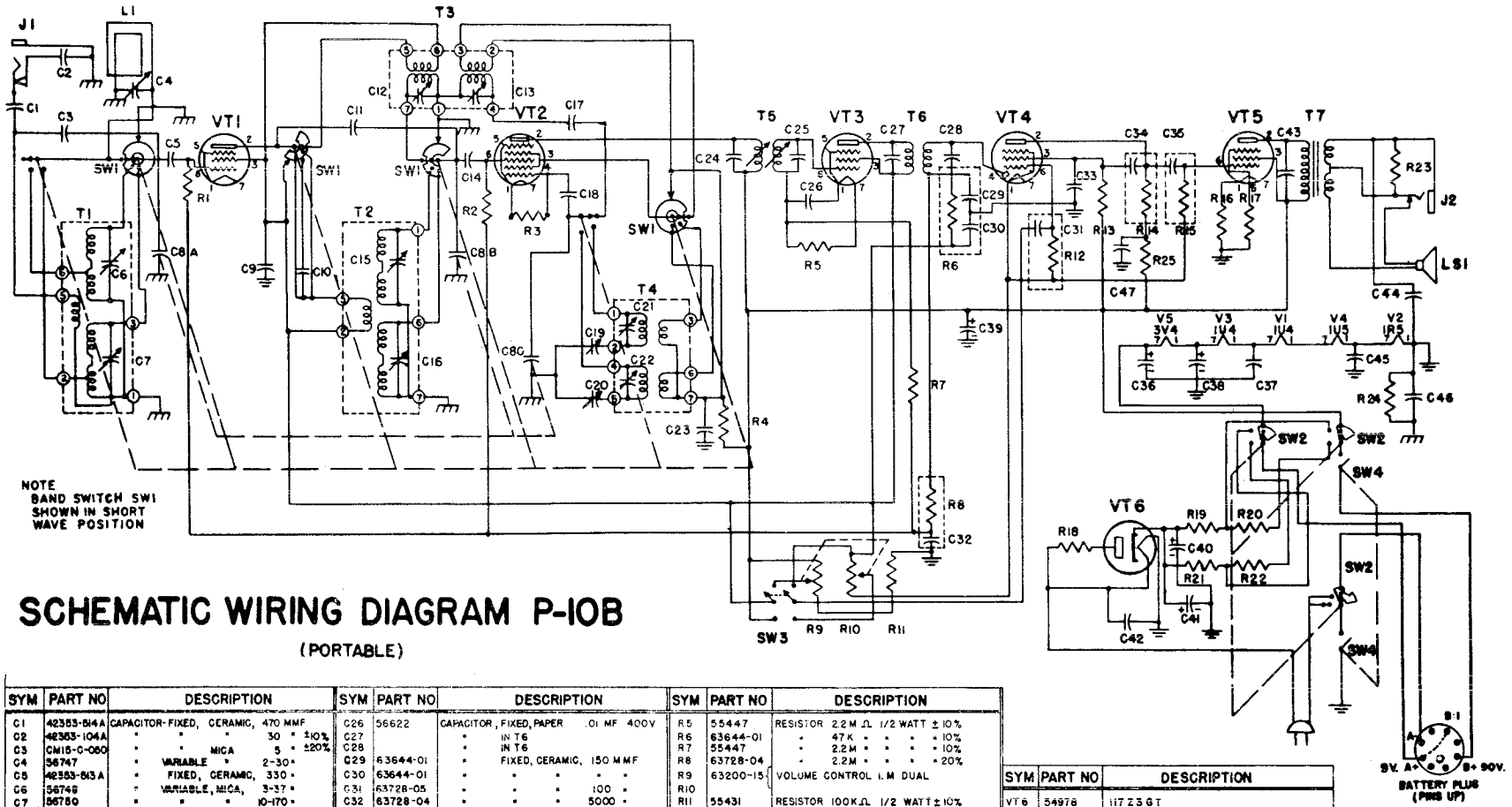


FIG. 2 TUBE PLACEMENT AND ALIGNMENT DIAGRAM



NOTE
BAND SWITCH SW1 SHOWN IN SHORT WAVE POSITION

SCHEMATIC WIRING DIAGRAM P-10B

(PORTABLE)

SYM	PART NO	DESCRIPTION
C1	42353-514A	CAPACITOR-FIXED, CERAMIC, 470 MMF
C2	42353-104A	" " " 30 " ±10%
C3	CM15-C-050	" MICA 5 " ±20%
C4	56747	" VARIABLE " 2-30 "
C5	42353-513A	" FIXED, CERAMIC, 330 "
C6	56748	" VARIABLE, MICA, 3-37 "
C7	56750	" " " 10-170 "
C8A		
C8B	63763	" " AIR, 3 GANG
C8C		
C9	56603	" FIXED, PAPER .1MF 200 V
C10	42353-108A	" " CERAMIC 50 MMF ±10%
C11	CM15-C-050	" " MICA 5 " ±20%
C12	56748	" VARIABLE, MICA 3-37 "
C13	56748	" " " " "
C14	42353-513A	" FIXED, CERAMIC, 330 "
C15	56748	" VARIABLE, MICA 3-37 "
C16	56750	" " " 10-170 "
C17	CM30-C-1502	" FIXED, " 1500 " ±2%
C18	42353-308A	" " CERAMIC, 100 " ±10%
C19	56754	" VARIABLE, MICA, 100-590 "
C20	56751	" " " 20-270 "
C21	56748	" " " 3-37 "
C22	56750	" " " 10-170 "
C23	56600	" FIXED, PAPER .05 MF
C24		" IN T5
C25		" IN T5
C26	56622	" FIXED, PAPER .01 MF 400V
C27		" IN T6
C28		" IN T6
C29	63644-01	" FIXED, CERAMIC, 150 MMF
C30	63644-01	" " " " "
C31	63728-05	" " " 100 "
C32	63728-04	" " " 5000 "
C33	56603	" " PAPER .1 MF 200 V
C34	63728-07	" " CERAMIC 100 MMF
C35	63728-06	" " " " "
C36	42289	" ELECTROLYTIC 100 MF 15 VDC
C37	56603	" FIXED, PAPER, .1 MF 200 V
C38		" ELECTROLYTIC 100 MF 12 VDC
C39		" " 40 " 150 "
C40	63785	" " " " " "
C41		" " " " " "
C42	56628	" FIXED, PAPER .05 MF 400 V
C43	56613	" " " .001 " " V
C44	56622	" " " .01 " " V
C45	56603	" " " .1 " 200V
C46	56661	" " " .2 " 600V
C47	56603	" " " .1 " 200V
R1	55492	RESISTOR 3.3 M Ω 1/2 WATT ± 20%
R2	55492	" " " " " 20%
R3	55431	" 100K Ω " " " 10%
R4	55421	" 15 K Ω " " " 10%
R5	55447	RESISTOR 2.2 M Ω 1/2 WATT ± 10%
R6	63644-01	" 47K " " " " 10%
R7	55447	" 2.2 M " " " " 10%
R8	63728-04	" 2.2 M " " " " 20%
R9	63200-15	VOLUME CONTROL 1 M DUAL
R10		
R11	55431	RESISTOR 100K Ω 1/2 WATT ± 10%
R12	63728-05	" 10 M " " " " 20%
R13	55492	" 3.3 M " " " " 20%
R14	63728-07	" 470K " " " " 20%
R15	63728-06	" 2.2 M " " " " 20%
R16	55409	" 1500 " " " " 10%
R17	55409	" " " " " " 10%
R18	55388	" 27 " " " " 10%
R19	57342	" 1 K " " " " 10%
R20	55739	" 2.2 K " 1 " " 20%
R21	2310	" 2250 " 10 " " 5%
R22	2316	" 2 K " 10 " " 10%
R23	55473	" 2.2 K " 1/2 " " 20%
R24	56487	" 470K " 1/2 " " 20%
R25	57104	" 220K " 1/2 " " 10%
VT1	63760	TUBE 1U4
VT2	54982	" 1R5
VT3	63760	" 1U4
VT4	63761	" 1U5
VT5	63762	" 3V4
VT6	54978	117 Z3 GT
T1	43313	TRANS. ANT. BC & RANGE BAND
T2	43314	" RF BC & " "
T3	43316	" RF MARINE & OSC. MARINE BAND
T4	43315	COIL OSC. BC & RANGE BAND
T5	63621	TRANS. I.F.
T6	63819	" "
T7	53758	" AUDIO OUTPUT
SW1	43300	SWITCH, BAND CHANGE
SW2	43301	" FUNCTION
SW3	50230	" SLIDE DPDT
SW4		SWITCH PART OF VOLUME CONTROL
J1	2628	JACK ANT.
J2	2628	" PHONE
LS1	63751	SPEAKER
L1	63747	LOOP ANTENNA

MODEL RM-402B

HOW TO CONNECT BATTERIES—

BE SURE RADIO IS TURNED OFF—

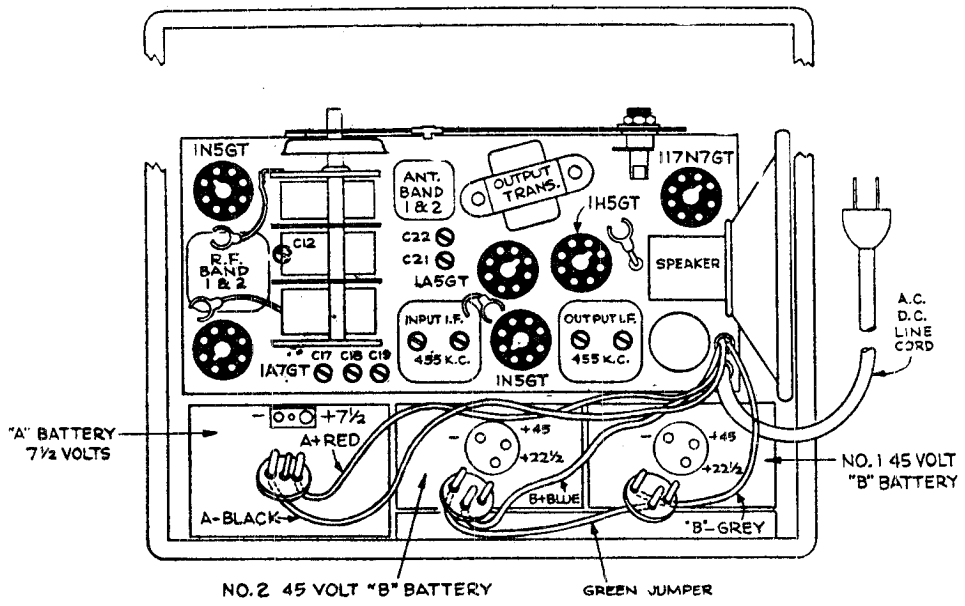


FIG. 1

INSTALLING AND CONNECTING THE BATTERIES— BE SURE THE RADIO IS TURNED OFF

1. Remove the back of the cabinet by removing the four screws which hold the back in place. Remove the cardboard spacer.
2. Place the three batteries in the cabinet exactly as shown in the above illustration (Fig. 1).
3. Insert the plug of the "A" battery cable from the radio into the socket on the "A" battery.
4. Next insert the two three-prong "B" battery plugs into the sockets on the "B" batteries, marked "Battery No. 1" and "Battery No. 2" in Fig. 1.
5. Replace the back of the cabinet and fasten it in place with the four screws.

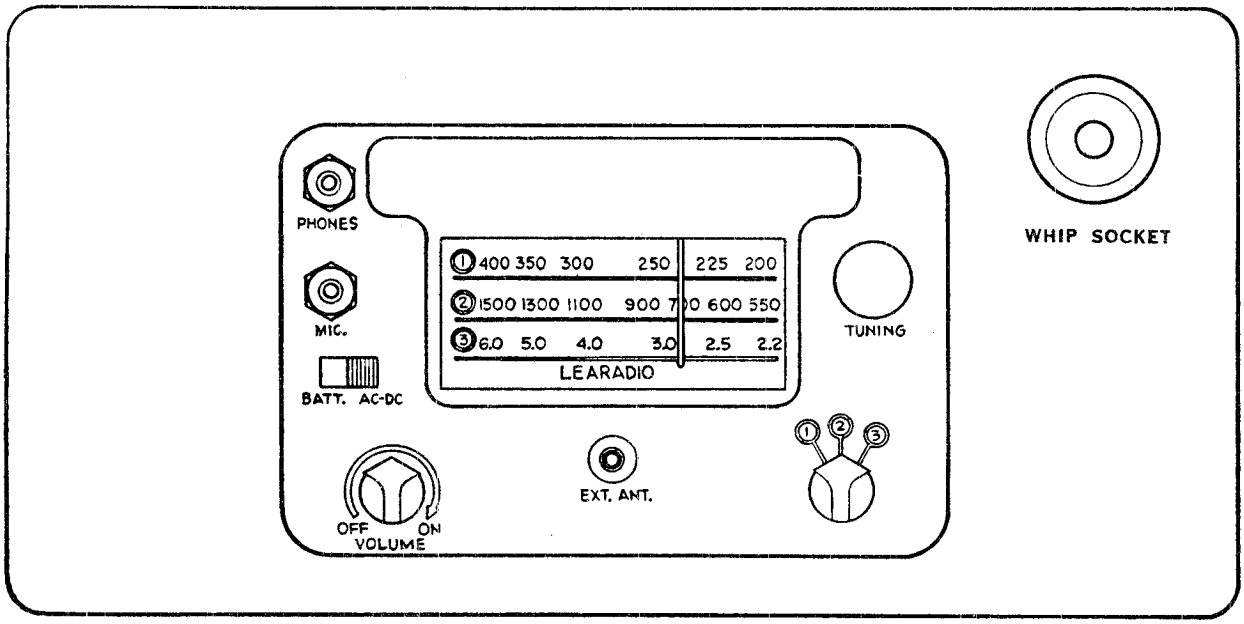


FIG. 2

MODEL RM-402B

HOW TO REMOVE RADIO CHASSIS FROM CABINET—

To remove chassis from the cabinet proceed as follows:
1. Remove back of cabinet (four screws).
2. Remove 2 chassis mounting screws from top of cabinet and 2 from front of cabinet, also 2 holding dial.

BATTERY REPLACEMENTS—

The batteries are designed especially for the Lear RM-402 B Portable and will give approximately 200 hours of service.

Use code word APRAB when ORDERING BATTERIES.

This type of radio set is designed to use less battery current when the set is operated at low volume and to use maximum battery current only when large volume is desired. For this reason you will obtain longer life from your "B" batteries by not operating your set any louder than is necessary.

Be careful not to leave your radio turned on over night. The long drain uses a lot of current and gives the batteries no chance to recuperate. Remember also that the life of your batteries will depend upon the number of hours each day that you use your set. *Turning the radio off when it is not needed saves the batteries accordingly.*

The "A" and "B" batteries of the size used in this radio have an approximate life of 200 hours. This battery life may be expected with an average of several hours' daily use. Allowing the radio to run for long periods at a time reduces the life of the batteries. When reception becomes weak new batteries should be installed.

**Caution: When the receiver is operating on A.C. or D.C.—door in rear of cabinet should be left open in order to provide ventilation.*

MODEL RM-402 B

Series 1

When ordering parts always mention complete factory model number, and series

LIST OF REPAIR PARTS

RESISTORS

Schematic No.	*Part No.*	*Description*
R1	R207	1 megohm—⅓ watt
R2	R302	30 ohm—½ watt
R3	R208	200,000 ohm—⅓ watt
R4	R206	75,000 ohm—⅓ watt
R5	R201	10,000 ohm—⅓ watt
R6	R205	40,000 ohm—⅓ watt
R7	R210	5 megohm—⅓ watt
R8	R212	500,000 ohm—⅓ watt
R9	R207	1 megohm—⅓ watt
R10	R202	1,200 ohm—⅓ watt
R11	R209	3 megohm—⅓ watt
R12	R100	1 megohm—Vol. Control
R13	R211	100,000 ohm—⅓ watt
R14	R303	250,000 ohm—⅓ watt
R15	R211	100,000 ohm—⅓ watt
R16	R207	1 megohm—⅓ watt
R17	R301	460 ohm wire—1½ watt
R18	R202	1,200 ohm—⅓ watt
R19	R209	3 megohm—⅓ watt

CONDENSERS

C	A102	3 gang Variable
C1	A302	.01 MFD.—400 V.
C2	A2177	.01 MFD.—Mica
C3	2186-C	5 MMFD.—Mica
C4	A502	Broadcast Ant. Trimmer
C5	A502	Shortwave Ant. Trimmer
C6	A502	Longwave Ant. Trimmer
C7	A206	.00025 MFD.—Mica
C8		Broadcast Coupling Cond.
C9		Longwave Coupling Cond.
C10	A205	.0001 MF.—Mica
C11	A304	.05 MFD.—400 V.
C12	A503	Shortwave R.F. Trimmer
C13		Broadcast Trimmer
C14	A210	.000025 MFD.—Mica
C15		Longwave R.F. Trimmer
C16	A200	.0001 MFD.—Mica
C17	A501	Shortwave Osc. Trimmer
C18	A501	Broadcast Osc. Trimmer
C19	A501	Longwave Osc. Trimmer
C20	A50247	1600 MMFD.—Mica
C21	A500	Broadcast Padder
C22	A500	Longwave Padder
C23	A306	.1 MFD.—200 V.
C24	A200	.0001 MFD.—Mica
C25	A202	.00025 MFD.—Mica
C26	A300	.002 MFD.—400 V.
C27	A304	.05 MFD.—400 V.
C28	A208	.00044 MFD.—Mica
C29	A302	.01 MFD.—400 V.
C30	A306	.1 MFD.—200 V.
C31	A300	.002 MFD.—400 V.
C32	A303	.005 MFD.—400 V.
C33	A304	.05 MFD.—400 V.
C34	A306	.1 MFD.—200 V.
C35	A400	20 MFD.—150 W.V. } In one can
C36	A400	40 MFD.—150 W.V. } In one can
C37	A400	200 MFD.— 6 W.V. } In one can
C38	A401	200 MFD.—10 W.V.
C39	2186-C	5 MMFD.—Mica
C40	2187-C	10 MMFD.—Mica
C41	2189-C	20 MMFD.—Ceramicon
C42	A50425	400 MFD.—10 W.V.

COILS

T1	A50220	Shortwave Ant. Coil
T2	A50221	L.W. & B.C. Ant. Coil
T5	A50160	Shortwave R. F. Coil
T6	T302	L.W. & B.C., R. F. Coil in Can
T7	A50236	Shortwave Osc. Coil
T8	T404	L.W. & B.C. Osc. Coil
T9	T501	1st I.F. Coil
T10	T601	2nd I.F. Coil
T11	T600	Output Trans.
T11	T700	Output Trans.

PARTS

S1		On-off Switch (on R12)
S2	A50230	Power change-over switch
S5	A50228	Band Switch
J2	E400	Phone Jack
J1	E406	Microphone Jack
	H1	Sockets
	E100	Tuning Knob
	E101	Volume and Switch Knob

SERVICE DATA FOR PROFESSIONAL SERVICE MEN

DESCRIPTION:

TUBES—

The tube complement of this chassis consists of the following tubes:

1—Type 1N5GT R.F. Amplifier.

1—Type 1A7GT Mixer, First Detector-Oscillator.

1—Type 1N5GT, First I.F. Amplifier (455 K.C.).

1—Type 1H5GT Second Detector, A.V.C. First Audio.

1—Type 1A5GT Output Amplifier. (Battery only.)

1—117N7GT-Rectifier and Output Tube. (A.D., D.C. only.)

SERVICE NOTES—

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1,000 ohms per volt. All voltages are indicated on the voltage chart.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets, or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. Weak batteries are also a source of trouble.

ALIGNING INSTRUCTIONS—

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low battery voltage, defective tubes, condensers and resistors. In order to properly align this chassis an oscillator (generator) is absolutely necessary.

HEADPHONES—

Best results will be obtained with 200 ohm headphones.

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect generator ground to shell of antenna socket.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter into phone jack and set generator input at 200 ohms.
- Allow chassis and signal generator to "heat up" for several minutes.

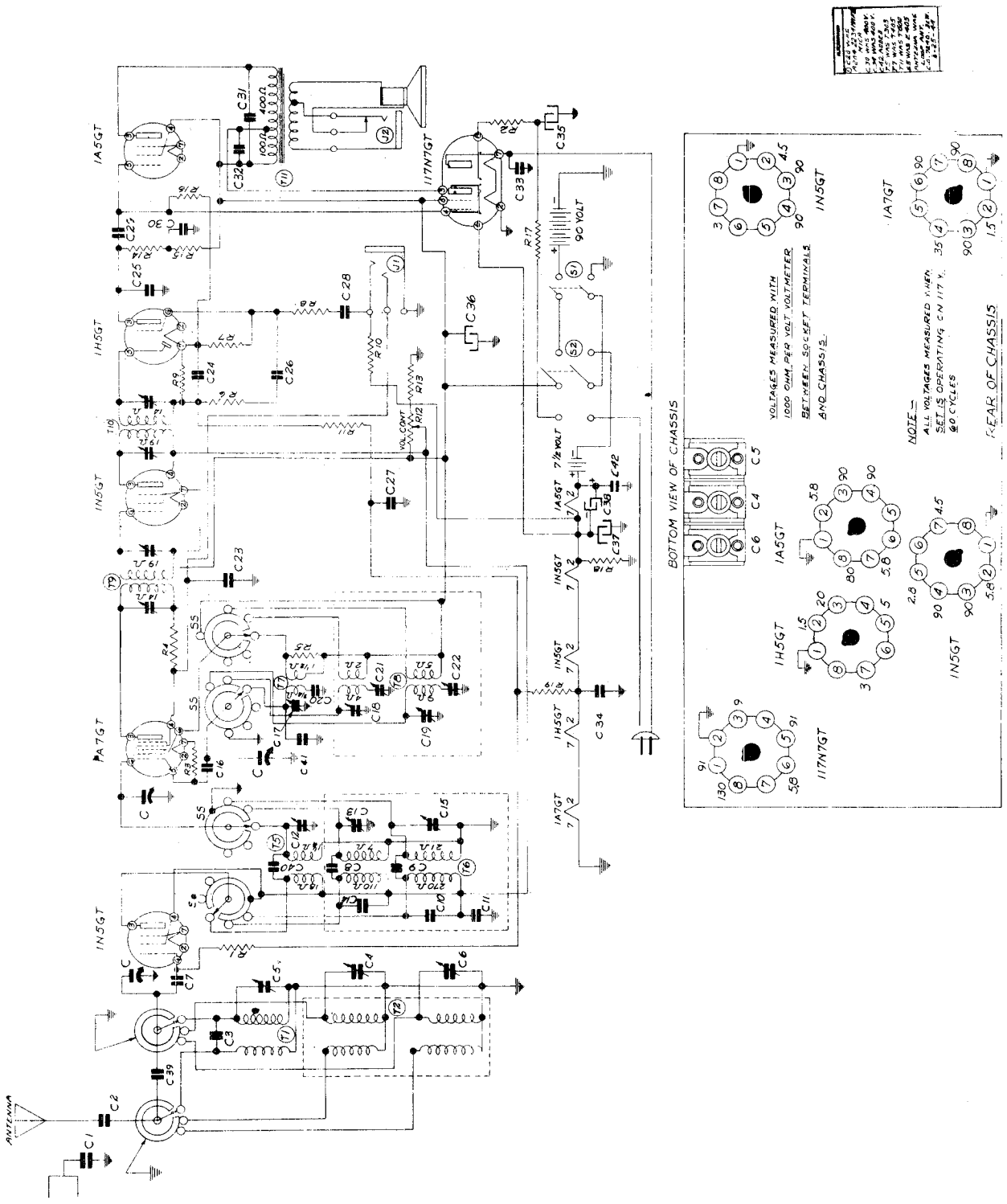
The following equipment is required for alignment:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., 20 MMFD.

Band	*Switch Position*	*Signal Generator Frequency Setting*	*Dummy Antenna*	*Connection To Radio*	*Dial Setting*	*Trimmers Adjusted (in Order Shown)*	*Trimmer Function*	*Adjustment*
I F	2	455 Kc.	.1 Mfd.	1A7GT Grid	Rotor full closed	Four trimmers on top of I. F. cans	Output and input I. F.	Adjust to maximum output
Adjust dial pointer to read 2.2 mc. on band 3 with gang condenser fully closed.								
1	1	400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 19 C 6, C 15	Band 1 oscillator trimmer Band 1 antenna & R. F. trimmers	Adjust to max. output Adjust for max. output
1	1	220 Kc.	20 MMFD	Antenna and Ground Terminal	Rock rotor while adjusting	C 22	Band 1 Oscillator padder	Adjust for max. output
1	1	400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 15 & C 6	R. F. & Ant. trimmers	Adjust for max. output
2	2	1400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 18 C 4 & C 13	Osc., Antenna & R. F. trimmers	Adjust for max. output Adjust for max. output
2	2	600 Kc.	20 MMFD	Antenna and Ground Terminal	600 Kc. Rock rotor while adjusting	C 21	Oscillator padder	Adjust for max. output
3	3	6 Mc.	20 MMFD	Antenna and Ground Terminal	6 MC.	C 17	Osc. trimmer	Adjust for max. output
3	3	6 Mc.	20 MMFD	Antenna and Ground Terminal	Rock rotor while adjusting	C 5 & C 12	Antenna & R. F. trimmers	Adjust for max. output

NOTE—Trimmers C4, C5, and C6 can be reached by removing the Lear nameplate on the side of the cabinet. The above adjustments should be made several times to insure exact settings of trimmers and padders.

MODEL RM-402B



HOW TO CONNECT BATTERIES—Read Carefully

BE SURE RADIO IS TURNED OFF–

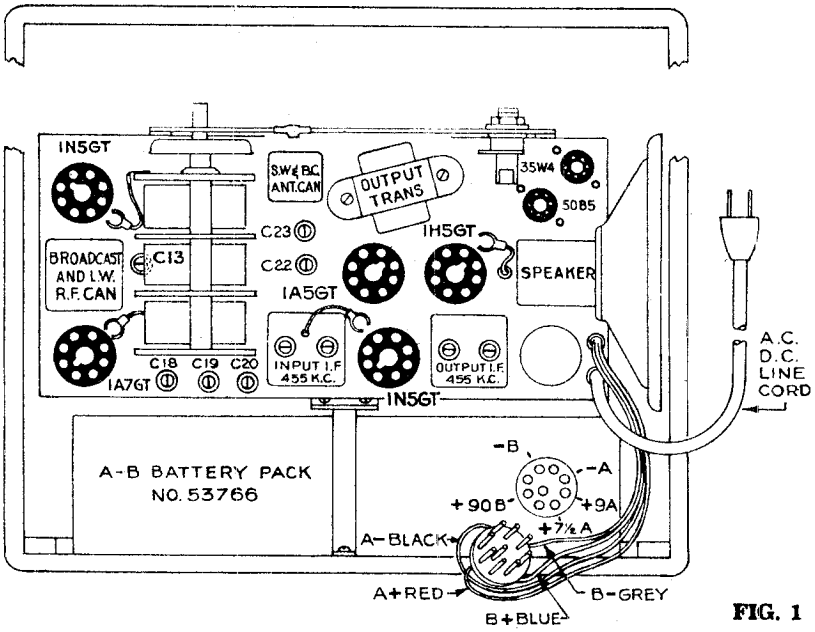


FIG. 1

INSTALLING AND CONNECTING THE BATTERIES — BE SURE THE RADIO IS TURNED OFF

1. Remove the back and loop of the cabinet by removing the four screws which hold the back in place.
2. Place the battery in the cabinet exactly as shown in the above illustration (Fig. 1).
3. Insert the plug of the battery cable from the radio into the socket on the battery.
4. Replace battery clamp and holding screw.
5. Replace the back of the cabinet and fasten it in place with the four screws.

**Caution when the receiver is operating on A.C. or D.C.—door in rear of cabinet should be left open in order to provide for ventilation.*

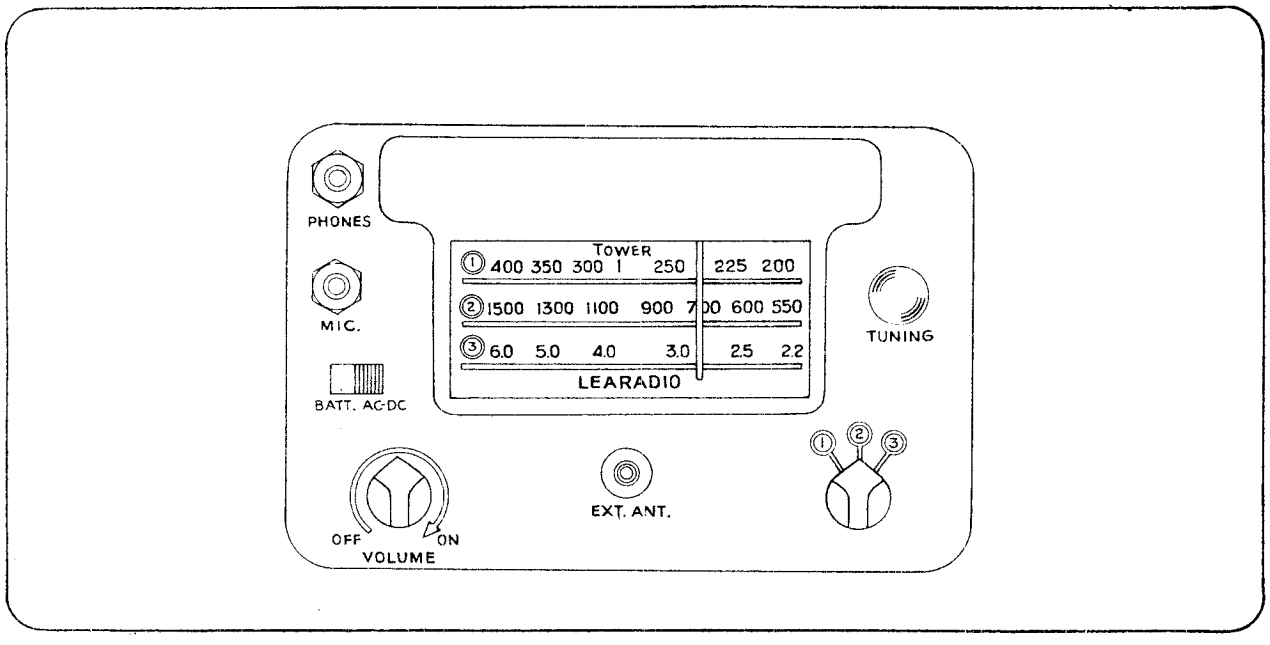


FIG. 2

MODEL RM-402C

CARE AND MAINTENANCE

BATTERY REPLACEMENTS—

The battery is designed especially for the Lear RM 402 C Portable and will give approximately 200 hours of service.

HOW TO REMOVE RADIO CHASSIS FROM CABINET—

To remove chassis from the cabinet proceed as follows:

1. Remove back of cabinet, (four screws).
2. Disconnect the loop antenna.
3. Remove 2 chassis mounting screws from top of cabinet and 2 from front of cabinet, also 2 holding dial.

Specify No. 53766 when ORDERING BATTERIES.

Most of the newer types of radio sets are designed to use less battery current when the set is operated at low volume and to use maximum battery current only when large volume is desired. For this reason you will obtain longer life from your "B" batteries by not operating your set any louder than is necessary.

Be careful not to leave your radio turned on over night. The long drain uses a lot of current and gives the batteries no chance to recuperate. Remember also that the life of your batteries will depend upon the number of hours each day that you use your set. Turning the radio off when it is not needed saves the batteries accordingly.

The battery used in this radio has an approximate life of 200 hours. This battery life may be expected with an average of several hours daily use. Allowing the radio to run for long periods at a time reduces the life of the batteries. When reception becomes weak a new battery should be installed.

MODEL RM-402 C

Series 1

When ordering parts always mention complete factory model number, and series.

LIST OF REPAIR PARTS

Code No.	Part No.	Description	
		RESISTORS	
R1	55489	1 Megohm	½W.
R2	55485	220K ohm	½W.
R3	55482	68K ohm	½W.
R4	55477	10K ohm	½W.
R5	55492	3.3 Megohm	½W.
R6	55408	1200 ohm	½W.
R7	55408	1200 ohm	½W.
R8	55489	1 Megohm	½W.
R9	55481	47K ohm	½W.
R10	55493	4.7 Megohm	½W.
R11	55492	3.3 Megohm	½W.
R12	56344	1 Meg. vol. cont.	
R13	55483	100K ohm	½W.
R14	55487	470K ohm	½W.
R15	2312	1900 ohm	10W.
R16	55485	220K ohm	½W.
R17	55483	100K ohm	½W.
R18	55935	470 ohm	2W.
R19	55492	3.3 Megohm	½W.
R20	55489	1 Megohm	½W.
R21	55398	180 ohm	½W.
R22	55388	27 ohm	½W.
R23	55492	3.3 Megohm	½W.
		CAPACITORS	
C	54070	3 Gang Variable	
C1	56622	.01 Mfd 400 V.	
C2	56059	220 Mmfd Mica	
C3	53734	Longwave Ant. Trimmer (On One Bracket)	
C5	53734	Shortwave Ant. Trimmer (On One Bracket)	
C6	(ON T2)	Shortwave Coup. Cap.	
C7	56059	220 Mmfd Mica	
C8	(ON T3)	Shortwave Coup. Cap.	
C9	(ON T4)	Broadcast Coup. Cap.	
C10	(ON T4)	Longwave Coup. Cap.	
C11	56057	100 Mmfd Mica	
C12	56600	.05 Mfd 200 V.	
C13	56748	Shortwave R. F. Trimmer	
C14	(ON T4)	Broadcast R. F. Trimmer	
C15	(ON T4)	Longwave Trimmer	
C16	56057	100 Mmfd Mica	
C17	2189	20 Mmfd Ceramic	
C18	53157	Shortwave Osc. Trimmer (On One Bracket)	
C19	53157	Broadcast Osc. Trimmer (On One Bracket)	
C20	53157	Longwave Osc. Trimmer (On One Bracket)	
C21	53844	1600 Mmfd Mica	
C22	53713	Broadcast Padder	
C23	53713	Longwave Padder	
C24	56603	.1 Mfd 200 V.	
C25	56603	.1 Mfd 200 V.	
C26	56603	.1 Mfd 200 V.	
C27	56600	.05 Mfd 200 V.	
C28	56057	100 Mmfd Mica	
C29	56614	002 Mfd 400 V.	
C30	56057	100 Mmfd Mica	
C31	56061	470 Mmfd Mica	
C32	56622	.01 Mfd 400 V.	
C33	56603	.1 Mfd 200 V.	
C34	56622	.01 Mfd 400 V.	
C35	56618	.005 Mfd 400 V.	
C36	56614	.002 Mfd 400 V.	
C37	60003	20 Mfd 25 V.	
C38	56628	.05 Mfd 400 V.	
C39	53728	50 Mfd 150 WV (In One Can)	
C40	53728	30 Mfd 150 WV (In One Can)	
C41	53728	200 Mfd 6WV (In One Can)	
C42	54057	200 Mfd 10 WV	
		COILS	
T1	53711	Longwave Loop	
T2	53771	S.W.&B.C. Ant. Shunt Coil	
T3	50160	S.W. R.F. Coil	
T4	53740	L.W.&B.C. R.F. Coil	
T5	50236	Shortwave Osc. Coil	
T6	53739	L.W.&B.C. Osc. Coil	
T7	53730	1st. I.F. Coil	
T8	53729	2nd. I.F. Coil	
T9	53733	Output Trans.	
		PARTS	
S1		On-Off Switch (on R 12)	
S2	50230	Power Change-Over Switch	
SS	53764	Band Switch	
J2	2628	Phone Jack	
J1	2638	Microphone Jack	
	53737	Sockets	
	53742	Tuning Knob	
	53741	Volume & Switch Knob	
PC1	54935	Power Cord	

DESCRIPTION:

TUBES—

The tube complement of this chassis consists of the following tubes:

1—Type 1N5GT R.F. Amplifier.
1—Type 1A7GT Mixer, First Detector-Oscillator.
1—Type 1N5GT, First I.F. Amplifier (455 K.C.).
1—Type 1H5GT Second Detector, A.V.C. First Audio.
1—Type 1A5GT Output Amplifier. (Battery only.)
1—Type 50B5 Output Amplifier. (AC-DC only.)
1—Type 35W4 Rectifier. (AC-DC only.)

SERVICE DATA

SERVICE NOTES—

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1,000 ohms per volt. All voltages are indicated on the voltage chart.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets, or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. Weak batteries are also a source of trouble.

ALIGNING INSTRUCTIONS—

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low battery voltage, defective tubes, condensers and resistors. In order to properly align this chassis an oscillator (generator) is absolutely necessary.

HEADPHONES—

Best results will be obtained with 200 ohm headphones.

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect generator ground to shell of antenna socket.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter into phone jack and set generator input at 200 ohms.
- Allow chassis and signal generator to "heat up" for several minutes.

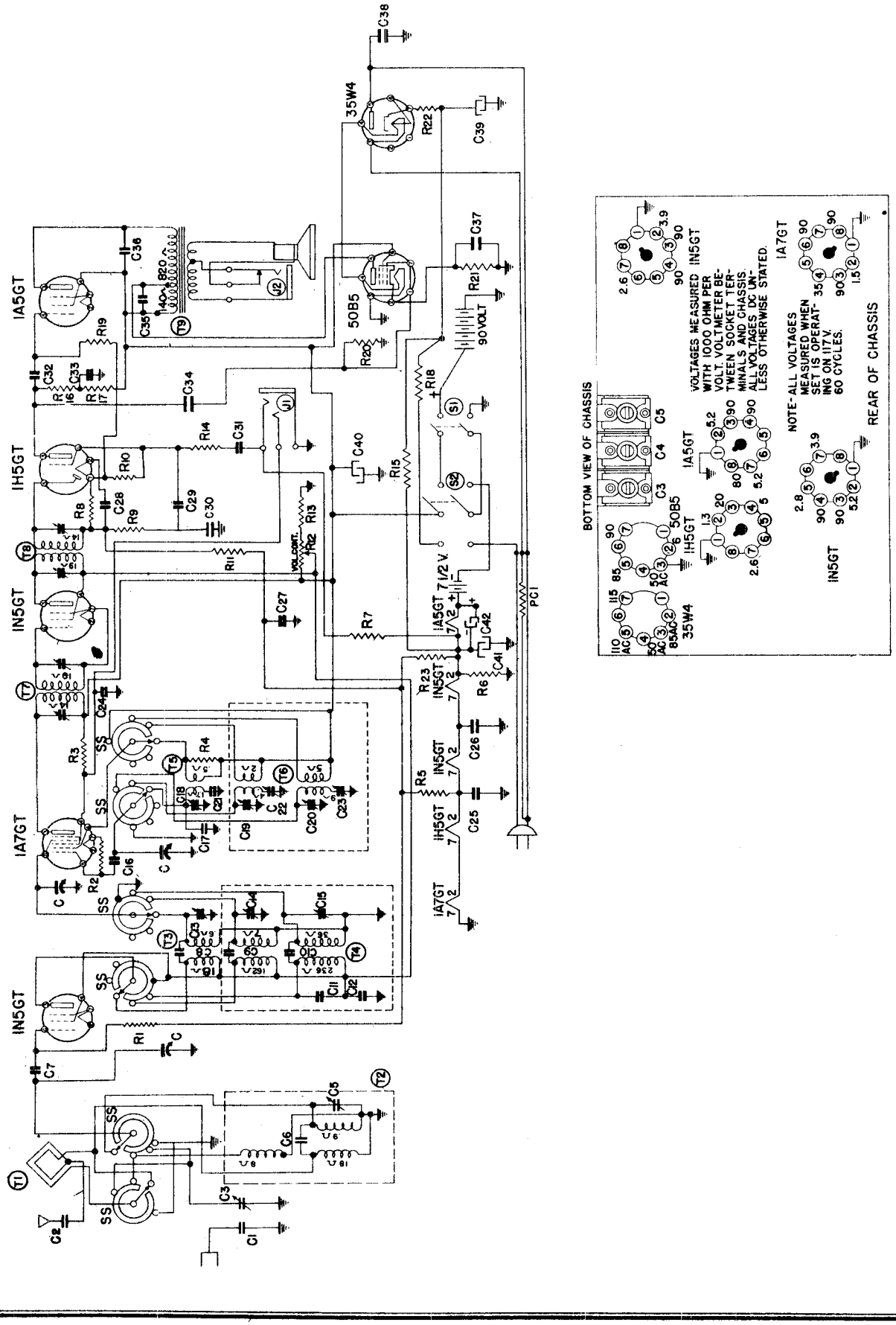
The following equipment is required for alignment:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., 20 MMFD.

Band	*Switch Position*	*Signal Generator Frequency Setting*	*Dummy Antenna*	*Connection To Radio*	*Dial Setting*	*Trimmers Adjusted (in Order Shown)*	*Trimmer Function*	*Adjustment*
I F	2	455 Kc.	.1 Mfd.	1A7GT Grid	Rotor full closed	Four trimmers on top of I. F. cans	Output and input I. F.	Adjust to maximum output
Adjust dial pointer to read 2.2 mc. on band 3 with gang condenser fully closed.								
1	1	400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 20 C 6, C 15	Band 1 oscillator trimmer Band 1 antenna & R. F. trimmers	Adjust to max. output Adjust for max. output
1	1	220 Kc.	20 MMFD	Antenna and Ground Terminal	Rock rotor while adjusting	C 23	Band 1 Oscillator padder	Adjust for max. output
1	1	400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 15 & C 3	R. F. & Ant. trimmers	Adjust for max. output
2	2	1400 Kc.	20 MMFD	Antenna and Ground Terminal	400 Kc.	C 19 C 4 & C 14	Osc., Antenna & R. F. trimmers	Adjust for max. output Adjust for max. output
2	2	600 Kc.	20 MMFD	Antenna and Ground Terminal	600 Kc. Rock rotor while adjusting	C 22	Oscillator padder	Adjust for max. output
3	3	6 Mc.	20 MMFD	Antenna and Ground Terminal	6 MC.	C 18	Osc. trimmer	Adjust for max. output
3	3	6 Mc.	20 MMFD	Antenna and Ground Terminal	Rock rotor while adjusting	C 5 & C 13	Antenna & R. F. trimmers	Adjust for max. output

NOTE — Trimmers C3, C4, and C5 can be reached by removing the Lear nameplate on the side of the cabinet. The above adjustments should be made several times to insure exact settings of trimmers and padders.

MODEL RM-402C



SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC	
Power consumption	160 watts	
Power output	20 watts	
Intermediate frequency	455 kc./10.7 mc.	
Tuning frequency range:		
Broadcast Band	540-1620 kc.	
FM Band	88—108 mc.	
Tubes:		
R-F Amplifier	6BA6	
Converter	6BE6	
1st I-F Amplifier (AM-FM)	6SG7	
2nd I-F (FM), Detector and AVC (AM)	6SG7	
Limiter	6SH7	
Discriminator	6H6	
First Audio	6SR7	
Inverter	6SN7GT	
Power output (push-pull stage)	(2) 6L6	
Rectifier	5U4G	
Tuning Indicator	6U5	
Dial Lamps	Mazda No. 44	
Speaker: coaxial	12" Dynamic	5" PM
Field coil resistance	165 ohms	None
Voice coil impedance (400 cycles)	6 ohms	3.8 ohms
Output transformer	5000/6	

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-234 radio chassis is designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front, ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated r-f signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

MODEL CR-234

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.

2. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.

3. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.

4. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.

5. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.

6. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor—Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:
- 600 kc. 5.00
- 98 mc. 1.15

R-F Grid to Converter Grid at:
- 600 kc. 14.5
- 98 mc. 9.4

R-F on Converter Grid to 455 kc. on I-F Grid at:
- 600 kc. 25.0
- 98 mc. 3.2

I-F on Converter Grid to 1st I-F Grid at:
- 455 kc. (gang closed) 28.0

1st I-F Grid to 2nd I-F Grid** at:
- 455 kc. 95
- 10.7 mc. 33

2nd I-F Grid to Limiter Grid at:
- 10.7 mc. 33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

- 600 kc. ..... 6.6V.
- 98 mc. ..... 6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

*Variations of ± 20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.74V. as measured by a high resistance AC voltmeter across the output transformer secondary.

**Detector Plate on AM.

***0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.25 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-234 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

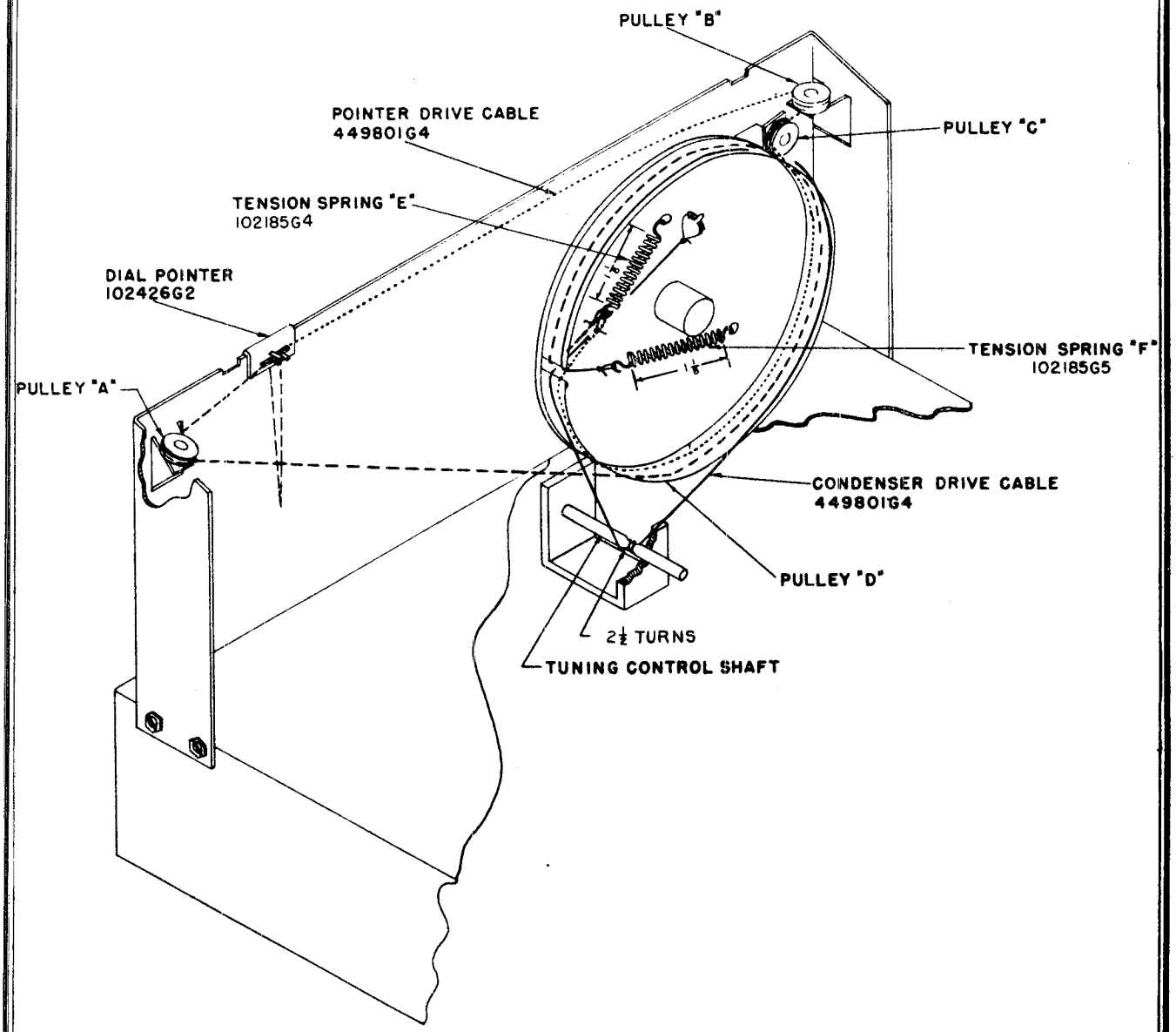
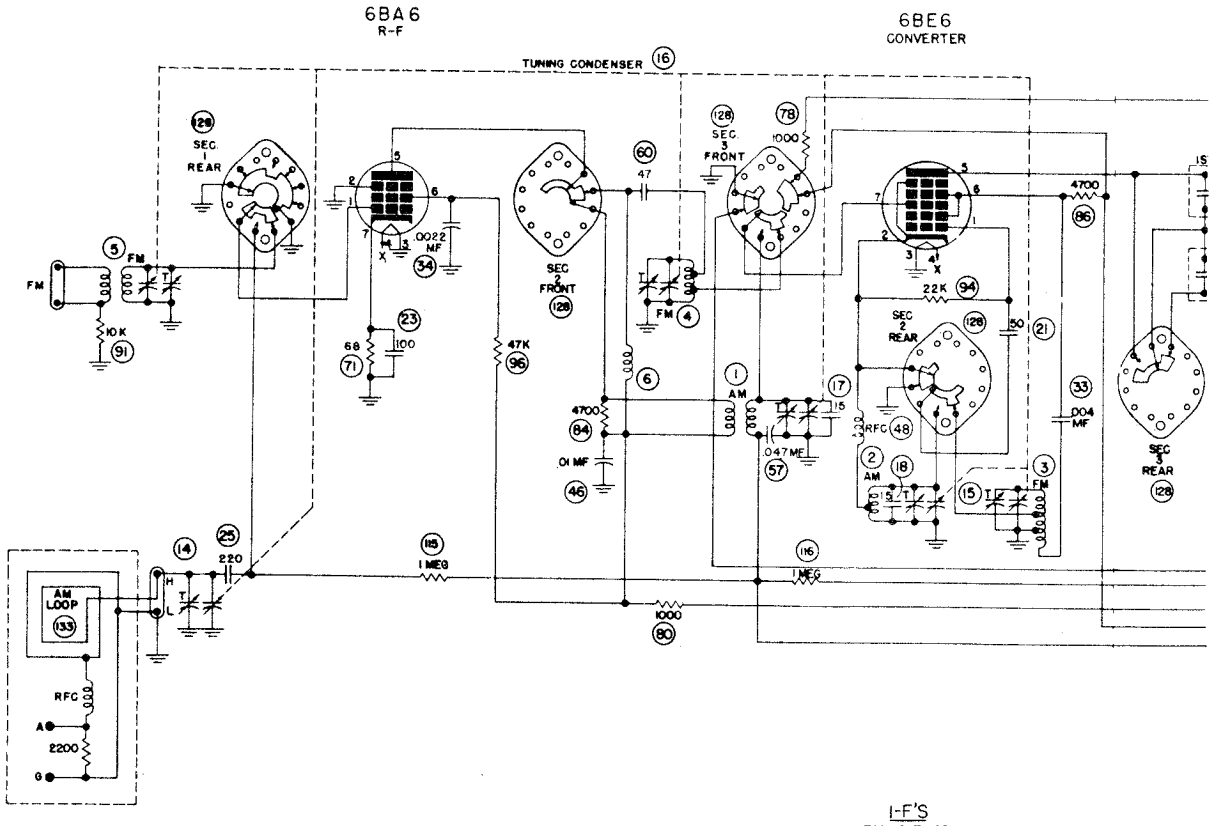


FIGURE 1



I-F'S

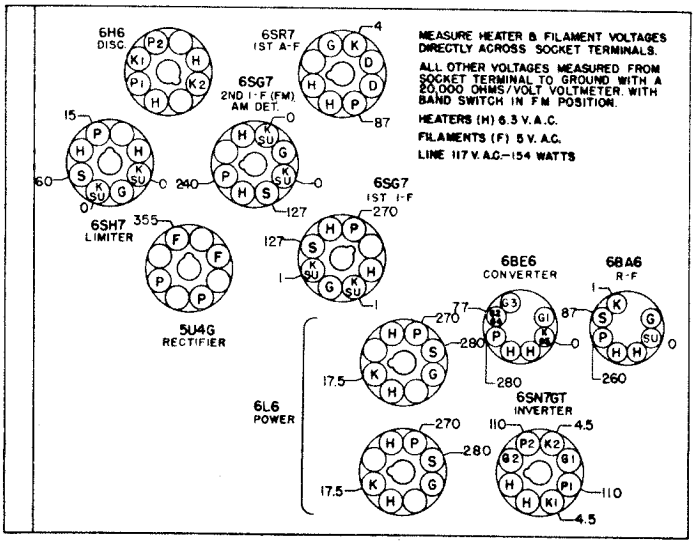
FM 10.7 MC.
AM 455 KC.

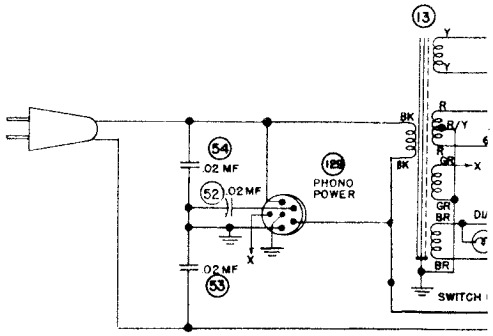
NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.

LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.





MODEL CR-234

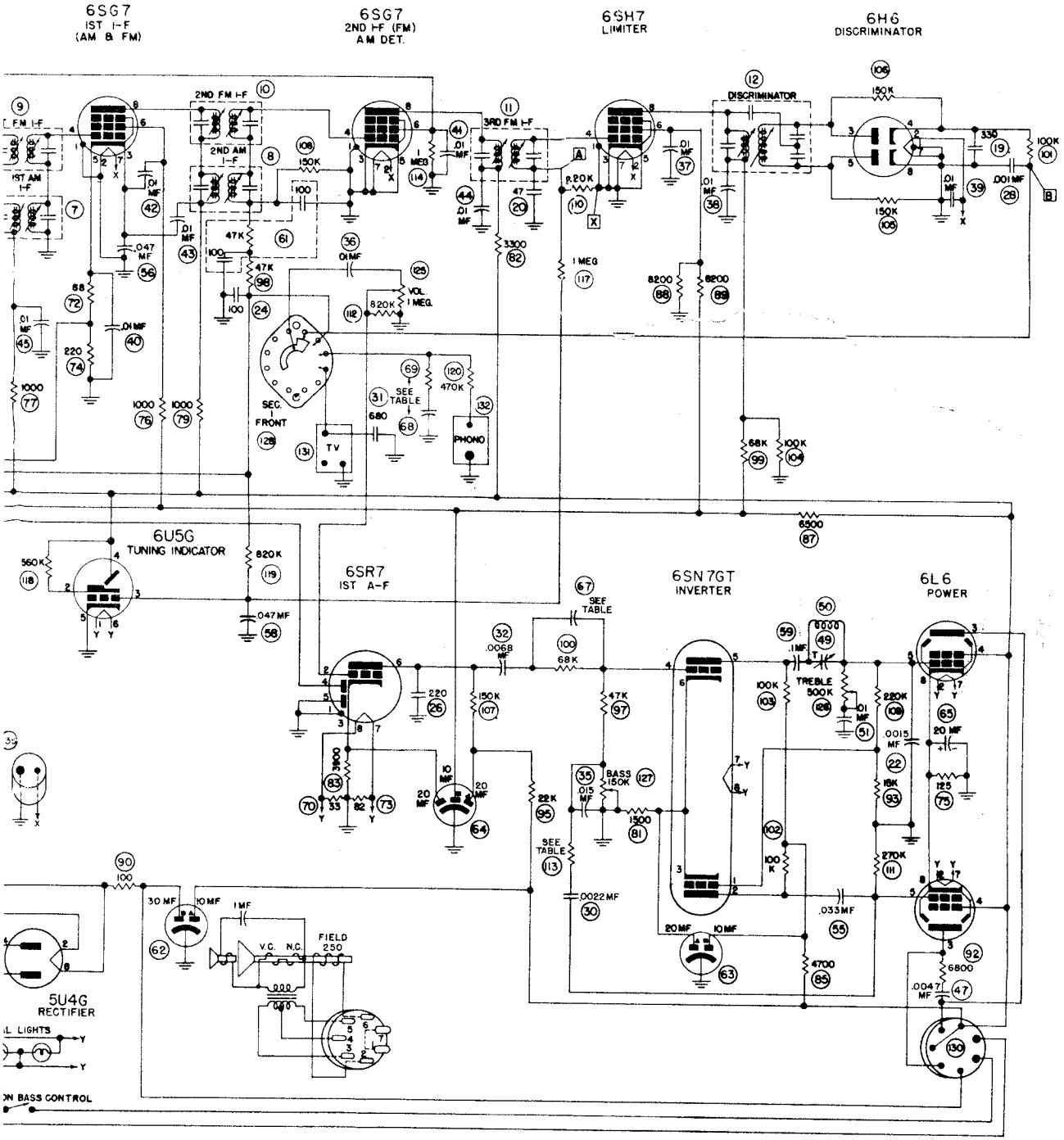


FIGURE 2

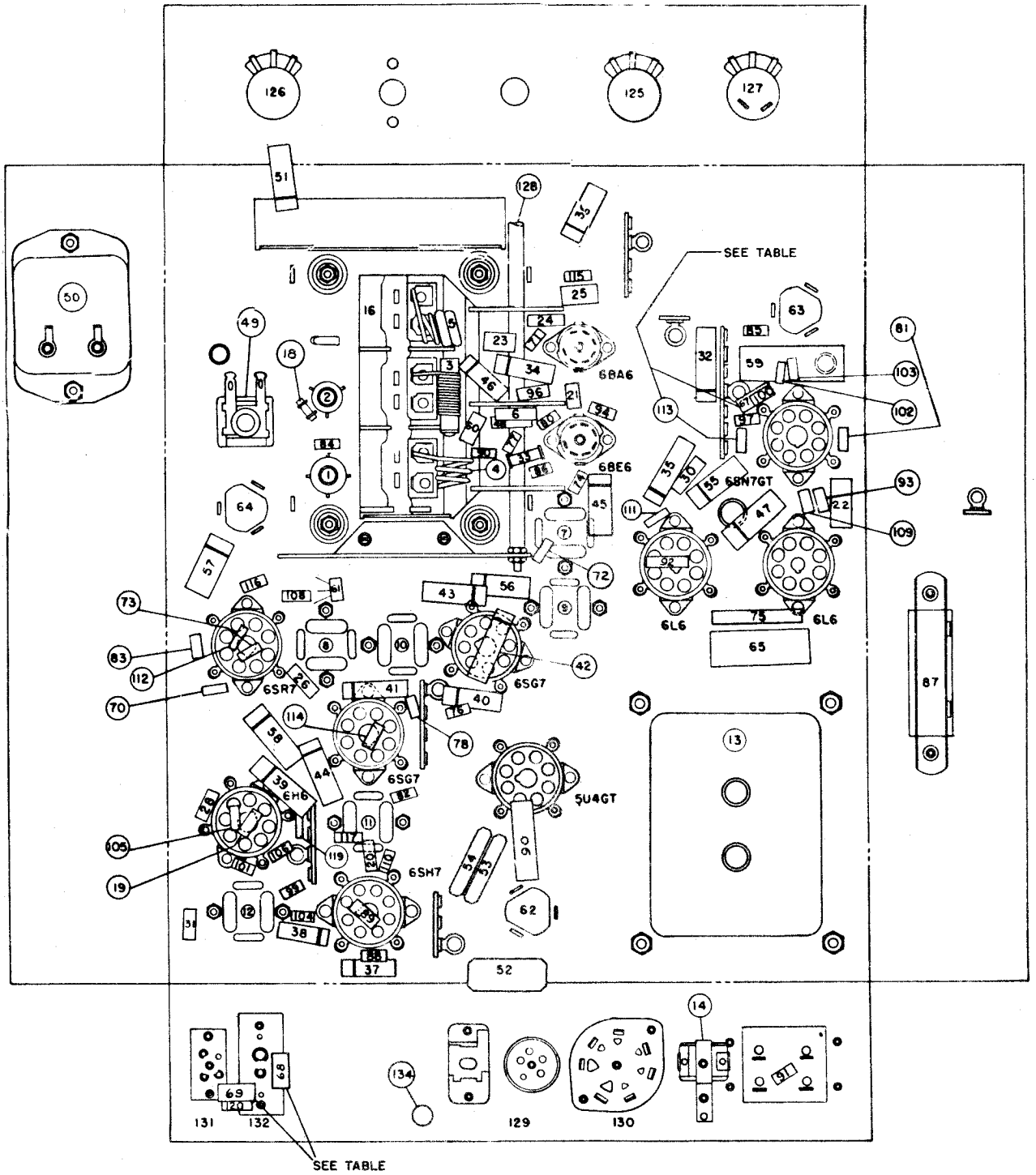
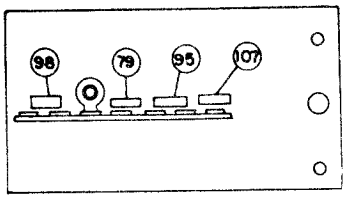
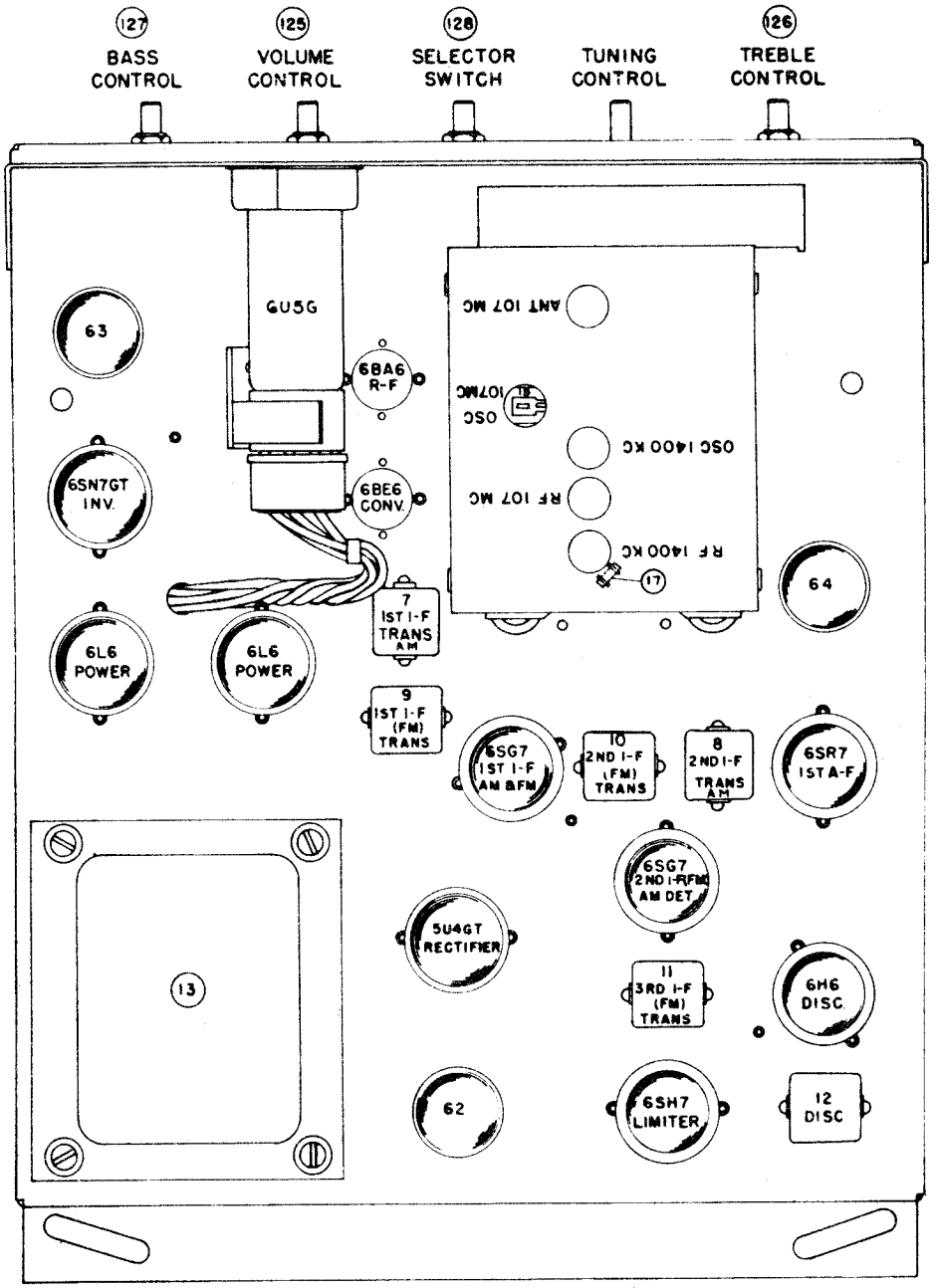


FIGURE 3

MODEL CR-234





MODEL CR-234

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, R-F (AM)	360348G1
2	Coil Assembly, Oscillator (AM)	360407G1
3	Coil Assembly, Oscillator (FM)	360323G1
4	Coil Assembly, R-F (FM)	360322G2
5	Coil Assembly, Antenna (FM)	360321G2
6	Coil Choke	360284G1
7	Transformer, First I.F. (AM)	360373G1
8	Transformer, Second I.F. (AM)	360373G2
9	Transformer, First I.F. (FM)	360374G1
10	Transformer, Second I.F. (FM)	360374G1
11	Transformer, Third I.F. (FM)	360374G1
12	Transformer, Discriminator	360375G1
13	Transformer, Power	300052G2
14	Capacitor, Variable Trimmer	250046G2
15	Capacitor, Variable Trimmer	260067G6
16	Capacitor, Three Gang Tuning	260103G1
17	Capacitor, Ceramic, 15mmf, ± 10%, 500 V.	250187G43
18	Capacitor, Ceramic, 15mmf, ± 10%, 500 V.	250187G43
19	Capacitor, Mica, 330 mmf, 500 V.	250159G101
20	Capacitor, Mica, 47 mmf, 500 V.	250159G96
21	Capacitor, Ceramic, 50 mmf, ± 10%, 500 V.	250088G39
22	Capacitor, Molded Paper, .0015 mfd, 600 V.	250201G2
23	Capacitor, Mica, 100 mmf, 500 V.	250159G98
24	Capacitor, Mica, 100 mmf, 500 V.	250159G98
25	Capacitor, Mica, 220 mmf, 500 V.	250159G100
26	Capacitor, Mica, 220 mmf, 500 V.	250159G100
28	Capacitor, Molded Paper, .001 mfd, 600 V.	250201G1
30	Capacitor, Mica, .0022 mfd, ± 5%, 500 V.	250160G46
31	Capacitor, Mica, 680 mmf, 500 V.	250159G136
32	Capacitor, Molded Paper, .0068 mfd, 600 V.	250201G6
33	Capacitor, Ceramic, .004 mfd, 350 V.	250088G34
34	Capacitor, Molded Paper, .0022 mfd, 600 V.	250201G3
35	Capacitor, Paper, .015 mfd, ± 10%, 200 V.	250185G1
36	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
37	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
38	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
39	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
40	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
41	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
42	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
43	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
44	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
45	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
46	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
47	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
48	R. F. Choke	360284G1
49	Trimmer, 10 K.C.	259610G2
50	Coil, 10 K.C.	360244G2
51	Capacitor, Molded Paper, .01 mfd, 600 V.	250201G7
52	Capacitor, Molded Paper, .02 mfd, 600 V.	250129G3

MODEL CR-234

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
53	Capacitor, Molded Paper, .02 mfd, 600 V.	250129G3
54	Capacitor, Molded Paper, .02 mfd, 600 V.	250129G3
55	Capacitor, Molded Paper, .033 mfd, 600 V.	250201G10
56	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
57	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
58	Capacitor, Molded Paper, .047 mfd, 600 V.	250201G11
59	Capacitor, Molded Paper, .1 mfd, 600 V.	250201G13
60	Capacitor, Mica, 47 mmf	250159G96
61	Capacitor-Resistor Filter	250170G1
62	Capacitor, Electrolytic, 30-10 mfd, 475 V.	27002362
63	Capacitor, Electrolytic, 10 mfd, 475 V. — 20 mfd, 25 V.	270023G13
64	Capacitor, Electrolytic, 20-10 mfd, 475 V. — 20 mfd, 25 V.	270023G12
65	Capacitor, Electrolytic, 20 mfd, 25 V.	27002762
66	Capacitor, Mica, 680 mmf, 300 V. ± 10%	250159G131
67	Capacitor, Mica, 470 mmfd.	250159G90
68	Capacitor, Mica, 270 mmf.	250159G87
69	Resistor, Composition, 270 Ohms, ± 10%, ½ W.	230104G91
70	Resistor, Composition, 33 Ohms, ± 10%, ½ W.	230104G44
71	Resistor, Composition, 68 Ohms, ± 10%, ½ W.	230104G48
72	Resistor, Composition, 68 Ohms, ± 10%, ½ W.	230104G48
73	Resistor, Composition, 82 Ohms, ± 10%, ½ W.	230104G49
74	Resistor, Composition, 220 Ohms, ± 10%, ½ W.	230104G54
75	Resistor, Wire Wound, 125 Ohms, 5 W.	240021G11
76	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
77	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
78	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
79	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
80	Resistor, Composition, 1000 Ohms, ± 10%, ½ W.	230104G62
81	Resistor, Composition, 1500 Ohms, ± 10%, ½ W.	230104G64
82	Resistor, Composition, 3300 Ohms, ± 10%, ½ W.	230104G68
83	Resistor, Composition, 3900 Ohms, ± 10%, ½ W.	230104G69
84	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
85	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
86	Resistor, Composition, 4700 Ohms, ± 10%, ½ W.	230104G70
87	Resistor, Wire Wound, 6500 Ohms, ± 10%.	24003569
88	Resistor, Composition, 8200 Ohms, ± 10%, 1 W.	230105G73
89	Resistor, Composition, 8200 Ohms, ± 10%, 1 W.	230105G73
90	Resistor, Wire Wound, 100 Ohms, 10 W.	240021G17
91	Resistor, Composition, 10K Ohms, ± 10%, ½ W.	230104G74
92	Resistor, Composition, 6800 Ohms, 1W.	230105G72
93	Resistor, Composition, 15K Ohms, ± 10%, ½ W.	230104G76
94	Resistor, Composition, 22K Ohms, ± 10%, ½ W.	230104G78
95	Resistor, Composition, 22K Ohms, ± 10%, ½ W.	230104G78
96	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230105G82
97	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230104G82
98	Resistor, Composition, 47K Ohms, ± 10%, ½ W.	230104G82
99	Resistor, Composition, 68K Ohms, ± 10%, ½ W.	230104G84
100	Resistor, Composition, 68K Ohms, ± 10%, ½ W.	230104G84
101	Resistor, Composition, 100K Ohms, ± 10%, ½ W.	230104G86
102	Resistor, Composition, 100K Ohms, ± 10%, 1 W.	230105G86
103	Resistor, Composition, 100K Ohms, ± 10%, 1 W.	230105G86

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
104	Resistor, Composition, 100K Ohms, ± 10%, ½ W.	230104G86
105	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
106	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
107	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
108	Resistor, Composition, 150K Ohms, ± 10%, ½ W.	230104G88
109	Resistor, Composition, 220K Ohms, ± 10%, ½ W.	230104G90
110	Resistor, Composition, 220K Ohms, ± 10%, ½ W.	230104G90
111	Resistor, Composition, 270K Ohms, ± 10%, ½ W.	230104G91
112	Resistor, Composition, 820K Ohms, ± 10%, ½ W.	230104G97
113	Resistor, Composition, 1.2 Megohm, ± 10%, ½ W. ... 234AA Only	230104G99
	Resistor, Composition, 1 Megohm, ± 10%, ½ W. ... 234BB Only	230104G98
114	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
115	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
116	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
117	Resistor, Composition, 1 Megohm, ± 10%, ½ W.	230104G98
118	Resistor, Composition, 560K Ohms, ± 10%, ½ W. .. (In Tuning Eye Socket)	230104G95
119	Resistor, Composition, 820K Ohms, ± 10%, ½ W.	230104G97
120	Resistor, Composition, 470K Ohms, ± 10%, ½ W.	230104G94
125	Control Volume	220072G18
126	Control, Treble	220072G8
127	Control, Bass, With Switch	220073G5
128	Switch, Selector	160194G1
129	Socket, Motor	180520G4
	Plug, Motor (4 Prong)	180502G5
	Plug, Motor (6 Prong)	180521G4
130	Socket, Speaker	180504G16
	Plug, Speaker	180503G4
131	Socket, External	180060G1
	Plug, External	180311G2
132	Socket, Phono	18974IG1
	Plug, Phono	180311G1
133	Loop Antenna	* * * *
134	Socket, A.C. Output	180505G5
135	Socket & Cable Assembly	180458G2
	Dial Glass	150353G1
	Panel Escutcheon	633934G3
	Knob, Tuning	
	Maroon	140025G4
	Beige	140025G2
	Knob, Selector	
	Maroon	143727G3
	Beige	143727G2
	Knob, Treble, Volume	
	Maroon	140025G5
	Beige	140025G3
	Output Transformer, Primary 5000 ohms, Secondary 6 ohms	623504G1

* * * * The part number of the Loop Antenna Assembly changes with different Cabinets. It is therefore important that you specify the style number of the instrument when ordering a replacement Loop Antenna Assembly.

MODELS CR-242,
CR-243

SPECIFICATIONS

JAN. 1951 1286

Power supply	117 volts 50/60 cycles AC
Power consumption	160 watts
Power output	20 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6L6
Rectifier	5U4G
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44

CT242 Speaker: coaxial	15″ Dynamic	5″ PM
Field coil resistance	500 ohms	None
Voice coil impedance (400 cycles)	15 ohms	3.8 ohms
Output transformer	5000/15	
CT243 Speaker: coaxial	12″ Dynamic	5″ PM
Field coil resistance	165 ohms	None
Voice coil impedance (400 cycles)	6 ohms	3.8 ohms
Output transformer	5000/6	

GENERAL

CR-242 and CR-243 differ only in the speaker systems and audio response for different cabinets. It may become necessary to make minor changes in the electrical circuit of a chassis to provide the correct response for different cabinets. If this becomes necessary such a variation from the original chassis is indicated by a suffix letter. Whenever necessary Service Bulletin Supplements will be issued with latest schematic drawings and parts lists indicating these changes.

METHOD FOR REMOVING CHASSIS FROM CABINET

Model CR-242 and CR-243 radio chassis are designed for easy removal from the cabinet in which it is installed. As the radio panel is permanently fastened to the chassis, the control knobs need not be removed when the chassis is taken out of the cabinet for service.

To remove the chassis, first remove the antenna leads from their terminals and all plugs from the receptacles on the rear of the chassis. Then remove the two Phillips-head screws from the angular slots in the flange at the rear of the chassis. Lift the rear of the chassis about one inch and pull it straight back. Never remove the chassis tray from the cabinet—it has been properly positioned to bring the radio panel in place when the chassis is replaced. In replacing the chassis, slide it so that the small hooks near the front, ride inside the flanges on the sides of the chassis tray. Push the chassis forward as far as it will go and the hook should then engage the slots in the chassis tray. Replace the two Phillips-head screws and nuts and tighten securely. Replace all plugs in their receptacles and the antenna leads on their correct terminals. The antenna terminal board for the loop antenna connections is designated L-H. The two terminals on the loop are designated L and H; the leads connected to these terminals should be wired to the corresponding terminals (L and H) on the chassis.

ALIGNMENT PROCEDURE

Alignment of these receivers requires the use of an accurately calibrated r-f signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagrams.

The pointer on the radio dial should line up with the first vertical mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the pointer on the dial string and move it to correct position. Re-tighten and re-cement the pointer to the string. Be sure the gang is fully meshed for this pointer alignment. Align AM first.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.
2. Tune the signal generator to EXACTLY 455 kc.
3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.
4. AM and FM i-f transformers on these models are separate and can be identified on the chassis layout diagram Figure 3.
5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

MODELS CR-242, CR-243

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 20 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Remove the signal generator lead from the 6BE6 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.

2. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.

3. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.

4. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.

5. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.

6. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 Limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter between point "B" on schematic diagram and ground (across .00047 mfd. capacitor—Pin 6 on 6H6 to ground).

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Point "A" on schematic to ground). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6BE6 converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6BE6.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

MODELS CR-242, CR-243

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.00
98 mc.	1.15

R-F Grid to Converter Grid at:

600 kc.	14.5
98 mc.	9.4

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	25.0
98 mc.	3.2

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (gang closed)	28.0

1st I-F Grid to 2nd I-F Grid** at:

455 kc.	95
10.7 mc.	33

2nd I-F Grid to Limiter Grid at:

10.7 mc.	33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	6.6V.
98 mc.	6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

CR-242—*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.74V. as measured by a high resistance AC voltmeter across the output transformer secondary.

**Detector Plate on AM.

***0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.25 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

CR-243—*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 1.22V. as measured by a high resistance AC voltmeter across the output transformer secondary.

**Detector Plate on AM.

***0.1 watt speaker output at 400 cycles is equivalent to a reading of .57 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

DIAL CORD REPLACEMENT

Two separate drive cables are used in both the CR-242 and CR-243 dial assemblies. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the gang condenser; the other cable actuates the dial pointer whenever the large pulley on the gang condenser is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns **from front to back**; then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the gang condenser is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the gang condenser is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

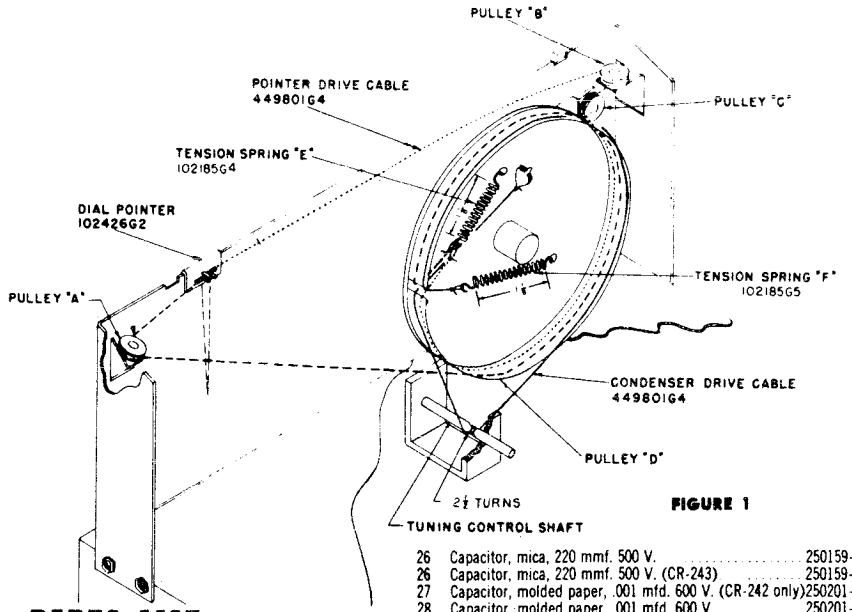


FIGURE 1

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f (AM)	360348-1
2	Coil assembly, oscillator (AM)	360407-1
3	Coil assembly, oscillator (FM)	360323-1
4	Coil assembly, r-f (FM)	360322-2
5	Coil assembly, antenna (FM)	360321-2
6	Coil, choke	360284-1
7	Transformer, first i-f	360373-1
8	Transformer, second i-f	360373-2
9	Transformer, first i-f (FM)	360374-1
10	Transformer, second i-f (FM)	360374-1
11	Transformer, third i-f (FM)	360374-1
12	Transformer, discriminator	360375-1
13	Transformer, power	300052-2
14	Capacitor, variable trimmer	250046-2
15	Capacitor, variable trimmer	260067-6
16	Capacitor, three gang tuning	260103-1
17	Capacitor, ceramic, 15 mmf. ± 10%, 500 V.	250187-43
18	Capacitor, ceramic, 15 mmf. ± 10%, 500 V.	250187-43
19	Capacitor, mica, 330 mmf. 500 V.	250159-88
19	Capacitor, mica, 330 mmf. 500 V. (CR-243)	250159-101
20	Capacitor, mica, 47 mmf. 500 V.	250187-49
20	Capacitor, mica, 47 mmf. 500 V. (CR-243)	250159-96
21	Capacitor, ceramic, 50 mmf. + 10%, 500 V	250088-39
22	Capacitor, molded paper, .0015 mfd. 600 V.	250201-2
23	Capacitor, mica, 100 mmf. 500 V.	250187-53
23	Capacitor, mica, 100 mmf. 500 V. (CR-243)	250159-98
24	Capacitor, mica, 100 mmf. 500 V.	250187-53
24	Capacitor, mica, 100 mmf. 500 V. (CR-243)	250159-98
25	Capacitor, mica, 220 mmf. 500 V.	250159-86
25	Capacitor, mica, 220 mmf. 500 V. (CR-243)	250159-100
26	Capacitor, mica, 220 mmf. 500 V.	250159-86
26	Capacitor, mica, 220 mmf. 500 V. (CR-243)	250159-100
27	Capacitor, molded paper, .001 mfd. 600 V. (CR-242 only)	250201-1
28	Capacitor, molded paper, .001 mfd. 600 V.	250201-1
30	Capacitor, mica, .0022 mfd. ± 5%, 500 V.	250160-46
31	Capacitor, mica, 680 mmf. ± 10%, 500 V.	250160-62
31	Capacitor, mica, 680 mmf. ± 10%, 500 V. (CR-243)	250160-136
32	Capacitor, molded paper, .0033 mfd. 600 V.	250201-4
32	Capacitor, molded paper, .0033 mfd. 600 V. (CR-243)	250201-6
33	Capacitor, ceramic, .004 mfd. 350 V.	250088-34
34	Capacitor, molded paper, .0022 mfd. 600 V.	250201-3
35	Capacitor, paper, .015 mfd. ± 10%, 200 V.	250185-1
36	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
37	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
38	Capacitor, molded peper, .01 mfd. 600 V.	250201-7
39	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
40	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
41	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
42	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
43	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
44	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
45	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
46	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
47	Capacitor, molded paper, .0047 mfd. 600 V. (CR-243)	250201-5
48	Coil, choke	360284-1
49	Trimmer, 10 kc.	259610-2
50	Coil, 10 kc.	360244-2
51	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
52	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
53	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
54	Capacitor, molded paper, .02 mfd. 600 V.	250129-3
55	Capacitor, molded paper, .033 mfd. 600 V.	250201-10
56	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
57	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
58	Capacitor, molded paper, .047 mfd. 600 V.	250201-11
59	Capacitor, molded paper, .1 mfd. 600 V.	250201-13
60	Capacitor, mica, 47 mmf.	250159-96
61	Capacitor-resistor filter	250170-1
62	Capacitor, electrolytic, 30-10 mfd. 475 V.	270023-2
63	Capacitor, electrolytic, 10 mfd. 475 V. 20 mfd. 25 V.	270023-13
64	Capacitor, electrolytic, 20-10 mfd. 475 V. 20 mfd. 25 V	270023-12
65	Capacitor, electrolytic, 20 mfd. 25 V.	270027-2
67	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
67	Capacitor, mica, 470 mmf. (CR-243)	250159-90
68	Capacitor, molded paper, .01 mfd. 600 V.	250201-7
68	Capacitor, mica, 270 mmf. (CR-243)	250159-87
69	Resistor, composition, 270,000 ohms, ± 10%, ½ W. (CR-243 only)	230104-91
70	Resistor, composition, 33 ohms, ± 10%, ½ W.	230104-44
71	Resistor, composition, 68 ohms, ± 10%, ½ W.	230104-48
72	Resistor, composition, 68 ohms, ± 10%, ½ W.	230104-48
73	Resistor, composition, 82 ohms, ± 10%, ½ W.	230104-49
74	Resistor, composition, 220 ohms, ± 10%, ½ W.	230104-54
75	Resistor, composition, 125 ohms, 5 W.	240021-11
76	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
77	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
78	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
79	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
80	Resistor, composition, 1000 ohms, ± 10%, ½ W.	230104-62
81	Resistor, composition, 1500 ohms, ± 10%, ½ W.	230104-64
82	Resistor, composition, 3300 ohms, ± 10%, ½ W.	230104-68
83	Resistor, composition, 3900 ohms, ± 10%, ½ W.	230104-60
83	Resistor, composition, 3900 ohms, ± 10%, ½ W.	230104-69
84	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
85	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
86	Resistor, composition, 4700 ohms, ± 10%, ½ W.	230104-70
87	Resistor, wire wound, 6500 ohms, ± 10%	240035-9
88	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230105-73
89	Resistor, composition, 8200 ohms, ± 10%, 1 W.	230105-73
90	Resistor, wire wound, 100 ohms, 10 W. (CR-243 only)	240021-17
91	Resistor, composition, 10,000 ohms, ± 10%, ½ W.	230104-74
92	Resistor, composition, 33,000 ohms, ± 10%, ½ W.	230104-80
93	Resistor, composition, 15,000 ohms, ± 5%, ½ W.	230104-187
94	Resistor, composition, 22,000 ohms, ± 10%, ½ W.	230104-78
95	Resistor, composition, 22,000 ohms, ± 10%, ½ W.	230104-78
96	Resistor, composition, 47,000 ohms, ± 10%, 1 W.	230105-82
97	Resistor, composition, 47,000 ohms, ± 10%, ½ W.	230104-82
98	Resistor, composition, 47,000 ohms, ± 10%, ½ W.	230104-82
99	Resistor, composition, 68,000 ohms, ± 10%, ½ W.	230104-84
100	Resistor, composition, 220,000 ohms, ± 10%, ½ W.	230104-90
100	Resistor, composition, 68,000 ohms, ± 10%, ½ W.	230104-84
101	Resistor, composition, 100,000 ohms, ± 10%, ½ W.	230104-86
102	Resistor, composition, 100,000 ohms, ± 10%, 1 W.	230105-86
103	Resistor, composition, 100,000 ohms, ± 10%, 1 W.	230105-86
104	Resistor, composition, 100,000 ohms, ± 10%, ½ W.	230104-86
105	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
106	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
107	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
108	Resistor, composition, 150,000 ohms, ± 10%, ½ W.	230104-88
109	Resistor, composition, 220,000 ohms, ± 5%, ½ W.	230104-215
110	Resistor, composition, 220,000 ohms, ± 10%, ½ W.	230104-90
111	Resistor, composition, 270,000 ohms, ± 10%, ½ W.	230104-91
112	Resistor, composition, 330,000 ohms, ± 10%, ½ W.	230104-92
112	Resistor, composition, 820,000 ohms, ± 10%, ½ W. (CR-243)	230104-97
113	Resistor, composition, 1.2 megohm, ± 10%, ½ W.	230104-99
113	Resistor, composition, 1 megohm, ± 10%, ½ W. (CR-243)	230104-98
114	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
115	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
116	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
117	Resistor, composition, 1 megohm, ± 10%, ½ W.	230104-98
118	Resistor, composition, 560,000 ohms, ± 10%, ½ W. (in tuning eye)	230104-95
119	Resistor, composition, 820,000 ohms, ± 10%, ½ W.	230104-97
120	Resistor, composition, 470,000 ohms, ± 10%, ½ W.	230104-94
125	Control, volume	220072-18

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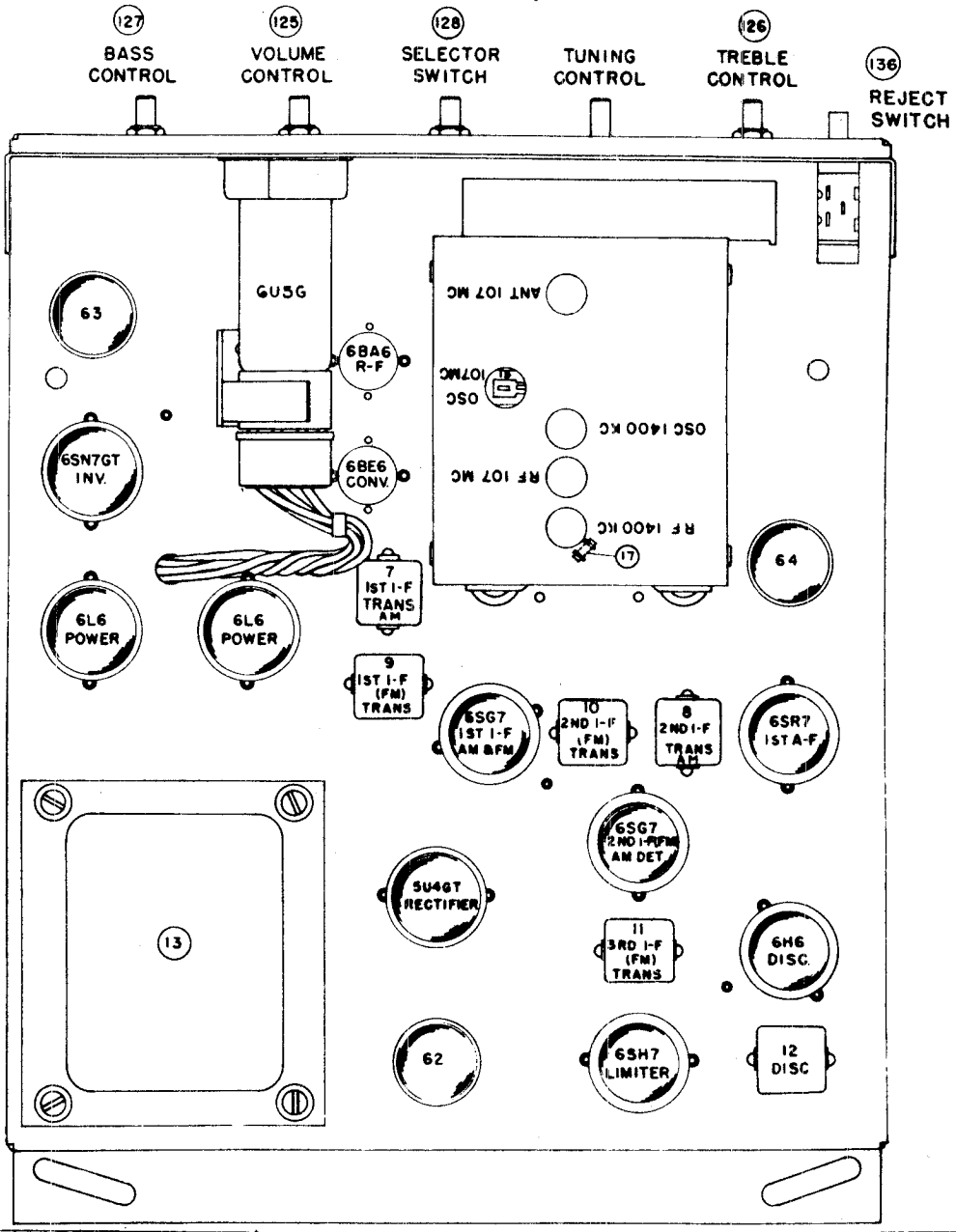
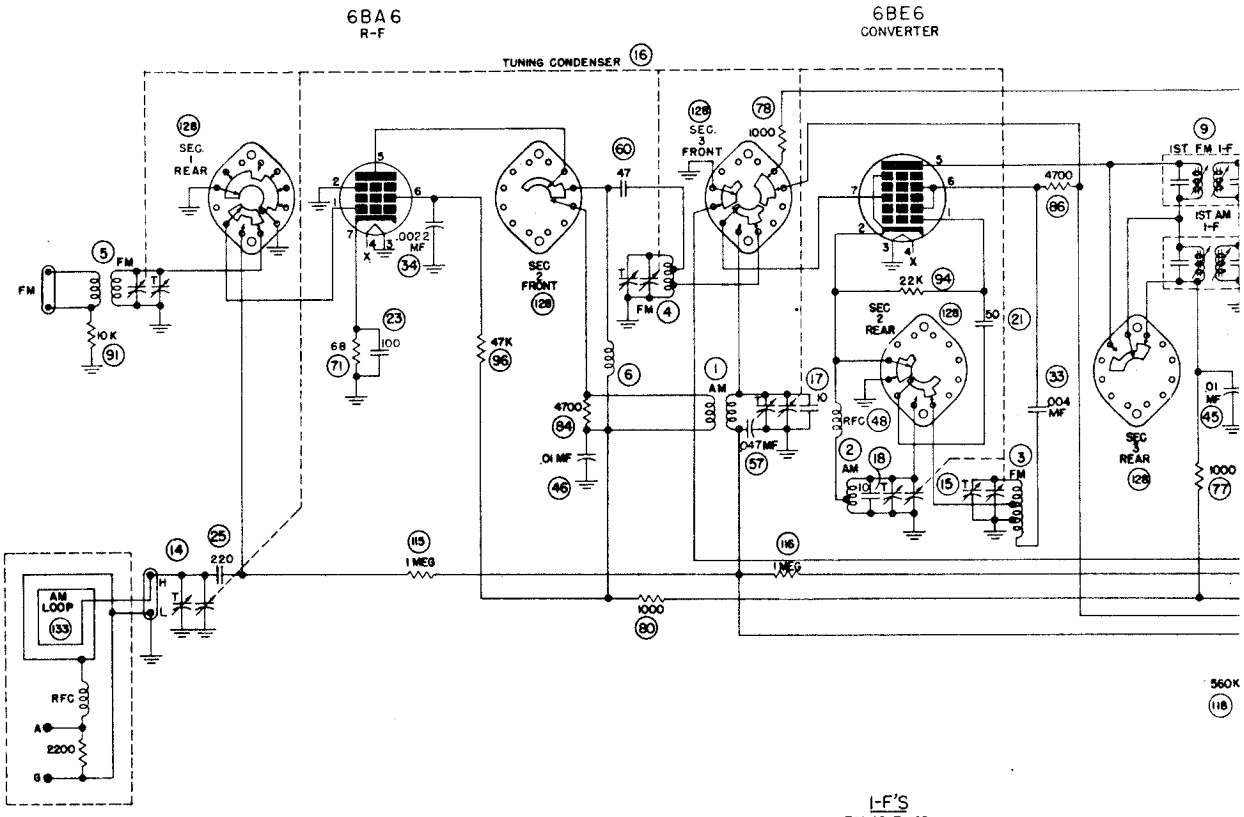
126	Control, treble	220072-8
127	Control, bass, with switch assembly (CR-243 only)	220073-5
128	Switch, selector	160194-1
129	Socket, motor	180520-4
	Plug, motor	180521-4
130	Socket, speaker	180504-16
	Plug, speaker	180503-4
131	Socket, external	180060-1
	Plug, external	180311-2
132	Socket, phono	189741-1
	Plug, phono	180311-1
133	Loop antenna	*
135	Socket and cable	180458-2
	Dial Glass	150353-1
	Panel Escutcheon	633934-3
	Knob, tuning	
	Maroon	140025-4
	Beige	140025-2
	Knob, selector	
	Maroon	143727-3
	Beige	143727-2
	Knob, treble, volume	
	Maroon	140025-5
	Beige	140025-3
136	Reject switch	160224-1
137	Socket, solenoid	182776-1

*The part number of the Loop Antenna Assembly changes with different Cabinets. It is therefore important that you specify the style number of the instrument when ordering a replacement Loop Antenna Assembly.





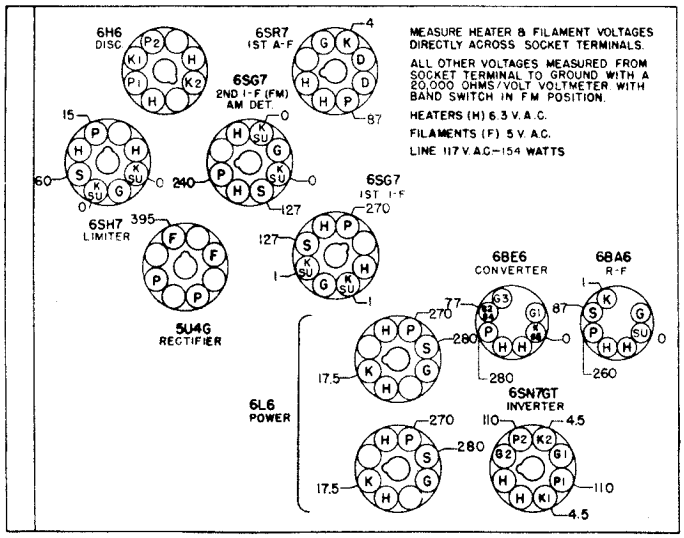
I-F'S
FM 10.7 MC.
AM 455 KC.

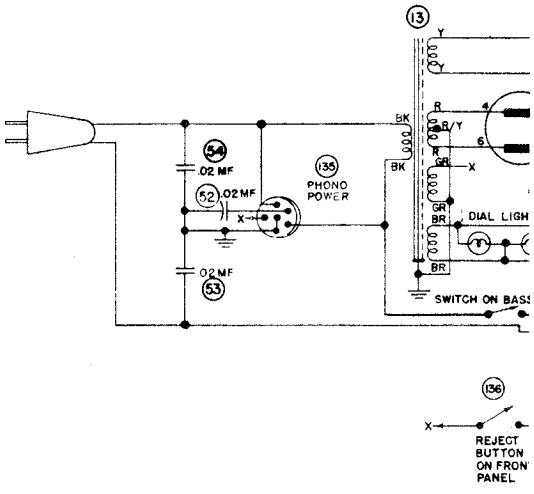
NOTES

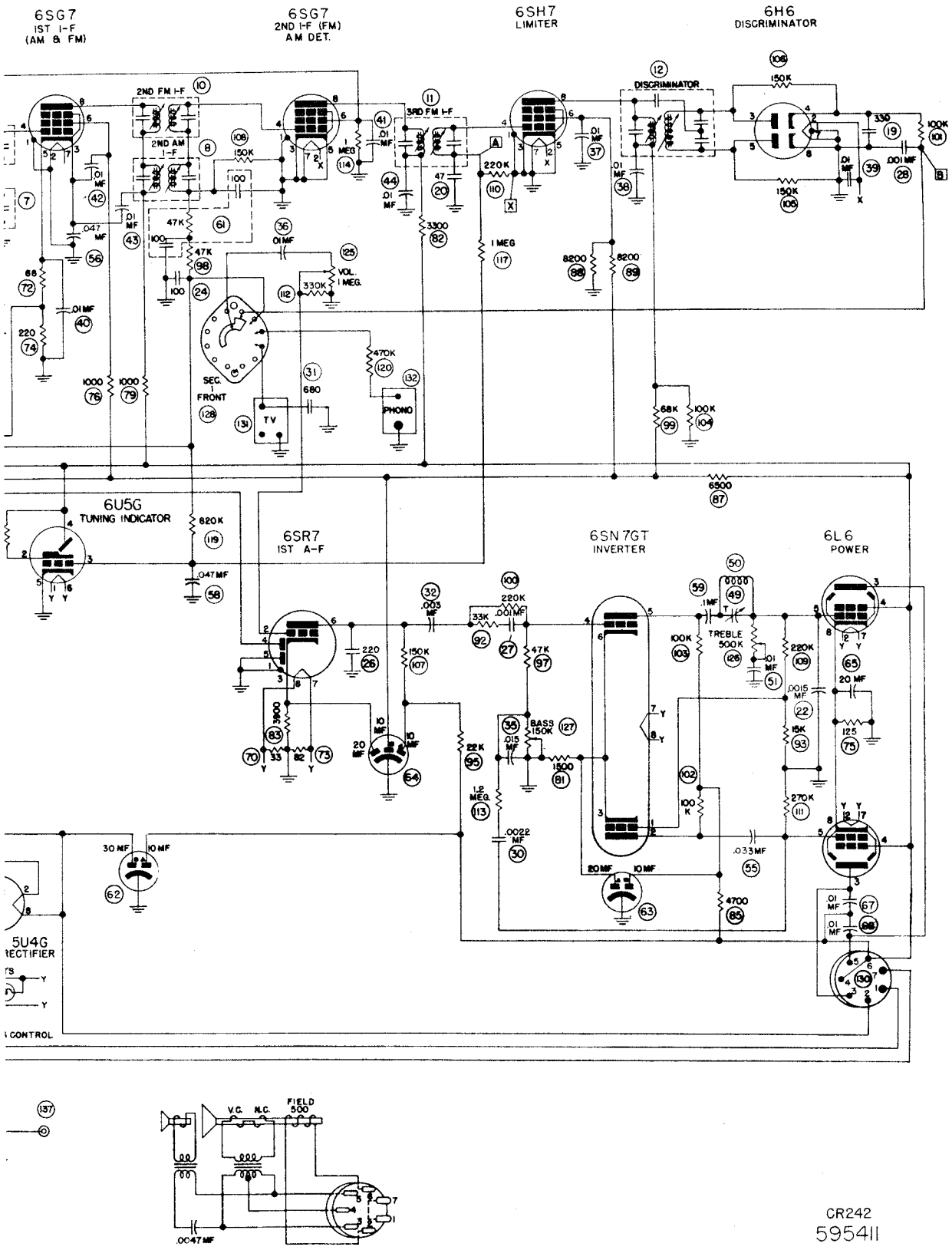
BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.

LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.



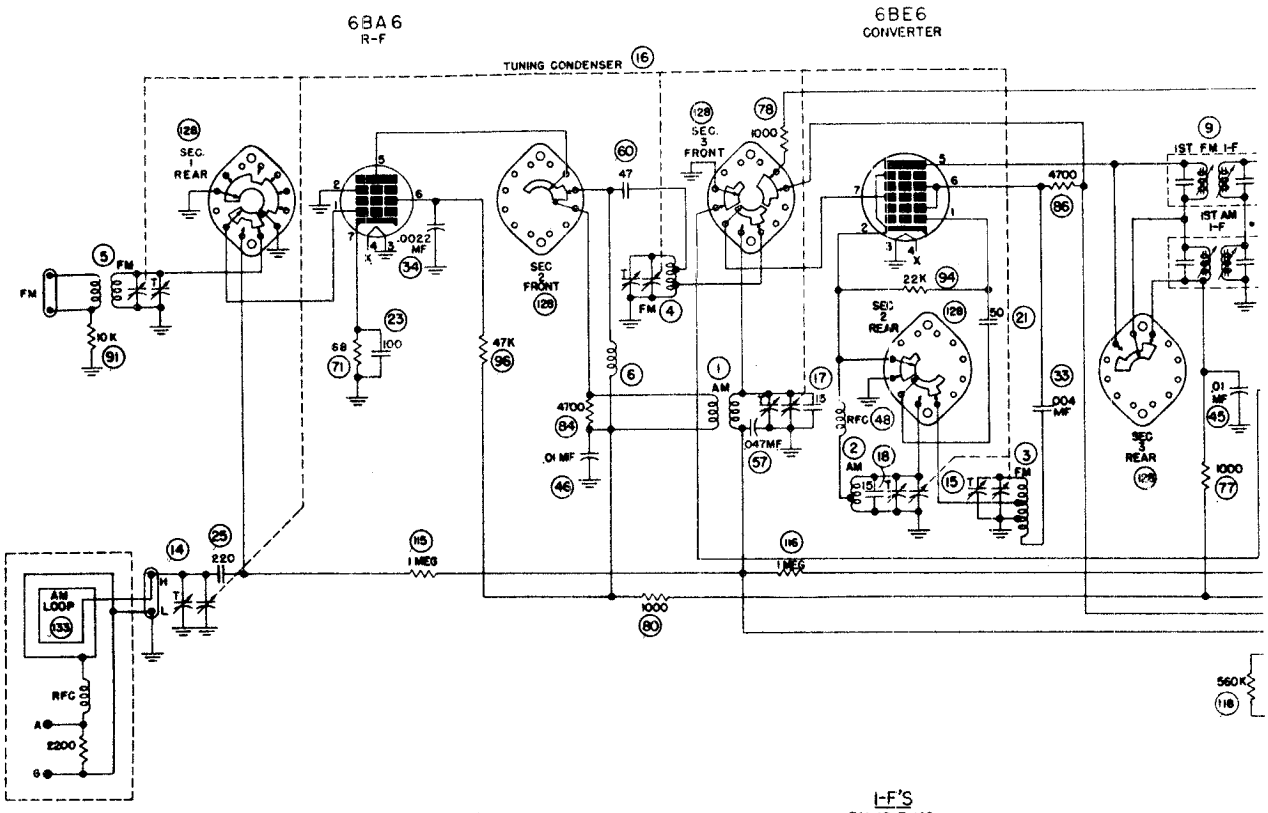




CR242
595411

FIG. 2a

MODEL CR-243



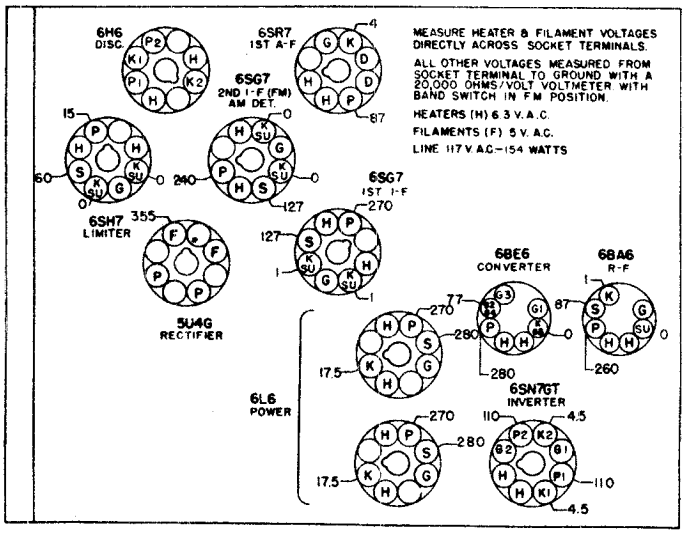
I-F'S
FM 10.7 MC.
AM 455 KC.

NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.

LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.



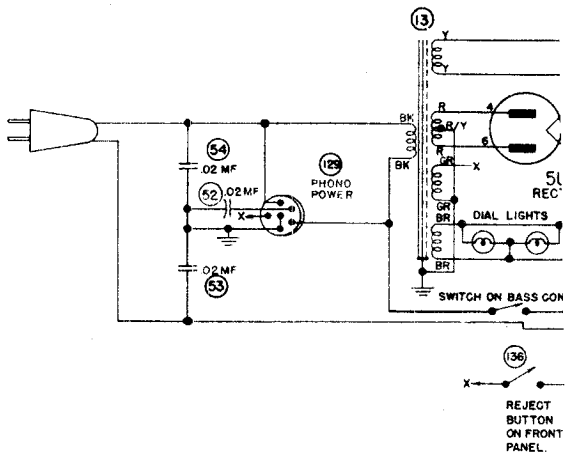
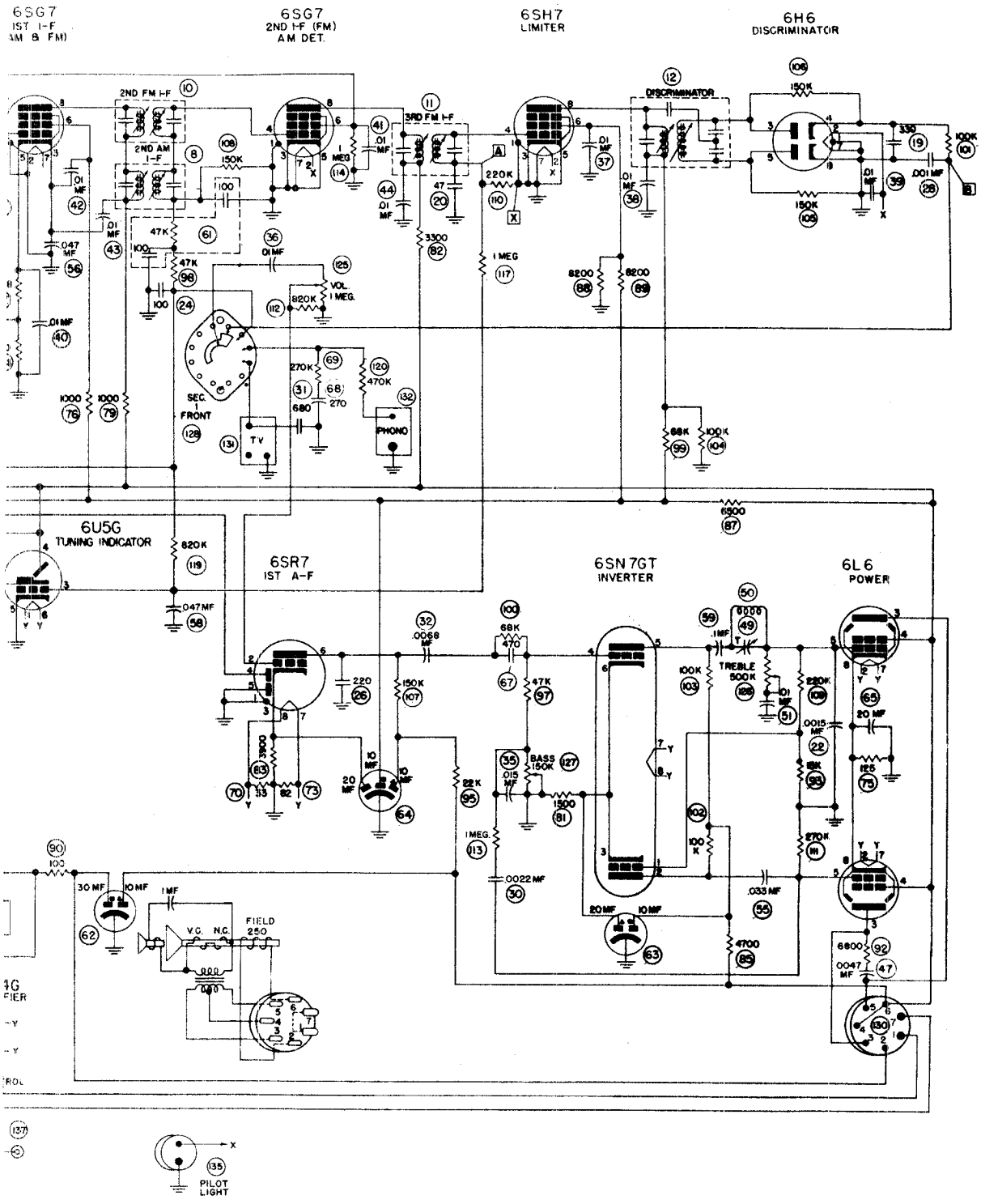
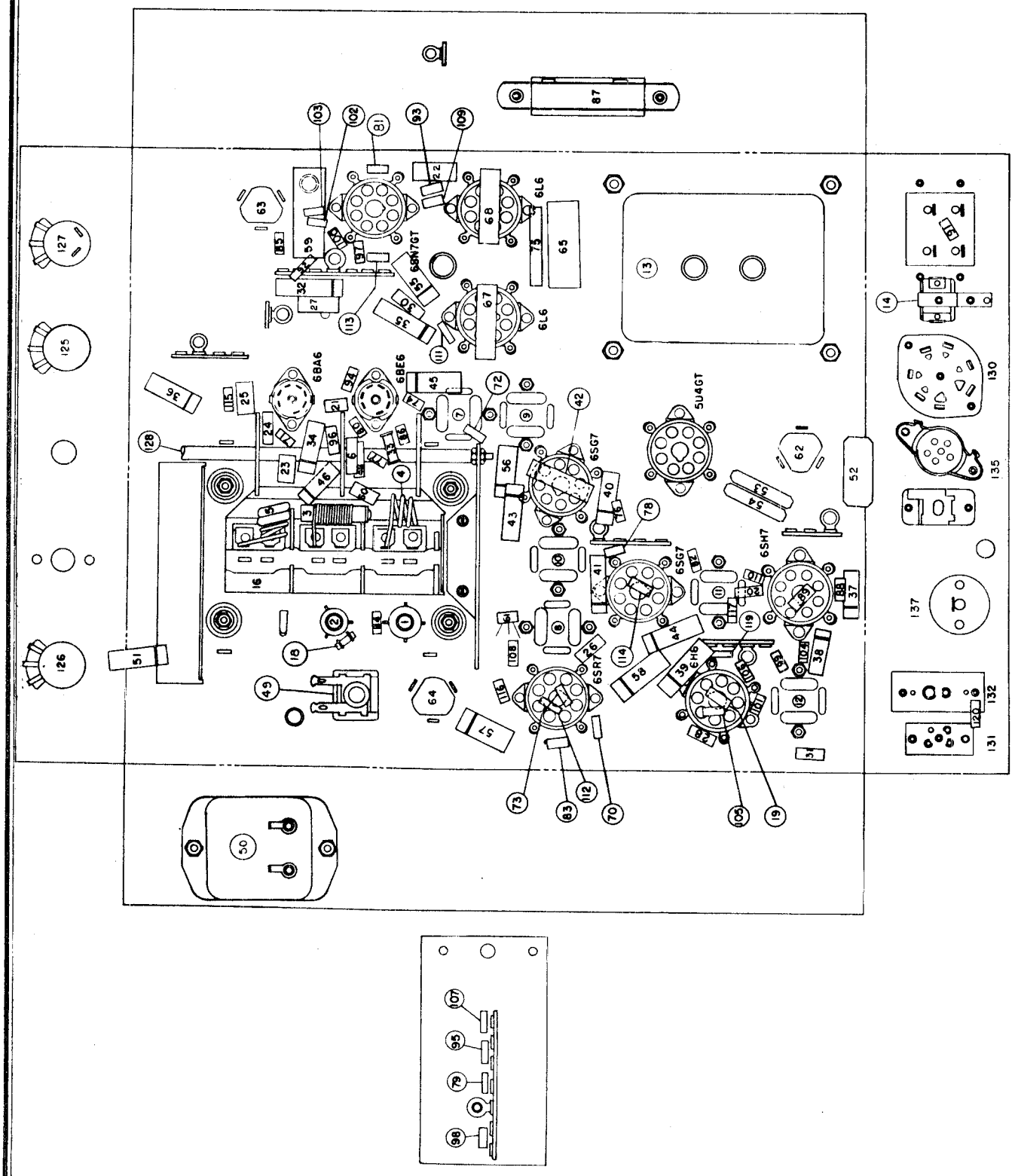


FIG. 2b



CR243
595412

MODELS CR-
242, CR-243



LINE VOLTAGE: This clock-radio receiver is designed for operation on 117 Volts, 60 Cycles, Alternating Current only.

POWER CONSUMPTION: Clock and Radio only — 35 watts
A.C. Receptacle — 700 watts max.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

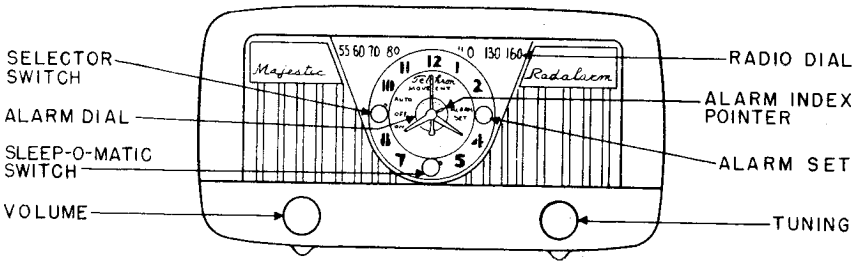
DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

TUBES: The tubes used, and their functions, are as follows:

12BE6 Converter	12AT6 or 12AV6 Detector, Avc and Audio Amp.
12BA6 I.F. Amplifier	50C5 Beam Power Amplifier
	35W4 Rectifier

INSTALLATION: Models 5C-2 and 5C-3 are complete in every detail for efficient and immediate operation. A self-contained Loop Antenna is included which will give excellent results in most locations. Due to the directional properties of the Loop, it may be advantageous to turn the receiver to the left or right in noisy locations for maximum signal and minimum noise. A best position for reception can always be found.

CONTROLS: Refer to the diagram below for location of the clock and radio control knobs.



HOW TO OPERATE YOUR "RADALARM" RADIO: The electric clock starts as soon as you plug the radio power cord into the A-C power line which corresponds with the rating shown on the Model Label. To set the clock to the correct time, turn the Time Set knob, located at the rear of the receiver, in the clockwise direction.

TO OPERATE THE RADIO: Turn the Selector knob located at the left side of the clock face so that its index points to ON. This turns on the power to the radio. Next, turn the Volume control knob at the bottom left of the cabinet about half way in the clockwise direction, or to the right. After the receiver has warmed up (allow about 30 seconds), set the Volume Control about half way and turn the Tuning Control knob so that the dial pointer indicates the frequency of the desired station. Then tune carefully for best reception. Adjust the volume by turning the Volume Control to the left or right to suit the listener. Never reduce the volume by detuning — always use the Volume Control knob.

To turn the radio off, turn the Selector knob so that the index points to the center or OFF position.

TO OPERATE YOUR "RADALARM" RADIO AS A MUSICAL ALARM: You may set your clock-radio to automatically turn on a program you wish to hear during the next eleven hours. Proceed by tuning in the station which will carry the program desired. Then set the Volume control knob at the level you want, as for regular radio operation. Pull alarm set knob, located at the right side of the clock face, and turn counterclockwise. This causes the alarm dial disc to rotate. Stop rotation when the time you desire the radio to go on, is indicated on the dial directly under the short index pointer, on the opposite end of the hour hand. Now turn Selector knob so that the index points to Auto position.

The "RADALARM" is now ready to turn on the radio automatically, at the time selected. As an added feature, an A.C. outlet is provided at the rear of the receiver. This enables the connection of any electrical appliance, of less than max. rated wattage, and its subsequent automatic simultaneous operation with that of the radio in the Auto position.

After setting the alarm, if you wish to return to normal radio operation, turn the Selector knob so that the index points to ON. Then operate the radio as described in preceding paragraphs. Be sure to turn the Selector knob back to the Auto position if you want a program to be turned on automatically, at the time previously set.

As with any alarm, when the radio goes on at the time selected, push alarm set knob in. To turn off radio, follow previous instructions.

SLEEP-O-MATIC: Uninterrupted radio operation and automatic shut-off may be obtained by turning the "Sleep-o-matic" control, located at the bottom of the clock face, clockwise for up to 60 minutes of operation. No further controls are necessary, other than Tuning and Volume.

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

(1) Set the Signal Generator to 455KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

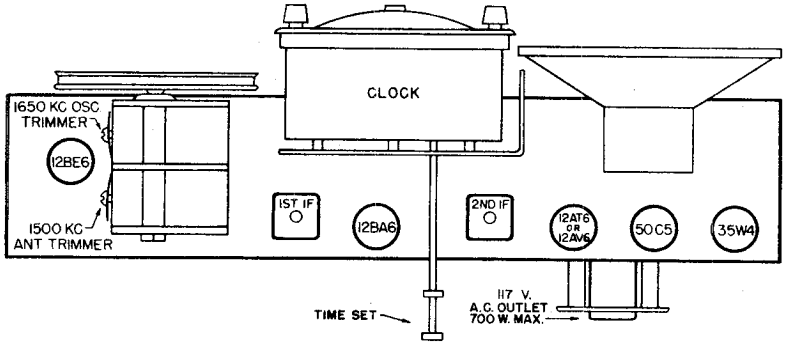
(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.

MODELS 5C-2,
5C-3

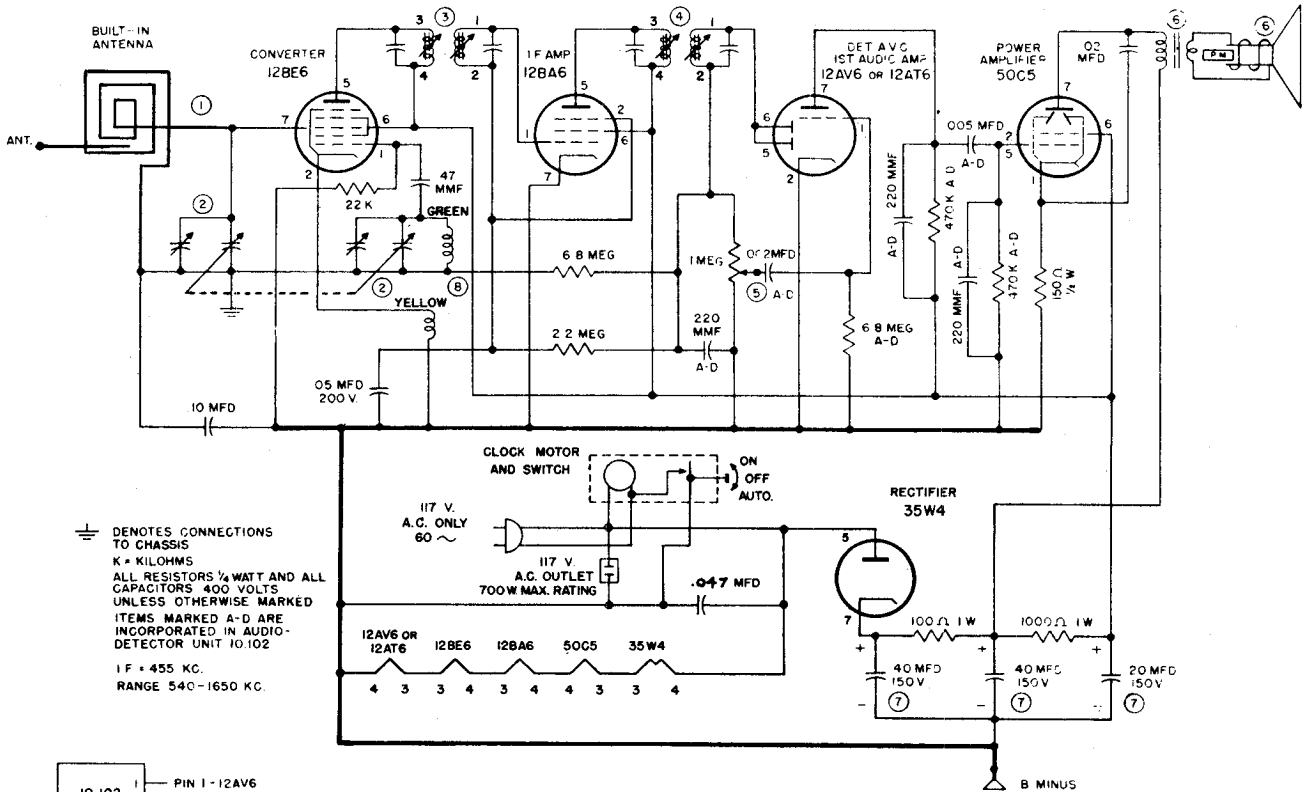
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM



PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
(1) 1.550	LOOP ASSEMBLY	(5) 8.200-11	VOLUME CONTROL AND SWITCH
(2) 2.163	2 GANG VARIABLE CONDENSER	(6) 30.332-3	P.M. 4" SPEAKER & OUTPUT TRANS.
(3) 1.445-2	1ST I.F. TRANSFORMER	(7) 5.415-5	ELECTROLYTIC CAP. 40-40-20 MFD 150V.
(4) 1.445-6	2ND I.F. TRANSFORMER	(8) 1.526	OSCILLATOR COIL

5247 4/51

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

TUBES: The tubes used, and their functions, are as follows:

12SA7 Converter — 12SQ7 Detector, Avc and Audio Amp.

12SK7 I.F. Amplifier — 50L6 Beam Power Amplifier

35Z5 Rectifier

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

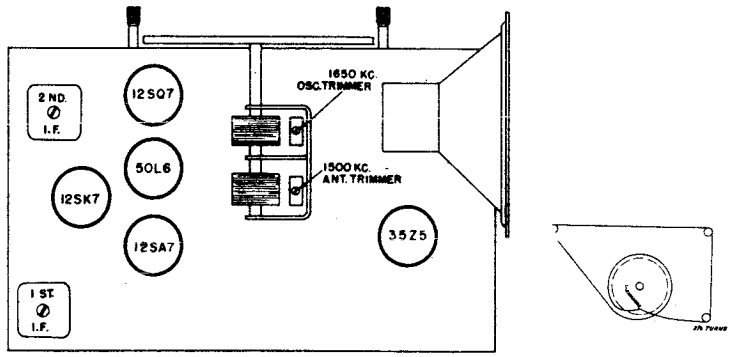
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.

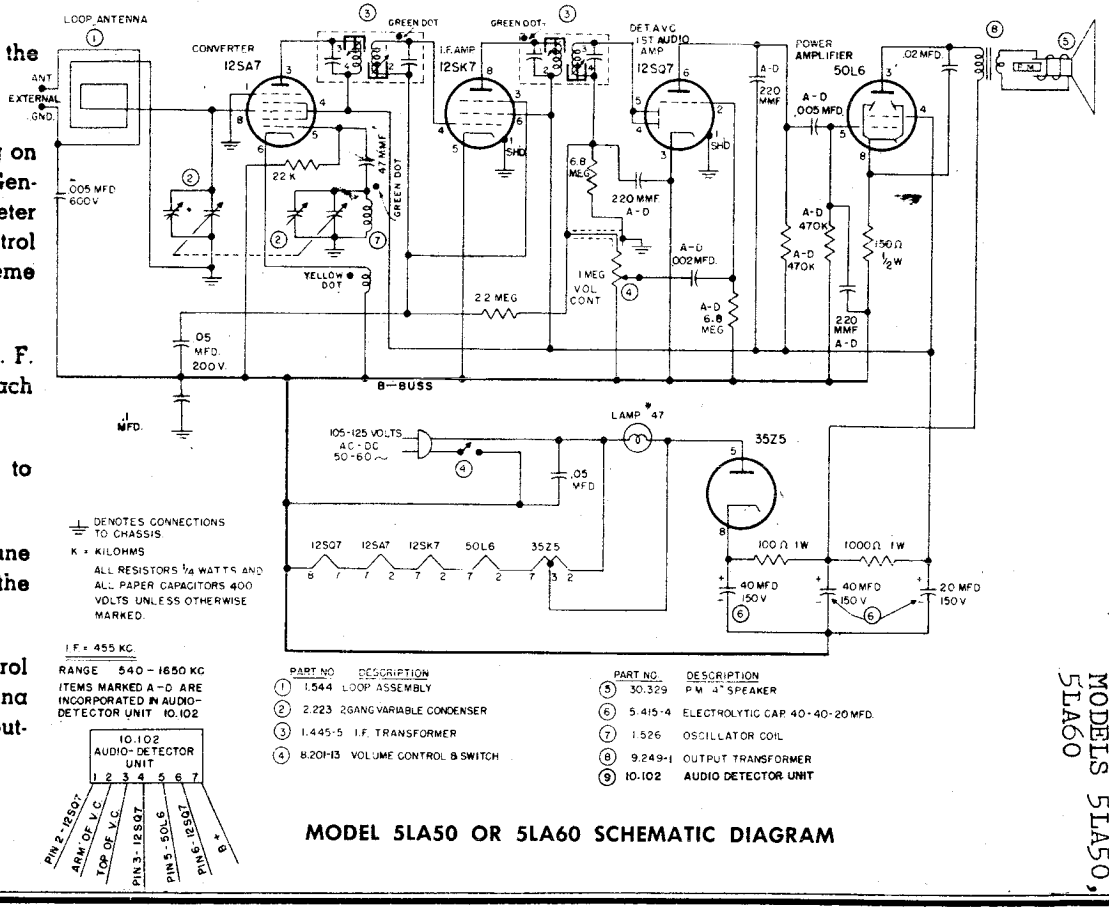
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM



PART NO	DESCRIPTION
(1) 1.544	LOOP ASSEMBLY
(2) 2.223	2GANG VARIABLE CONDENSER
(3) 1.445-5	I.F. TRANSFORMER
(4) 8.201-13	VOLUME CONTROL & SWITCH

PART NO.	DESCRIPTION
(5) 30.329	P.M. 4" SPEAKER
(6) 5.415-4	ELECTROLYTIC CAP. 40-40-20 MFD.
(7) 1.526	OSCILLATOR COIL
(8) 9.249-1	OUTPUT TRANSFORMER
(9) 10-102	AUDIO DETECTOR UNIT

MODEL 5LA50 OR 5LA60 SCHEMATIC DIAGRAM

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

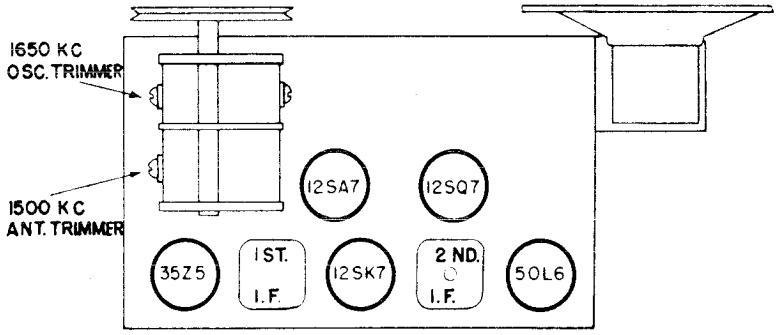
TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters)

TUBES: The tubes used, and their functions, are as follows:

12SA7 Converter — 12SQ7 Detector, Avc and Audio Amp

12SK7 I.F. Amplifier — 50L6 Beam Power Amplifier

35Z5 Rectifier



TRIMMER AND TUBE LOCATION DIAGRAM

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

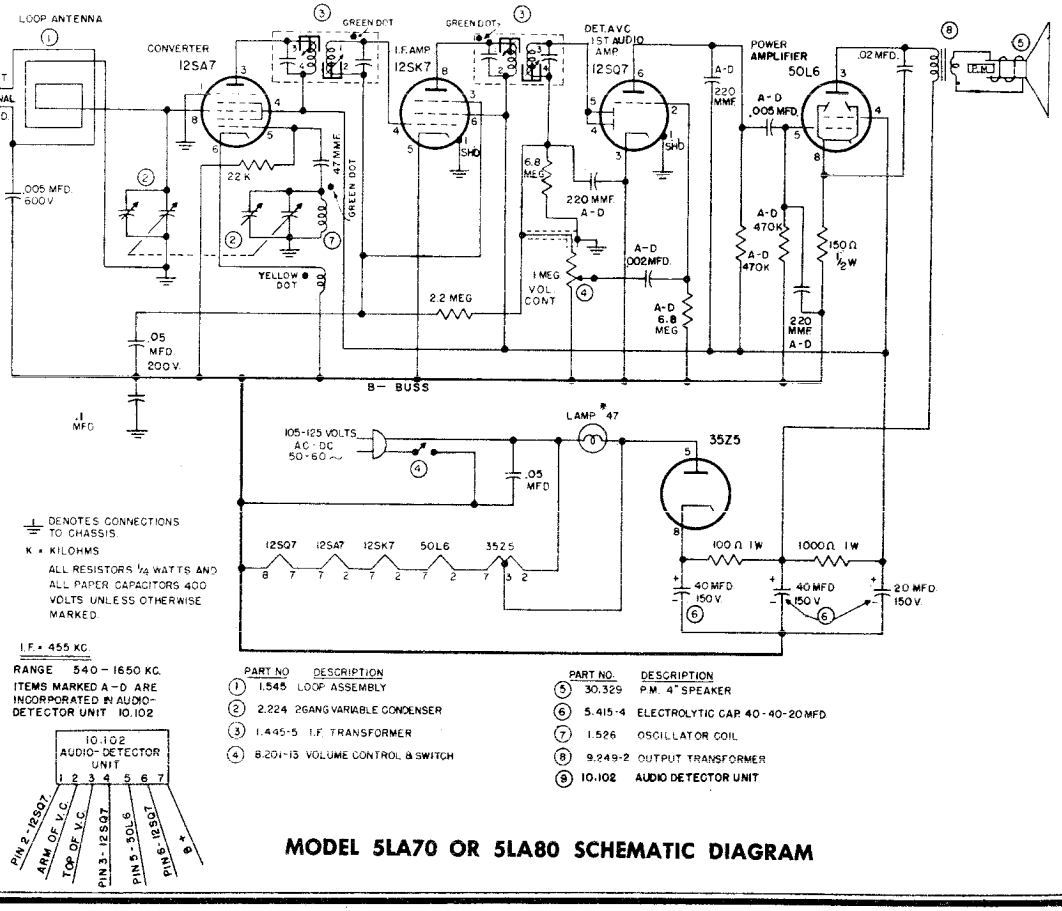
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.

(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



PART NO	DESCRIPTION
(1) 1.548	LOOP ASSEMBLY
(2) 2.224	2GANG VARIABLE CONDENSER
(3) 1.445-5	I.F. TRANSFORMER
(4) 8.201-13	VOLUME CONTROL & SWITCH

PART NO.	DESCRIPTION
(5) 30.329	P.M. 4" SPEAKER
(6) 5.415-4	ELECTROLYTIC CAP. 40-40-20 MFD.
(7) 1.526	OSCILLATOR COIL
(8) 9.249-2	OUTPUT TRANSFORMER
(9) 10.102	AUDIO DETECTOR UNIT

MODEL 5LA70 OR 5LA80 SCHEMATIC DIAGRAM

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

TUBES: The tubes used, and their functions, are as follows:

12BE6 Converter — 12AT6 or 12AV6 Detector, Avc and Audio Amp.

12BA6 I.F. Amplifier — 50C5 Beam Power Amplifier

35W4 Rectifier

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

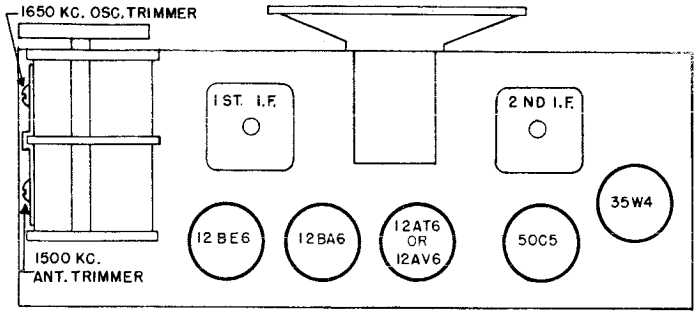
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.

(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.

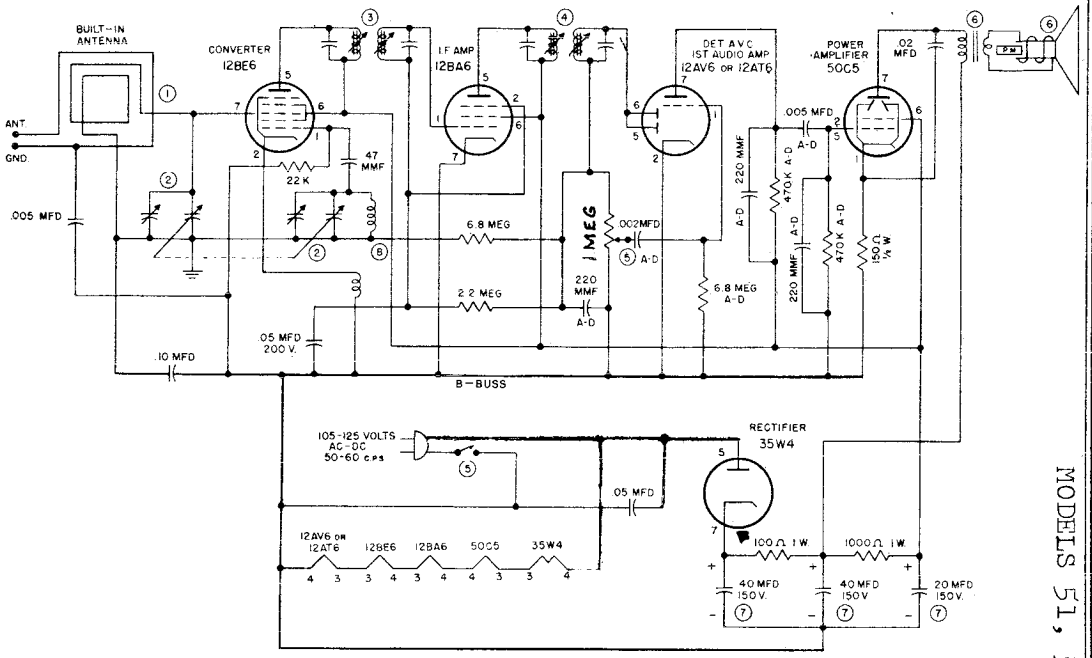


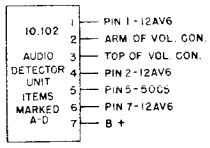
TRIMMER AND TUBE LOCATION DIAGRAM

	PART NO.	DESCRIPTION
(1)	1.546	LOOP ASSEMBLY
(2)	2.200	2 GANG VARIABLE CONDENSER
(3)	1.445-2	1st I.F. TRANSFORMER
(4)	1.445-6	2nd I.F. TRANSFORMER

	PART NO.	DESCRIPTION
(5)	8.200-9 OR 8.201-4	VOLUME CONTROL & SWITCH
(6)	30.332-2 PM 4"	SPEAKER & OUTPUT TRANS.
(7)	5.415-5	ELECTROLYTIC CAP 40-40-20 MFD 150V.
(8)	1.445-2	OSCILLATOR COIL
(9)	10.102	AUDIO-DETECTOR UNIT

MODEL 51, 52 SCHEMATIC DIAGRAM





DENOTES CONNECTIONS TO CHASSIS

K = KILOHMS

ALL RESISTORS ½ WATT AND ALL CAPACITORS 400 VOLTS UNLESS OTHERWISE MARKED

ITEMS MARKED A-D ARE INCORPORATED IN AUDIO-DETECTOR UNIT 10.102

I.F. = 455 KC.

RANGE 540-1650 KC.

MODEL 80FMP2

TUBES: The Tubes used, and their functions, are as follows:

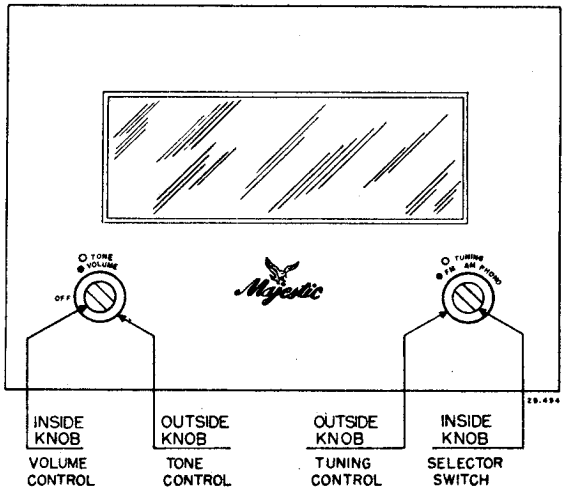
12AT7	R-F Amplifier and Mixer (F-M)
6BE6	A-M Converter and F-M Oscillator
6BA6	1st I-F Amplifier (A-M & F-M)
6BA6	2nd I-F Amplifier (F-M)
6AL5	F-M Detector
6AV6	A-M Detector, A.V.C. and Audio Amp.
6V6GT	Beam Power Amplifier
5Y3GT	Rectifier

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts; 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION INCLUDING RECORD CHANGER: 115 Watts.

TUNING RANGE:

Broadcast Band:	540 to 1650 Kilocycles (182 to 555 Meters)
F-M Band:	87.5 to 108.5 Megacycles (2.7 to 3.4 Meters)



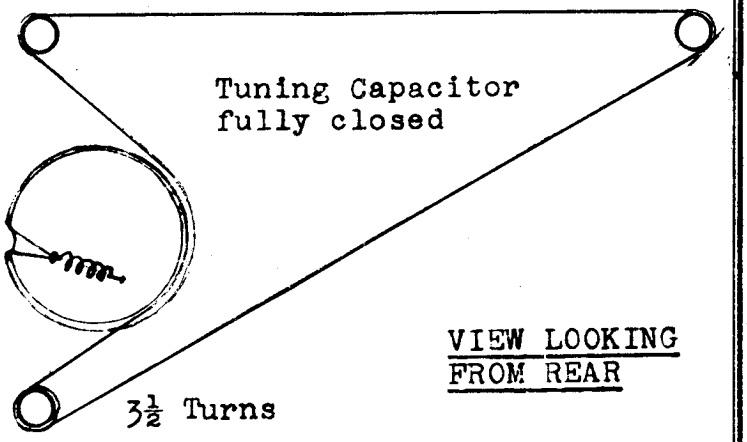


FIG. 1—FRONT PANEL CONTROLS

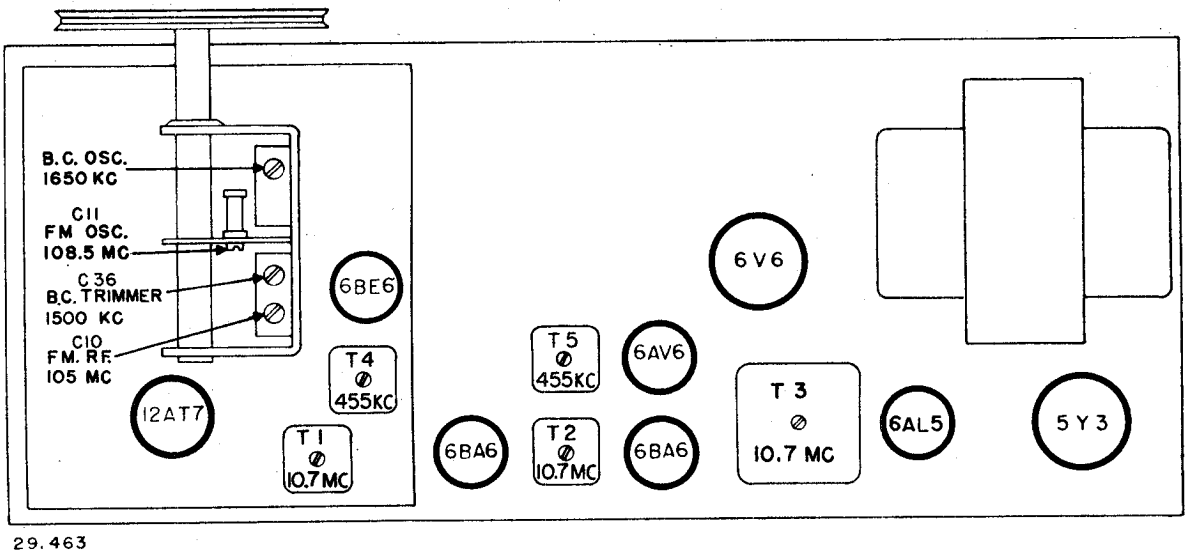


FIG. 2—TUBE AND ADJUSTMENT LOCATION DIAGRAM

ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER DIAL AT	SIGNAL GENERATOR			METER		ADJUST	METER INDICATION
			TYPE	FREQ.	CONNECTIONS	TYPE	CONNECTIONS		
1	B.C. I.F	B.C. BAND MAX. FREQ.	A.M.	455 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T4 & T5	MAX. OUTPUT
PREFERRED METHOD 2	F.M. I.F.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.	HIGH SIDE THROUGH .005 MF (APPROX.) CAP TO PIN 7 OF 12AT7	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T1 & T2; BOT. OF T3	MAX. OUTPUT
ALTERNATE METHOD 2			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 3	F.M. DET.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TOP OF T3	MAX. OUTPUT
ALTERNATE METHOD 3			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEG. TO JUNCTION OF 8.2K'S AT 6AL5; POS. TO JUNCTION OF R15 & C17.		ZERO BETWEEN TWO OPPOSITE POLARITY PEAKS
PREFERRED METHOD 4	F.M. OSC.	F.M. BAND MAX. FREQ.	F.M.	108.5 MC. 30% MOD.	EACH SIDE OF GEN. OUTPUT THROUGH 150 OHM RESISTOR TO F.M. ANT. TERMINALS	OUTPUT	ACROSS VOICE COIL	TRIMMER ON TOP CENTER OF VAR. COND. (C11)	MAX. OUTPUT
ALTERNATE METHOD 4			R.F. OR A.M.	108.5 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 5	F.M. R.F.	F.M. BAND 105 MC	F.M.	105 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TRIMMER AT REAR OF VAR. COND. (C10)	MAX. OUTPUT
ALTERNATE METHOD 5			R.F. OR A.M.	105 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
6	B.C OSC.	B.C. BAND MAX. FREQ.	A.M.	1650 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TRIMMER AT FRONT OF VAR. COND. (C34).	MAX. OUTPUT
7	B.C. R.F.	B.C. BAND 1500 KC	A.M.	1500 KC 30% MOD.	EACH SIDE OF GEN. OUTPUT TO 2 OR 3-TURN LOOP (1 FOOT DIA.) SEVERAL FEET FROM ANT.	OUTPUT	ACROSS VOICE COIL	B.C. TRIM. AT REAR OF VAR. COND. (C36).	

29.498

NOTES:

1-TURN VOLUME CONTROL FULLY CLOCKWISE.

2-MAINTAIN SIGNAL INPUT LOW ENOUGH TO HAVE LESS THAN 2 VOLTS ACROSS METERS.

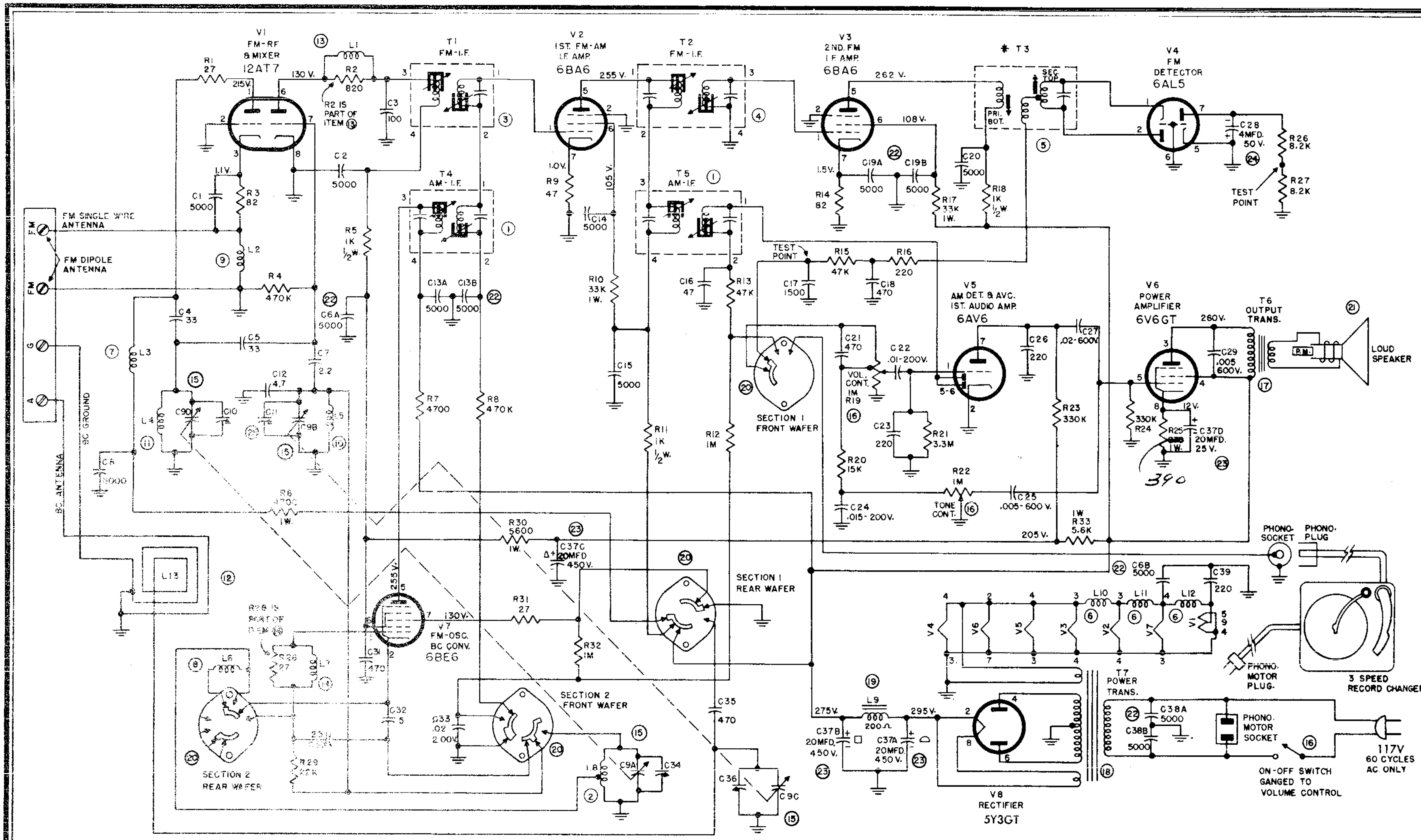
3-UNLESS OTHERWISE NOTED, CONNECT LOW SIDE OF SIGNAL GENERATOR TO CHASSIS.

4-UNLESS OTHERWISE NOTED, SET VARIABLE CONDENSER TO MINIMUM CAPACITY (MAX. FREQ.)

5-USE PROPER TOOL FOR SMALL I.F. TRANS. ADJUSTMENTS— I.E., .150 DIA. BAKELITE WITH BLADE .075 THICK.

6-MAINTAIN 60 CYCLE LINE VOLTAGE AT APPROX. 117 VOLTS.

MODEL 80FMP2



K = KILOHMS
M = MEGOHMS

FM-I.F. = 10.7MC
AM-I.F. = 455 KC

ALL CONDENSERS SHOWN IN MMF.
ALL CONDENSERS 500V. EXCEPT AS SHOWN.
ALL RESISTORS 1/4 WATT EXCEPT AS SHOWN.

BAND-SWITCH POSITIONS

COUNTER CLOCKWISE ____ FM (87.5 - 108.5 MC)
CENTER ____ AM (540 - 1650 KC)
CLOCKWISE ____ PHONO.

BAND-SWITCH IN FM POSITION.

* ITEM (5)

T3 RATIO DETECTOR TRANSFORMER

TWO TYPES OF TRANSFORMERS ARE USED. IDENTIFICATION AS FOLLOWS:

1 CAN HEIGHT OF PART NO C-1.524 IS 2 1/2".

2 - CAN HEIGHT OF PART NO C-1.542-1 IS 1 15/16".

Item	Part No.	Description
1	C-1.445-3	AM-I.F. TRANSFORMER
2	C-1.436-2	BC-OSCILLATOR COIL
3	C-1.446-2	FM-I.F. TRANSFORMER
4	C-1.446-3	FM-I.F. TRANSFORMER
5*	SEE NOTE	RATIO DETECTOR TRANS.
6	B-1.501	FILAMENT CHOKE
7	B-1.512	RF CHOKE - RF PLATE
8	B-1.535-1	RF CHOKE - OSC. CATHODE
9	B-1.535-2	RF CHOKE - RF CATHODE
10	B-1.538	FM OSCILLATOR COIL
11	B-1.539	FM-RF GRID COIL
12	D-1.540	BC LOOP ANTENNA
13	B-1.536-1	MODULATOR PLATE CHOKE
14	B-1.536-2	PARASITIC SUPPRESSOR
15	C-2.222	VARIABLE CONDENSER
16	C-8.218-2	DUAL CONCENTRIC VC, TC & SWITCH
17	C-9.241-3	OUTPUT TRANSFORMER
18	D-9.248	POWER TRANSFORMER
19	C-9.255	FILTER CHOKE
20	C-11.227-1	BAND-SWITCH
21	C-30.328	10" SPEAKER
22	B-4.125-1	DUAL SHIELDED CERAMIC CAPACITOR
23	C-5.421-7	DRY ELECTROLYTIC CAPACITOR UNIT
24	C-5.430	ELECTROLYTIC CAPACITOR
25	B-4.118	CERAMIC TRIMMER .7 TO 3.5 MMF.

SCH-102

MODEL 104, Lone Ranger, Rudolph

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

TUBES: The tubes used, and their functions, are as follows:

12BE6 Converter	12AT6 Detector, Avc and Audio Amp.
35W4 Rectifier	50C5 Power Amplifier

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

(1) Connect the high side of a 455 KC Signal Generator through a .1 mf capacitor to the stator lug on the rear section of the variable capacitor; the ground lead to one of the lugs on the line on-off switch. Connect a suitable output meter across the speaker voice coil. Turn the Volume and Tuning controls to their extreme clockwise positions.

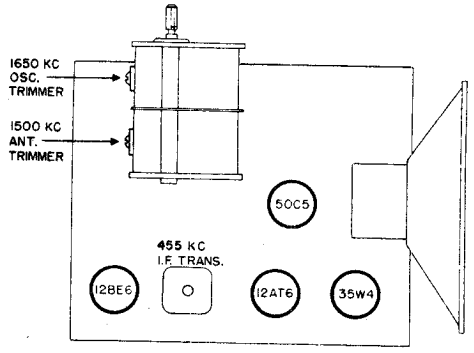
(2) Adjust the trimmers located at the top and bottom of the I-F transformer for maximum indication on the output meter.

(3) Connect the Signal Generator high side to the antenna lug through a 47 mmfd capacitor; the low side remains as in step (1). Set the Signal Generator to 1650 KC.

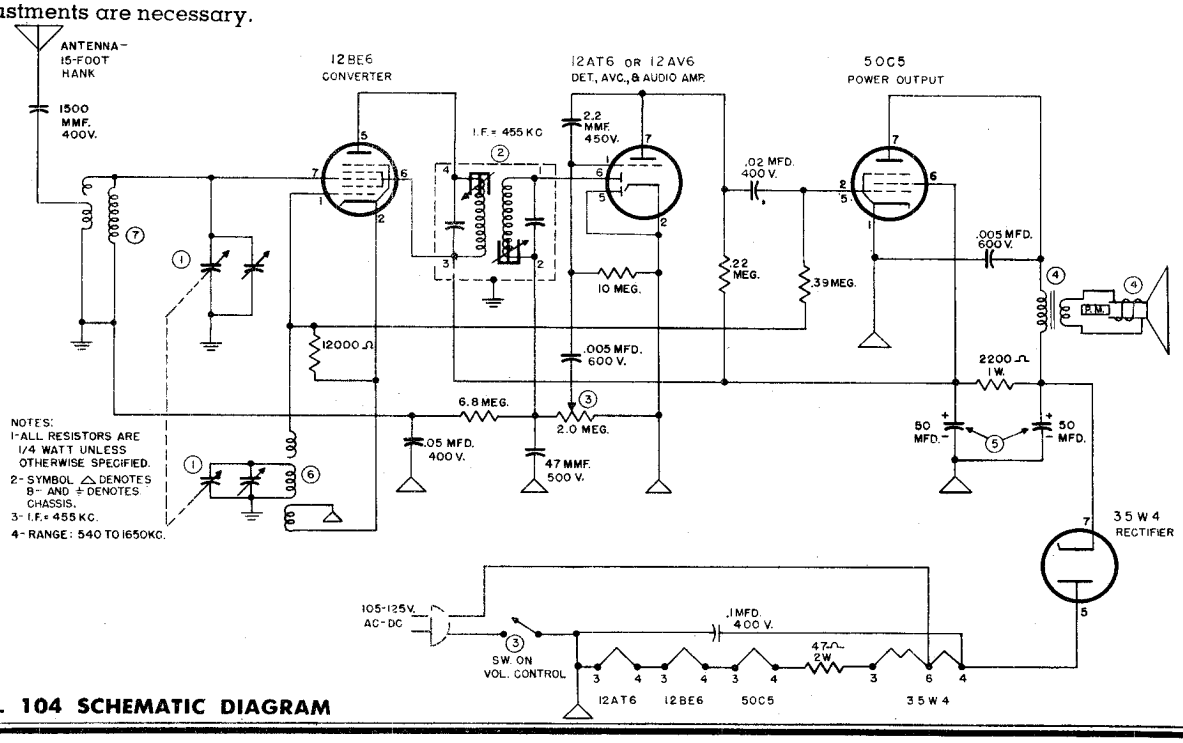
(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is received. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.

ITEM	PART NO.	DESCRIPTION
①	2.225	2-GANG VAR. CONDENSER
②	1.445-2	I.F. TRANSFORMER
③	8.201-9	VOLUME CONTROL W/SWITCH
④	30.332-1	4" P.M. SPEAKER WITH OUTPUT TRANSFORMER
⑤	5.436-1	50-50 MFD. ELECT. 150V. D.C.
⑥	1.402-4	OSCILLATOR COIL
⑦	1.534	ANTENNA COIL



TRIMMER AND TUBE LOCATION DIAGRAM



MODEL 104 SCHEMATIC DIAGRAM

MEISSNER T.R.F. BANDPASS TUNER
MODEL 4E

The Meissner Model 4E T.R.F. Bandpass Tuner is designed for superior high fidelity broadcast reception. It is specifically designed for custom installation and may be used in connection with a power amplifier and speaker system to fit a wide variety of installations ranging from the simplest home installation consisting of a low power amplifier and a speaker, to the largest high power installations designed to serve large auditoriums and consisting of one or more high power amplifiers and multiple speakers. Although the designer of such an installation must be guided to a large extent by the requirements of the installation, the following general hints may prove helpful.

The Power Amplifier

The output impedance of the 4E Tuner is 100,000 ohms and should be worked into an amplifier having high impedance input. High impedance amplifiers usually have an input impedance of 500,000 ohms, but some have a lower impedance than this and the 4E may be worked into an impedance as low as 100,000 ohms with no appreciable loss of low frequencies or increase in distortion. An amplifier having provision for phonograph input from a crystal pickup is satisfactory for use with the 4E, but under no conditions should the 4E be worked into a microphone input channel. The relatively high output of the 4E would cause overloading and severe distortion in the microphone input stage and the hum level would be too high to be a considered acceptable.

The Cabinet

No special precautions are necessary in the installation of the 4E Tuner, although it should be borne in mind that sufficient ventilation is required to prevent the unit from overheating. The heat generated by the 4E is low so that only a small amount of ventilation is required and usually the ordinary open back type of cabinet is satisfactory.

One more thing which should be observed in planning an installation is to use the normal precautions against microphonics. Since the 4E is a T.R.F. circuit and has no local oscillator, its tendency toward microphonism will be much less than in a similar superhet unit; but the 6AT6 audio amplifier tube may produce microphonics if subjected to severe vibration. This vibration may be transmitted through the cabinet or through the air from the speaker and the installation layout should be planned to avoid it.

The Record Player (or Changer)

The phonograph system of the 4E chassis is designed for use with crystal type pickups, and any record player or changer having this type pickup may be used. The following notes should be observed:

1. The record player frame must be connected to the tuner chassis in order to prevent hum pickup. In some record players the connecting lead from the phonograph pickup cartridge to the tuner chassis is a shielded lead with the shield connected to the pickup cartridge and to the record player frame. In this case the record player frame is automatically connected to the tuner chassis; but in record players which do not have this connection, a separate connecting lead between the record player frame and tuner may be used.

MODEL T4EK

2. The record player motor may be plugged into the convenience outlet on the rear of the tuner chassis. A power switch must be provided on the record player to turn the motor on and off.

3. The connecting lead from the pickup cartridge must be provided with a miniature phonograph plug. The 4E chassis is shipped with a proper plug in the input jack for use on phono units not so equipped. The outer band or shield is connected to the shell of the plug, and the center wire is soldered in the pin of the plug.

Antenna and Ground

For the best results it is strongly recommended that a good outdoor antenna be used with the 4E. Although this practice has been virtually abandoned with present day receivers having built-in antennas, it is still good practice when the best reception is desired.

Equally important in insuring the best possible reception is the use of a good ground system. Cold water pipes or a rod driven several feet into the earth may be used for external ground, but hot water or steam pipes or electrical conduit should not be used. A good ground connection will do much to minimize electrical interference, and is well worth the effort required for its installation.

Service Data - General

Power Supply 110-120 V 50-60 cycles.
Power Consumption 25 watts
Undistorted Output 2 to 15 volts.
Replacement Part Numbers - as shown on circuit diagram.
Circuit T.R.F. Bandpass.
Audio Frequency Response - flat ±2 db. 40 to 15,000 cycles.
Hum Output .002 volts.

Tubes:	6BA6 R.F. Amplifier	6AT6	Detector - Audio Amplifier
	6BA6 R.F. Amplifier	6X4	Rectifier

Alignment Procedure (use 200 uuf. dummy)

1. Using an F.M. Signal Generator and Oscilloscope:

Connect the vertical plates of the oscilloscope to the chassis and top of volume control. Connect the horizontal plates to the sync terminals of the F.M. signal generator.

Set the dial of the tuner to 1,400 kc and the generator to 1,400 kc, using a sweep frequency of 400 cycles and deviation of about ±50 kc. Set the output of the generator to the least that will give a useful picture, connecting generator to antenna terminal.

Adjust the 4 trimmers at the top of the gang condenser to obtain a pattern of the greatest amplitude, reducing generator input as alignment proceeds, and at the same time adjusting the trimmers to give a double-humped pattern with humps of equal magnitude and with the center of the pattern centered on the scope.

2. Using an A.M. Signal Generator:

Connect the signal generator as usual, with an output meter as indicator connected to top of volume control or audio cable.

Set generator at 1,385 kc and tuner to 1,400 kc. Loosen the 4 trimmers on top of the gang and slowly tighten one at a time to obtain a maximum output reading. Keep each trimmer on the loose side of resonance until all trimmers are nearly peaked; then carefully peak each trimmer. Check

alignment by slowly tuning generator to about 1,415 kc, during which the output meter should show a slight drop and then a rise again. This alignment centers the response at 1,400 kc so that the dial calibration will be accurate. If the generator had been set at 1,400 kc initially, the center of the tuner's response would be below 1,400 kc on the tuner dial.

Resistance and Voltage Chart

Resistance between pin and chassis

Tube	Pin Number						
	1	2	3	4	5	6	7
6BA6 1st RF	2.1 meg.	0	*0-25	*0-25	**5 meg.	**5 meg.	470
6BA6 2nd RF	470K	0	*0-25	*0-25	**5 meg.	**5 meg.	470
6AT6 Detector	10 meg.	0	*0-25	*0-25	940K	147K	**5 meg.
6X4 Rectifier	240	Tie Point	*0-25	*0-25	Tie Point	240	**5 meg.

* Reading subject to position of hum balance control.

** Reading subject to variation depending upon the filter condensers.
CAUTION: Discharge filter condensers before making measurements.

Voltage between pin and chassis

No signal condition.
Measurements to ground with 20,000 ohm/volt meter, 1,000 ohm/volt on AC

Tube	Pin Number						
	1	2	3	4	5	6	7
6BA6 1st RF	Sl.Neg.	0	*	*	200	132	3.5
6BA6 2nd RF	Sl.Neg.	0	*	*	200	132	3.9
6AT6 Detector	Sl.Neg.	0	*	*	Sl.Neg.	Sl.Neg.	85
6X4 Rectifier	185 VAC	Tie Point	*	*	Tie Point	185 VAC	237

* Reading will range from 0 to 6.3 volts AC depending on setting of hum control.

Parts List for T4EK

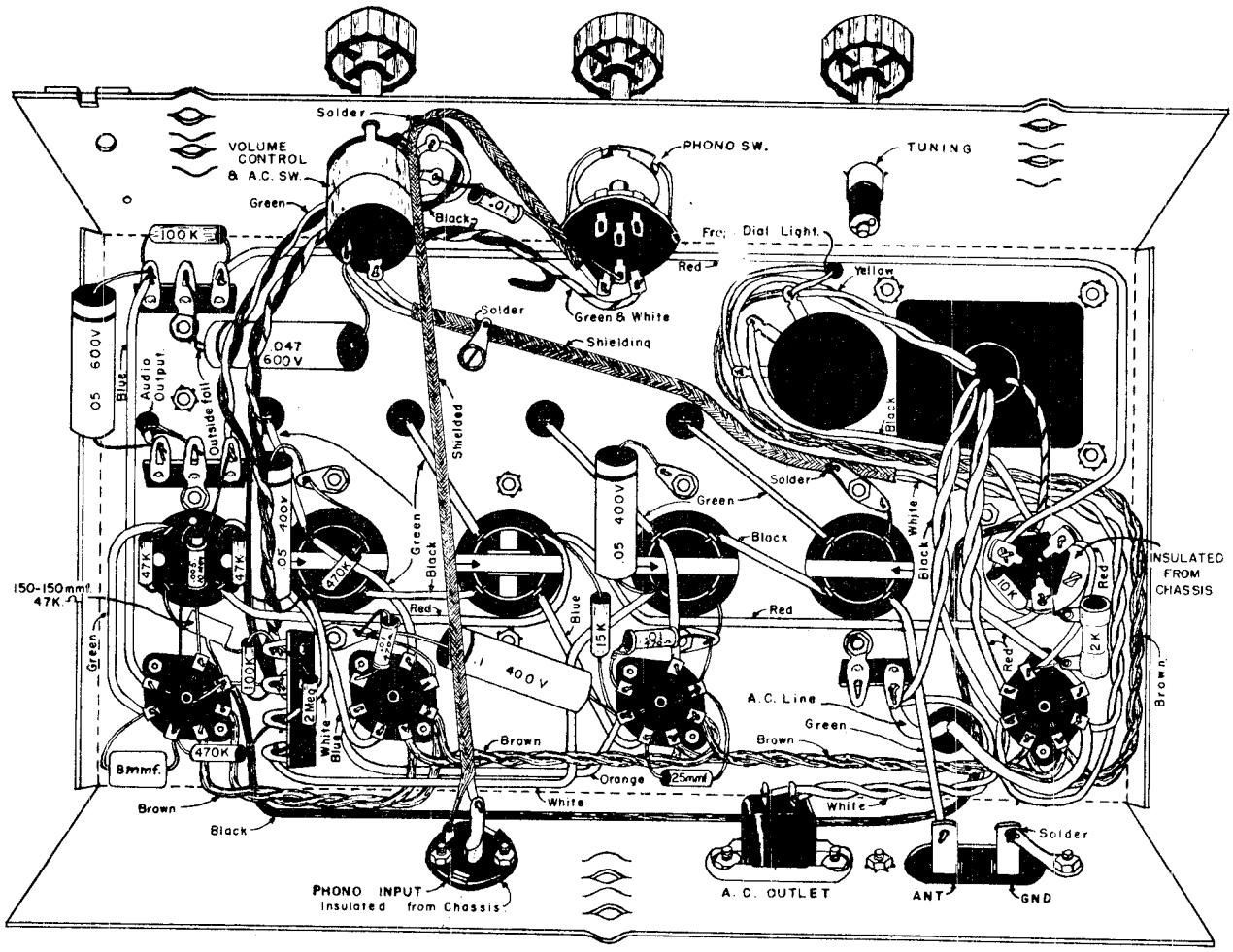
1. One chassis with bearing, #06279.
2. One bracket and pulley assembly #06282.
3. One 4 gang variable condenser #21-5223.
4. One gang condenser shield assembly #25-8208.
5. One dial plate assembly #05939.
6. One input ant. coil #9820.
7. One output ant. coil #9822.
8. One input R.F. coil #9824.
9. One output R.F. coil #9826.
10. One untuned R.F. coil #9828.
11. One 500K volume control with switch #29424.
12. One two-position switch #29582.
13. One 100 ohm jum balance control #29260.
14. One power transformer #29501.
15. One output cable assembly #05554.

MODEL T4EK

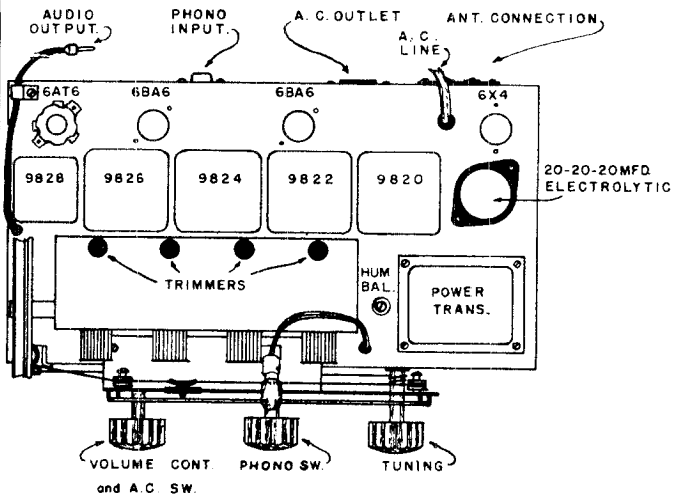
16. One length of shielded wire.
17. One length of braided shielding.
18. One line cord #12434.
19. One 20-20-20 mfd. 250 V. electrolytic condenser #34102.
20. One .1 mfd. 400 V. paper condenser #28113GT.
21. One .05 mfd. 600 V. paper condenser #28115GT.
22. Two .05 mfd. 400 V. paper condensers #28103GT.
23. One .047 mfd. 600 V. molded condenser #34160.
24. One 8 mmf. molded mica condenser #15149.
25. One 25 mmf. ceramic condenser #27165.
26. One .01 mfd. ceramic condenser #34111.
27. Two .01 mfd.-470 ohm type JCR-P capristors #34150-5.
28. One .005 mfd.-10 megohm type JCR-C capristor #34151-7.
29. One 150 mmf.-150 mmf.-47,000 ohm filpec #34171-1.
30. One 2,000 ohm 5 watt wire wound resistor #34149.
31. Two 47,000 ohm 1/2 watt carbon resistors.
32. One 100,000 ohm 1/2 watt carbon resistor.
33. One 100,000 ohm 1 watt carbon resistor.
34. Two 470,000 ohm 1/2 watt carbon resistors.
35. One 2 megohm 1/2 watt carbon resistor.
36. One 10,000 ohm 1/2 watt carbon resistor.
37. One 15,000 ohm 1 watt carbon resistor.
38. One tuning shaft #06285.
39. One AC receptacle #19794.
40. Four miniature tube sockets #29477.
41. One tube shield clip #29530.
42. One tube shield #29531.
43. One phono jack #29253.
44. One insulating washer for phono jack #26624.
45. One 2 lug terminal strip #16731.
46. One bakelite mounting plate for electrolytic condenser #19450.
47. One 1-insulated tie lug #25-5732.
48. One 3-insulated tie lug #25-6715.
49. Two 2-insulated tie lugs #25-5731.
50. Six single ended lugs.
51. One double ended lug #16480.
52. One cable clamp #16491.
53. One line cord strainrelief (2 pieces) #29414.
54. One dial pointer #29425.
55. Two dial scale retaining springs #05938.
56. One dial drum assembly #05817.
57. One dial cord assembly #06286.
58. One dial scale #23-8238.
59. Three felt washers #19595.
60. Two knobs (plain) #29270.
61. One knob with dot #05878.
62. One dial light socket #29583.
63. One dial lamp #29262.
64. One 6X4 tube.
65. One 6AT6 tube.
66. Two 6BA6 tubes.
67. One hairpin cotter #29493.
68. One piece of plastic tubing #23440.
69. Supply of screws, nuts, lockwashers, and washers for assembly.
70. Instructions, including circuit and pictorial diagrams.
71. One mounting dimensions sheet printed full scale.

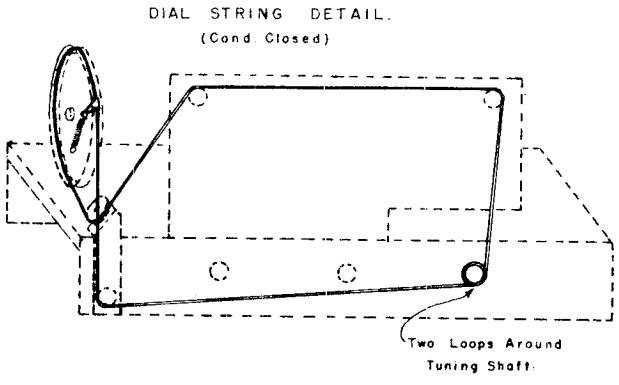
MODEL T4EK

4 TUBE T.R.F. TUNER KIT. MODEL 4EK.

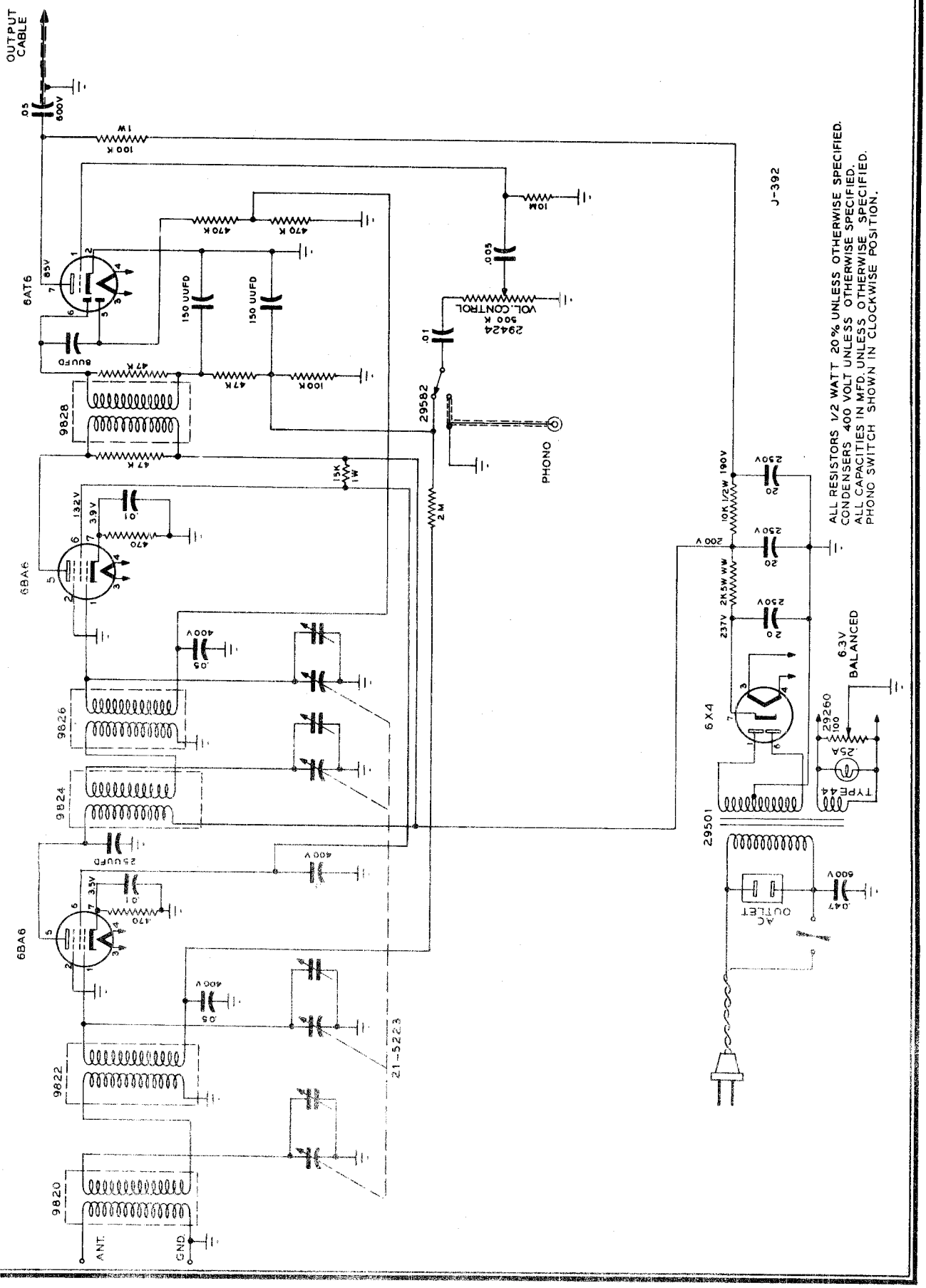


J-393





MODEL T4EK



MODEL TK-16,
Ch. KD-16

SPECIFICATIONS

Power Requirement: 120 volts, 50 to 60 cycles, 110 watts.
Frequency Coverage:

Band A – 540 to 1600 KC, AM
Band B – 1.6 to 4.7 MC
Band C – 4.7 to 10 MC
Band D – 11 to 22 MC
Band E – 88 to 108 MC, FM

Audio Sensitivity: .05 volts for ½ watt output.

Maximum Undistorted Audio: 7 watts.

AM Sensitivity: 2 to 4 microvolts.

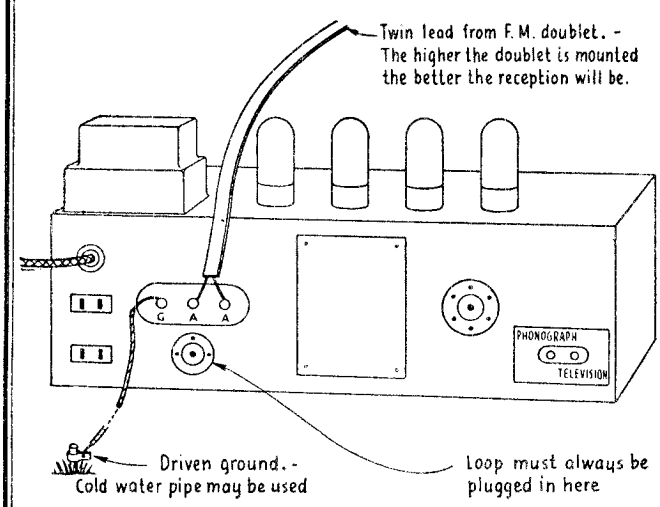
FM Sensitivity: 20 microvolts, quieting signal.
5 microvolts, minimum signal.

Tube Complement:

RF	6BA6	FM Detector	6AL5
Mixer	12AT7	1st AF	6C4
Oscillator	12AT7	2nd AF	6C4
1st IF	6BA6	Phase Inv.	6C4
2nd IF	6BA6	AF output, two	6V6GT
AM Detector	6AL5	Rectifiers, two	5Y3GT
3rd IF, FM	6BA6	Tuning Ind.	6U5

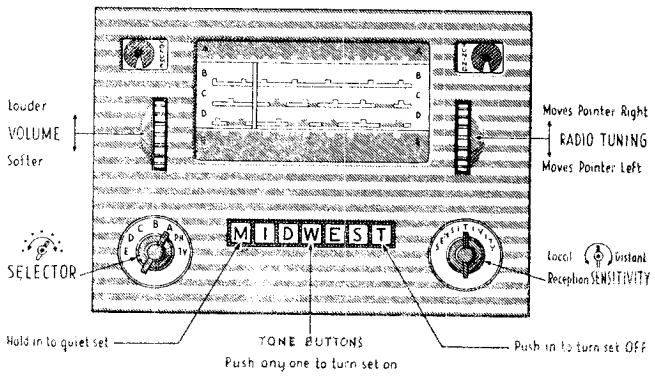
INSTALLATION

The Midwest Radio & Television receivers have built-in antennae for satisfactory reception of signals on the broadcast band, short wave and FM bands where the location is not unfavorable. In homes or apartments where steel is used extensively, such as for beams and concrete reinforcements or lath, or in rural areas distant from the broadcasting stations an FM doublet must be installed. The straight doublet antenna is directional only on the FM broadcast band so that it need be oriented only with respect to the FM transmitter location. The Midwest Model **DP** di-pole is a special design which is not directional and we recommend it for use with Midwest receivers for FM, broadcast and short wave reception.



PRECAUTIONS. Be sure that the speaker and Magna Tenna Loop are plugged in, also the flexible dipole leads must be connected to screw strip at "A – A". A ground wire may be connected to "G" but it is usually not needed. See that all tubes are seated and light up. Remove the packing inside the phonograph compartment and observe other warnings and cautions as advised by the tags attached to the receiver.

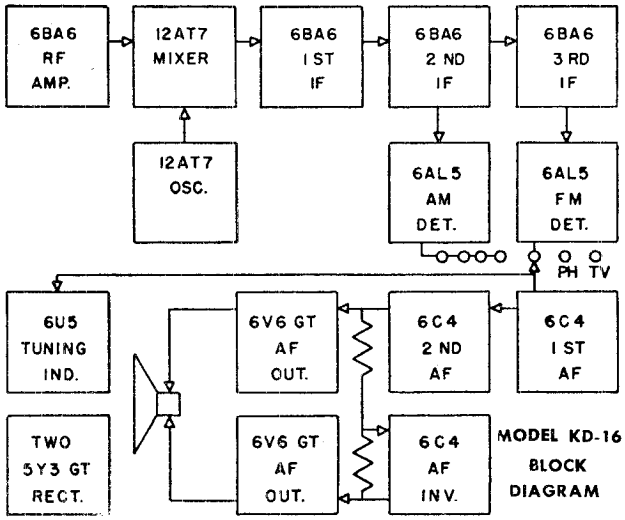
Plug the receiver into a 120 volt 60 cycle outlet. If you are not certain that your supply is 120 volts, 60 cycles alternating current (ac) call the local Electric Company.



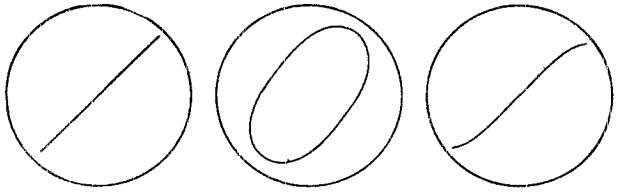
ALIGNMENT

AM IF should be aligned at 456 KC. There are three transformers and six adjustments, the transformers are coupled with less than critical coupling and there is only one peak. Couple the generator into the mixer grid and use either AVC or audio for the output meter.
FM IF should be aligned at 10.7 MC. There are four transformers and eight adjustments, the transformers are over-coupled and must be aligned with a scope and sweep generator.

MODEL TK-16,
Ch. KD-16



1. Connect generator to 3rd IF grid and vertical input of scope to the audio of the receiver at any point where sufficient signal is available and phasing can be properly adjusted.
2. Adjust the top screw for greatest length of straight line. This is the secondary winding; the bottom screw should give improvement in signal level.



A B C

A does not have the hook indicating that the sweep generator has a greater deviation than the detector capability.

B shows improper phasing of the horizontal sweep with the audio output of the receiver.

C is preferred because it shows the limits of deviation and you obtain it simply by adjusting the deviation (sweep width) control on the signal generator. Approximately 150 KC is normal.

3. Connect generator to 2nd IF grid and adjust the 2nd IF slugs for maximum signal **and** band width. This you can be sure of by the amount of hook at the ends of the line on the scope. Repeat this procedure for 1st IF grid and mixer grid. Adjust for greatest signal without appreciable loss of band width.

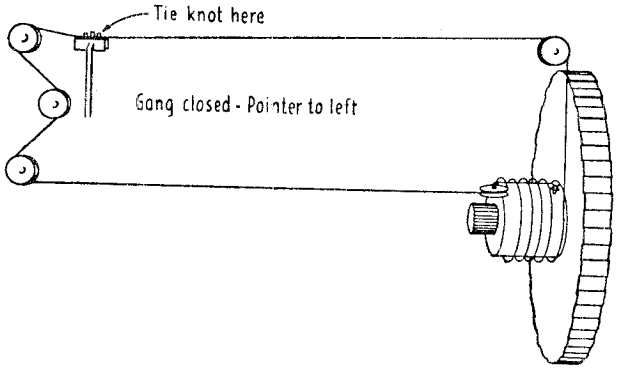
Alternate Method: The IF response of the 1st, 2nd and 3rd transformer may be observed more directly if you use a crystal detector at the plate of the tube following the transformer and feed the vertical plates of the scope from that point. Feed signal into grid of tube preceding transformer. Use a CW marker at 10.7 to be sure the double peaked response curve straddles the ratio detector response. Observe each stage separately. Discount the transformer in the plate of the tube following the transformer to be aligned and use 470 ohm resistor as plate load.

Notice: Do not use AM or CW signal to peak the FM transformers. Regeneration may result and bandwidth and noise rejection will be poor, although signal strength will increase.

FM RF should be trimmed at 105 MC. There should not be any reason to adjust the low end but if this is necessary it can be done by distorting the FM coils on the tuning gang.

AM RF should be peaked at the high end with the trimmer and at the low end by core adjustment.

Notice: Use as low signal input as possible for readable output indication. Feed signal in from FM RF generator through 150 ohms in each lead to "A-A." Use 400 ohms in lead from AM RF generator and connect to either "A" terminal.

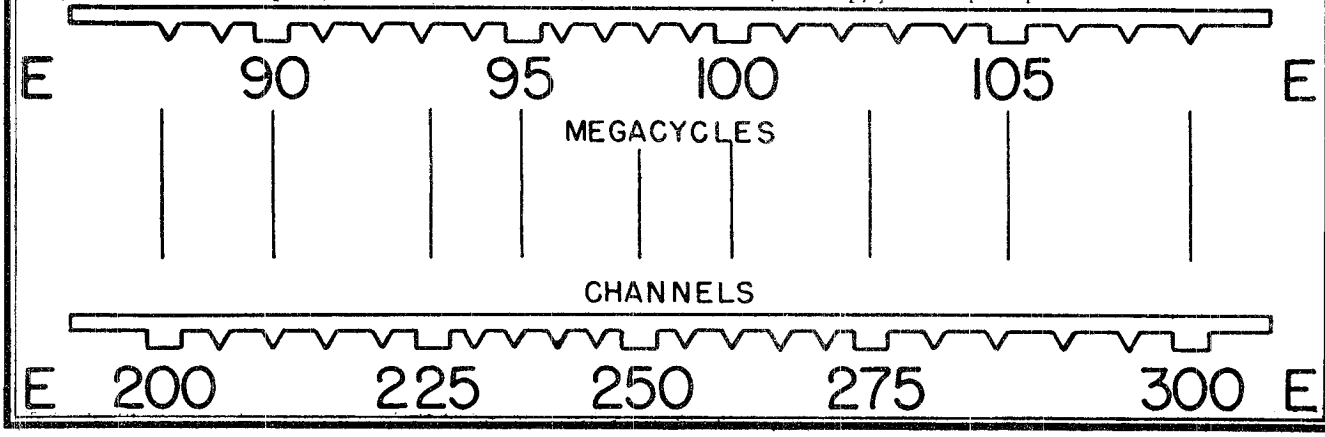


For dial stringing use a light weight dial cord such as Bevin-Wilcox 6-18 Imperial silk cord.

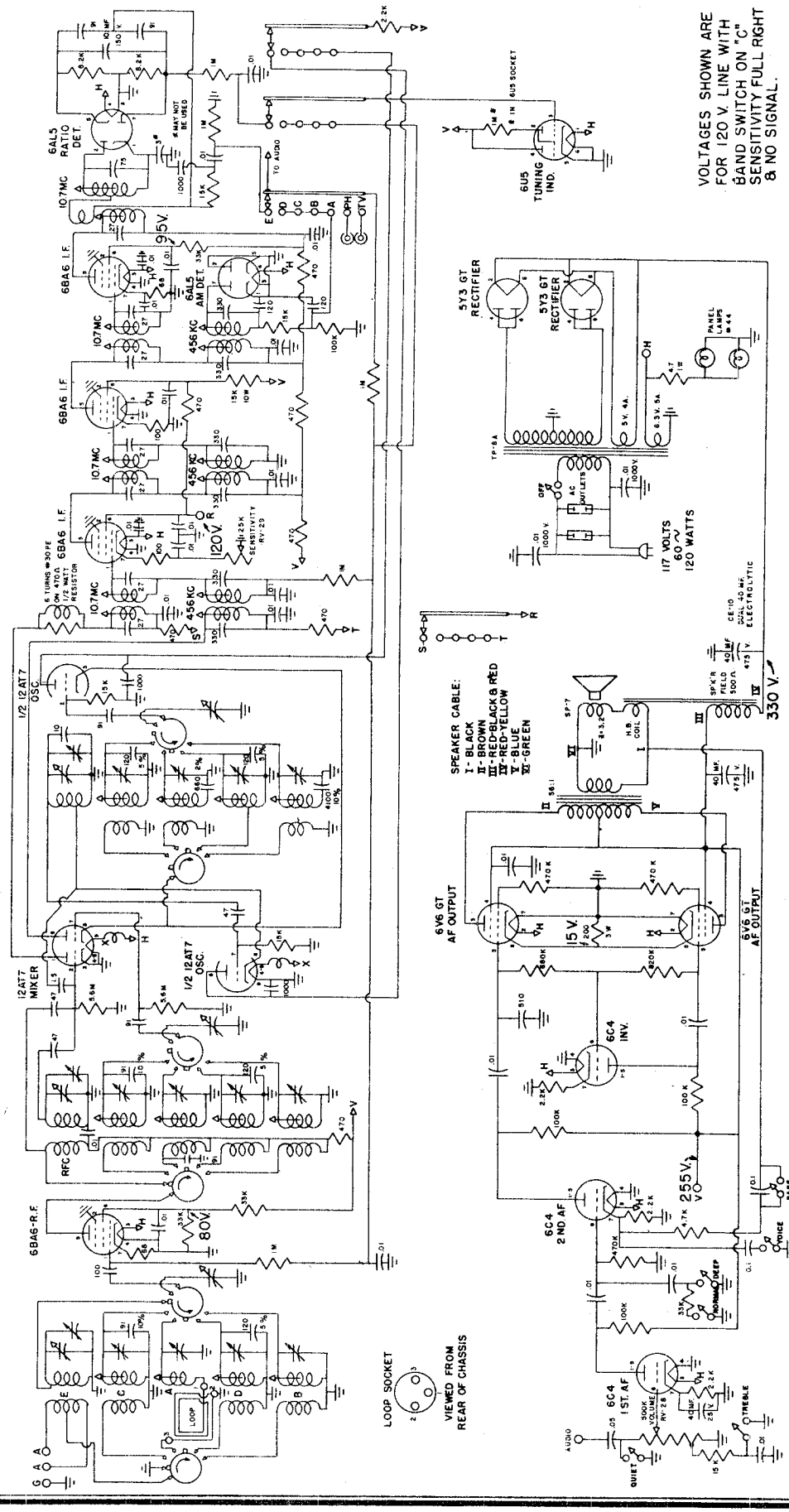
Radio Band	Coil Adj.	Trimmer Adj.
A	560 KC	1500 KC
B	1.6 MC	4.7 MC
C	5 MC	10 MC
D	11.5 MC	22 MC
E	.....	105 MC

If replacement parts of identical manufacture and rating are not available for service repairs these should be ordered from Midwest Radio & Television Corporation, giving model number and serial number of the chassis and name of the part.

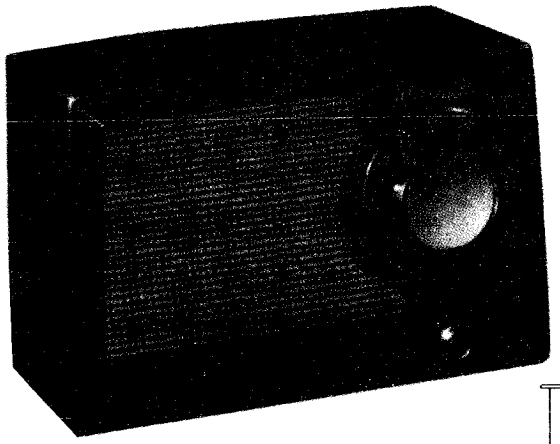
Repair data for the record changer mechanism is available separately, please specify Model.

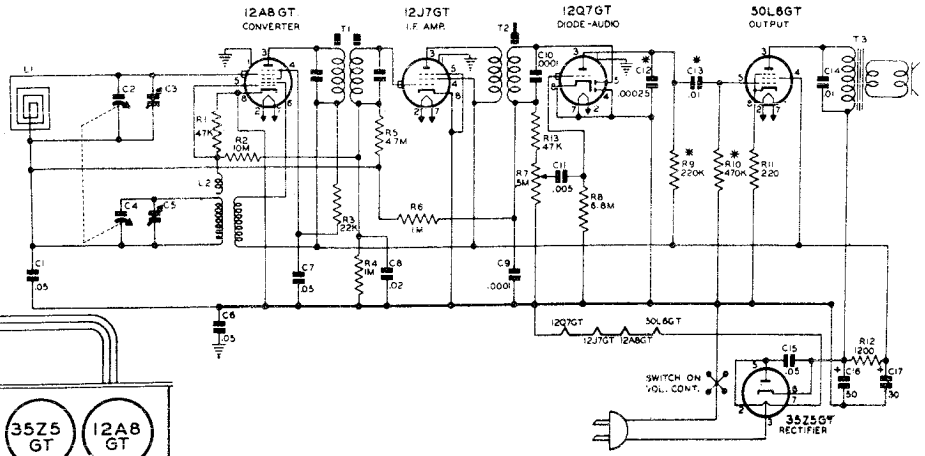


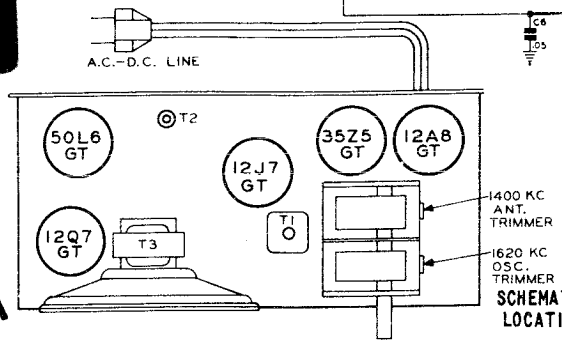
MODEL TK-16,
Ch. KD-16



MODELS 1252, 1253,
The Nocturne







SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

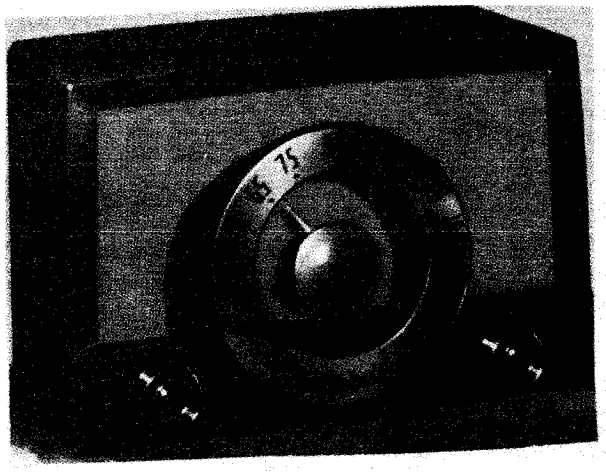
NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

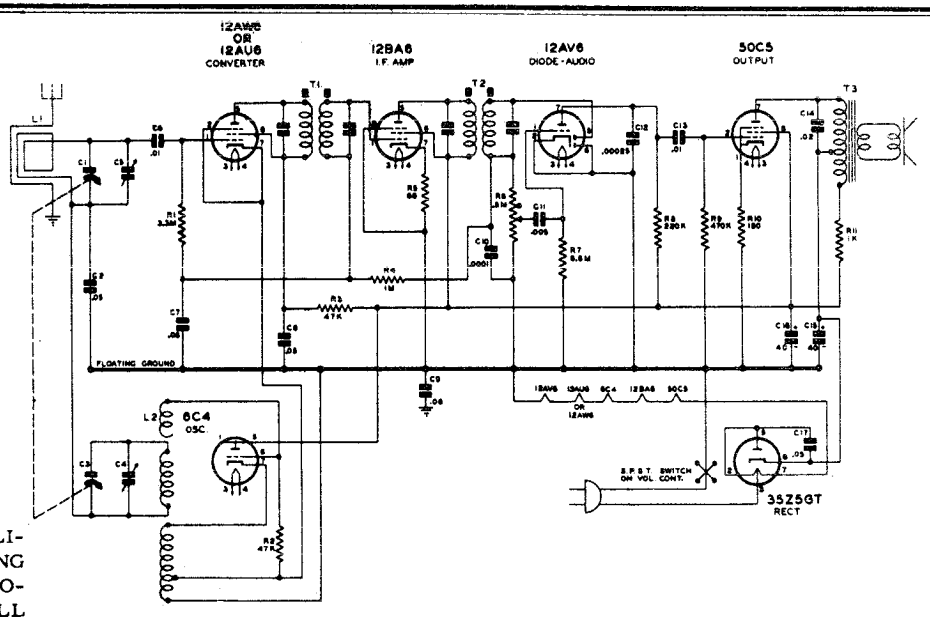
ALIGNMENT PROCEDURE

STEP NO.	POSITION OF GANG	SIGNAL GENERAL FREQUENCY	GENERATOR CONNECTION	DUMMY ANTENNA	ADJUSTMENT	TYPE OF ADJUSTMENT
1.	Open	455 KC.	Rear Gang Terminal	.1 Mfd.	I.F.Slugs	Adjust for Maximum Output
2.	Open	1620 KC.	Dummy Antenna	2 Turns of Hookup Wire 6" in Dia.(Place Approx.a Foot from & parallel to loop.)	Front Gang Trimmer	Adjust for Maximum Output
3.	1400 KC.	1400 KC.			Rear Gang Trimmer	Adjust for Maximum Output
4.	600 KC	600 KC.				Check Gang Alignment

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C1,C6,C7	N-1345	Capacitor, Paper .05 MFD. 200 V.
C8	N-1376	Capacitor, Paper .02 MFD. 200 V.
C9	N-6015	Capacitor, Ceramic .0001 MFD. 500 V. 20%
C10	N-7549	Capacitor, Ceramic .0001 MFD. 500 V. 10%
C11	N-4894	Capacitor, Paper .005 MFD. 600 V.
*C12	N-6488	Capacitor, Ceramic .00025 MFD. 500 V. 20%
*C13,C14	N-1344	Capacitor, Paper .01 MFD. 400 V.
C15	N-1346	Capacitor, Paper .05 MFD. 400 V.
C16) C17)	N-7889	Capacitor, Electro-lytic (30-50 MFD. 150 V.
R1,R13	N-4063	Resistor 47,000 Ohm - 1/2 W. - 20%
R2	N-1623	Resistor 10 Megohm - 1/2 W. - 20%
R3	N-4025	Resistor 22,000 Ohm - 1/2 W. - 20%
R4,R6	N-1262	Resistor 1.0 Megohm - 1/2 W. - 20%
R5	N-4061	Resistor 4.7 Megohm - 1/2 W. - 20%
R7	N-7890	Volume Control with On-Off Switch
R8	N-4028	Resistor 6.8 Megohm - 1/2 W. - 20%
*R9	N-4026	Resistor 220,000 Ohm - 1/2 W. - 20%
*R10	N-4027	Resistor 470,000 Ohm - 1/2 W. - 20%
R11	N-4024	Resistor 220 Ohm - 1/2 W. - 10%
R12	N-4900	Resistor 1,200 Ohm - 1.0 W. - 10%
	N-7824	Speaker, 4" P.M with Output Transformer
	N-8138	Coil, Loop Antenna
	N-7981	Coil, 1st. I.F.
	N-8150 or N-7542	Coil, 2nd. I.F. (Includes C10) Coil, 2nd I.F.(C10 must be added externally)
	N-8263	Coil, Oscillator

* In some receivers parts indicated with asterisk are replaced by an N-8215 Couplate.





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ALIGNMENT PROCEDURE

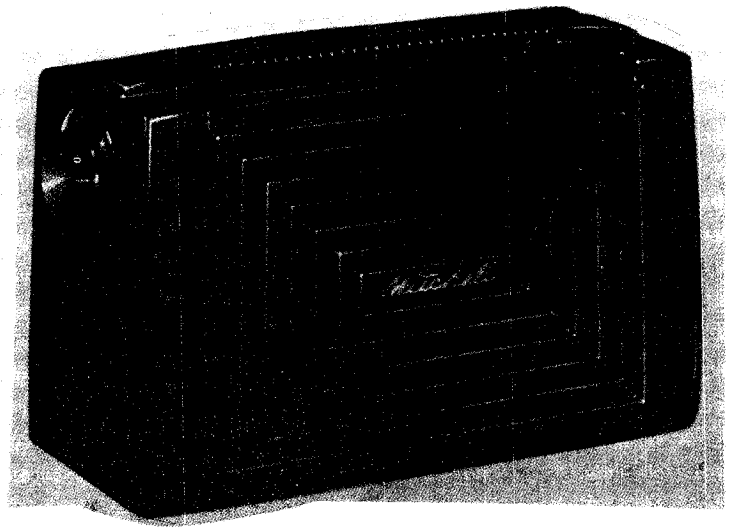
STEPS	SET RECEIVER DIAL TO	TEST OSCILLATOR: ADJUST TEST OSCILLATOR FREQUENCY TO	TEST OSCILLATOR: ATTACH OUTPUT OF TEST OSCILLATOR TO	DUMMY ANTENNA	ADJUSTMENTS
1	Any point where no interfering signal is received	EXACTLY 455 KC	High side to grid of Converter Tube, Low side to common negtive.	.05 MFD CONDENSER	Adjust slugs at top and bottom of 2nd I.F.(T2) and then each of the slugs of the 1st. I.F.for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	External Antenna blue lead on loop.	100 MMFD Condenser.	Adjust 1620 KC cillator trimmer (C4) for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	External Antenna blue lead on loop.	100 MMFD Condenser.	Adjust 1400 KC antenna trimmer for maximum output.

PARTS LIST

ILLUS. NO.	PART NUMBER	DESCRIPTION
C2,C7,C8	N-1345	Condenser, Paper .05 MFD. 200 V.
C6,C13	N-1344	Condenser, Paper .01 MFD. 400 V.
C9	N-8092	Condenser, Paper .08 MFD. 200 V.
C10	N-6015	Condenser, Ceramic 100 MMFD. 500 V. 20%
C11	N-4894	Condenser, Paper .005 MFD. 600 V.
C12	N-6488	Condenser, Ceramic 250 MMFD. 500 V. 20%
C14	N-1376	Condenser, Paper .02 MFD. 400 V.
C15)		(40 MFD. 150 V.
C16)	N-5051	Condenser, Electrolytic(40 MFD. 150 V.
C17	N-1346	Condenser, Paper .05 MFD. 400 V.
R1	N-4062	Resistor, Carbon 3.3 Megohm 1/2 W. 20%
R2,R3	N-4063	Resistor, Carbon 47,000 Ohm 1/2W. 20%
R4	N-1262	Resistor, Carbon 1.0 Megohm 1/2 W. 20%
R5	N-6485	Resistor, Carbon 68 Ohm 1/2 W. 10%
R6	N-7984	Volume Control- 500,000 Ohm with Switch
R7	N-4028	Resistor, Carbon 6.8 Megohm 1/2 W. 20%
R8	N-4026	Resistor, Carbon 220,000 Ohm 1/2W. 20%
R9	N-4027	Resistor, Carbon 470,000 Ohm 1/2W. 20%
R10	N-4067	Resistor, Carbon 180 Ohm 1/2W. 10%
R11	N-3341	Resistor, Carbon 1,000 Ohm 1/2W. 10%

ILLUS. NO.	PART NUMBER	DESCRIPTION	
L1	N-8002	Coil,	Loop Antenna and Cabinet Back
L2	N-7982	Coil,	Oscillator
T1,T2	N-7981	Coil,	1st.and 2nd. I.F.Transformer
T3	N-8001	Transformer,	Output
	N-7980	Speaker,	5 Inch P.M.
	N-8045	Assembly,	Gang Condenser & Pulley
	N-8386	Screen,	Flocked - Front Panel
	N-8387	Escutcheon,	Dial
	N-8392	Pointer,	Dial Indicator
	N-1090	Cord,	Line - 6 Ft. Rubber
	#314	Cabinet,	Ivory Plastic) Model 1255
	N-8003	Knob,	Ivory Plastic) Only
	#315	Cabinet,	Walnut Plastic) Model 1254
	N-8004	Knob,	Walnut Plastic) Only

MODEL 1256



BATTERY INSTALLATION

BATTERY INSTALLATION: Before installing new batteries or replacing old ones, turn the volume control to the extreme left or "OFF" position.

Attach the connector with the snap-on fasteners to the "B" battery (90 Volt) and insert battery into the left hand side of the battery retaining area of the cabinet back so that the connector faces in the direction of the top of the receiver. Insert the prongs of the other battery connector into the socket of the "A" battery (4-1/2 Volt) and place battery in cabinet back so that the connector faces the outside wall of cabinet.

This receiver will accommodate any of the batteries listed below: (No preference is intended by the order of listing.)

MANUFACTURER	MANUFACTURER'S TYPE NUMBER "A" Battery	"B" Battery
National Carbon (Eveready)	746	490
General Dry Battery	3H3	132
Ray-O-Vac	P83A	4390
Burgess Battery	G3	N-60

BATTERY OPERATION

BATTERY OPERATION: To operate this receiver on battery, insert the power cord prongs into the power switch through the two slots provided in the bottom of chassis. These slots are at the right hand edge of chassis as viewed from rear.

TUBE REPLACEMENT

Do not replace tubes or batteries unless switch on the volume control is turned completely off. In case of tube failure be sure to turn the receiver off immediately.

Four tubes (Plus selenium rectifier) are used. Type numbers and locations **are shown in the tube diagram label** located inside the cabinet. If tubes are **removed from their sockets for test or replacement purposes, make certain that the receiver is turned off when replacing the tubes in their proper sockets. Failure to replace tubes in their proper sockets may result in damage to the tube, or to the receiver, or both.**

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

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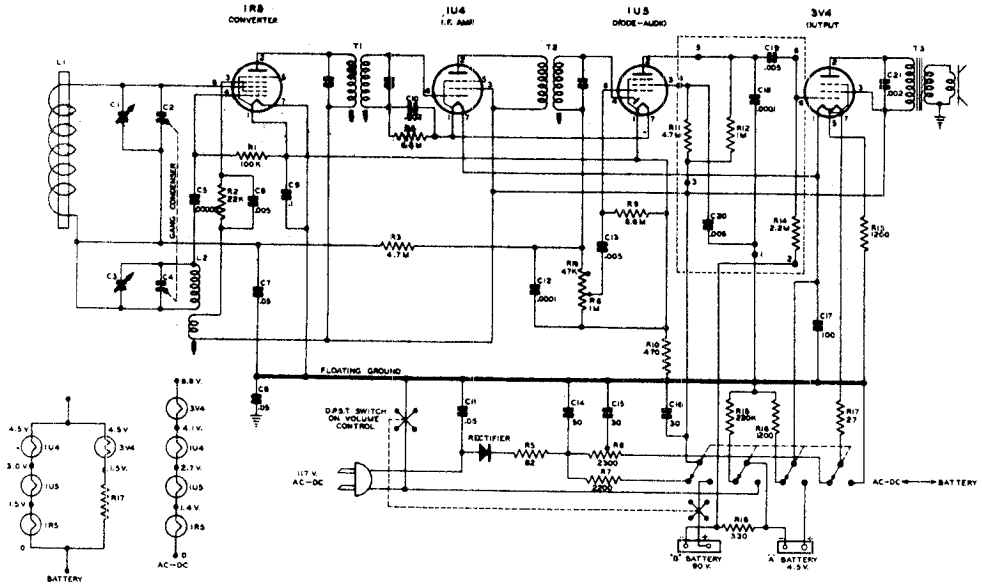
MODEL 1256



ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455,600,1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

ALIGNMENT PROCEDURE CHART

STEP NO.	POSITION OF GANG	SIGNAL GENERATOR FREQUENCY	GENERATOR CONNECTION	DUMMY ANTENNA	ADJUSTMENT	TYPE OF ADJUSTMENT
1	Any point where no interfering signal is received	Exactly 455 KC	High side to grid of 1R5 tube. Low side to common negative	.05 MFD Condenser	*Slug at top of 2nd. I.F. (T2) and then each of the slugs of the 1st. I.F.	For Maximum Output.
2	Exactly 1620 KC	Exactly 1620 KC.	DUMMY ANTENNA	2 Turns of hookup wire 6" in Diameter. (Place approximately a foot from end of, and in same axis as loop.)	Front Gang Trimmer	For Maximum Output.
3	Approx. 1400 KC.	Approx. 1400 KC			Rear Gang Trimmer	For Maximum Output.
4	Exactly 600 KC	Exactly 600 KC			Slug in Oscillator Coil. (L2)	For Maximum Output.
5					Repeat Steps 2 and 3.	

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER		DESCRIPTION
C18)			(.0001 MFD.)
C19,C20)			(.005 MFD.)
R11)	N-8330	Couplate	(4.7 Megohm)
R12)			(1.0 Megohm)
R14)			(2.2 Megohm)
C5	N-6375	Condenser, Ceramic	50 MMFS. 500 V.
C6,C13	N-4894	Condenser, Paper	.005 MFD. 600 V.
C7,C8	N-1345	Condenser, Paper	.05 MFD. 200 V.
C9	N-1351	Condenser, Paper	.1 MFD. 200 V.
C10,C21	N-6377	Condenser, Paper	.002 MFD. 600 V.
C11	N-1346	Condenser, Paper	.05 MFD. 400 V.
C12	N-6015	Condenser, Paper	100 MMFD. 500 V.
C14)			(50 MFD. 150 V.)
C15)	N-6841	Condenser, Electro-	(30 MFD. 150 V.)
C16)		lytic	(30 MFD. 150 V.)
C17)			(100 MFD. 25 V.)
	N-6681	Speaker, 4" P.M.	
L1	N-8328	Coil, Loop - Iron Rod Type	
T1	N-7981	Coil, 1st, I.F.	
T2	N-8326	Coil, 2nd, I.F.	
L2	N-8327	Coil, Oscillator	
T3	N-8329	Transformer, Output	
	N-8331	Rectifier, Selenium	
	N-5951	Switch, Power Changeover	

N-8381

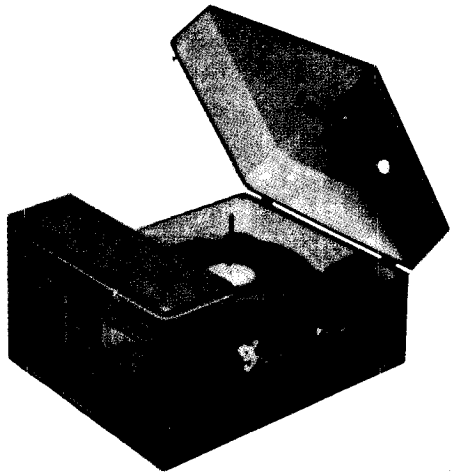
PARTS LIST

SCHEMATIC LOCATION	PART NUMBER		DESCRIPTION
R1	N-1973	Resistor	100,000 Ohm 1/2W. 10%
R2	N-6012	Resistor	22,000 Ohm 1/2W. 10%
R3	N-4061	Resistor	4.7 Megohm 1/2W. 20%
R4,R9	N-4028	Resistor	6.8 Megohm 1/2W. 20%
R5	N-4023	Resistor	82 Ohm 2.0W. 10%
R6	N-8333	Resistor	2,300 Ohm 5.6W. 5% (Center Tapped)

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER		DESCRIPTION
R7	N-4896	Resistor	2,200 Ohm 1/2W. 10%
R8	N-8332	Volume Control with Switch	1.0 Megohm
R10	N-4066	Resistor	470 Ohm 1/2W. 10%
R13,R16	N-6793	Resistor	1,200 Ohm 1/2W. 10%
R15	N-4026	Resistor	220,000 Ohm 1/2W. 20%
R17	N-6792	Resistor	27 Ohm 1/2W. 10%
R18	N-4420	Resistor	330 Ohm 1/2W. 10%

MODEL 05GAA-992A



ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts A.C. 60 cycle. 50 watts with record player operating.
Frequency Range	535 to 1620 KC
Intermediate Frequency	455 KC
Selectivity	40 KC broad at 1000 times signal, 1000 KC
Sensitivity	(.05 watt output with Hazeltine test loop) 350 Microvolt per meter average.
Power Output	1.1 watts max. .7 watts 10% distortion.
Loud Speaker	5" PM dynamic 1.47 oz. Alnico 5 magnet, voice coil impedance 3.2 ohms at 400 cycles
Tube Complement	1 - 12SA7 Mixer 1 - 12SK7 I.F. Amplifier 1 - 12SQ7 Det. & A.F. 1 - 50L6 Power Amp. 1 - 35Z5 Rectifier 1 - No. 47 Dial Lamp
Record Changer	Three speed intermix. (10" and 12")

SPECIAL INSTRUCTIONS

REMOVAL OF RADIO CHASSIS

Remove two screws holding record changer. Lift record changer and move back, tilting at the same time. Remove changer power cord and pick up lead.

Remove two wood screws holding back board. This will expose the antenna. Remove antenna plug.

Remove two wood screws holding back of chassis. Remove two nuts holding front panel. Chassis may now be removed.

ALIGNMENT PROCEDURE

The following equipment is required for aligning: A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

Radiation Loop: 2-turn loop, 6 inches in diameter.

Conditions for Alignment:

Tone - Treble

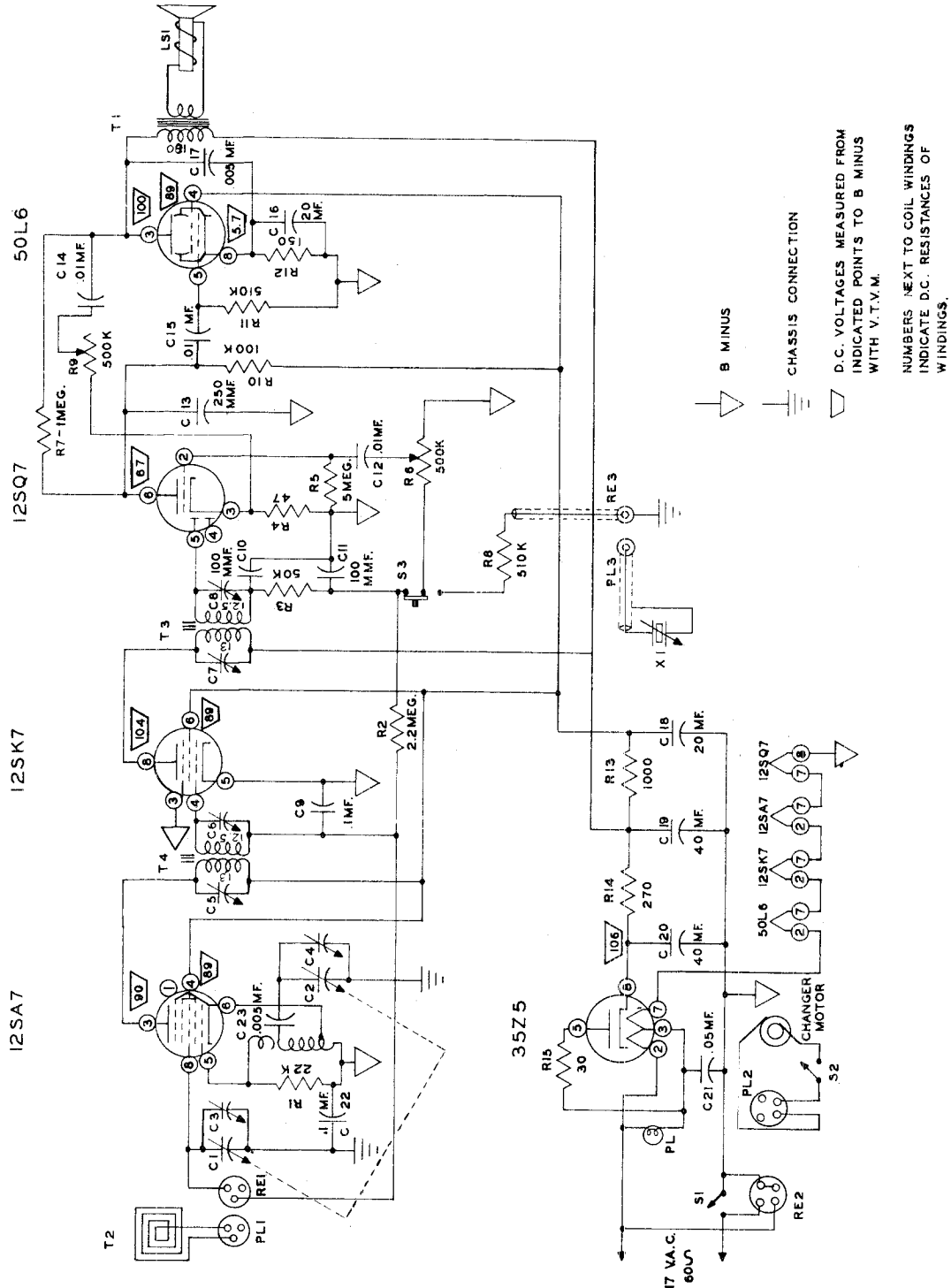
Volume - Maximum

Selector Switch - "Radio" position

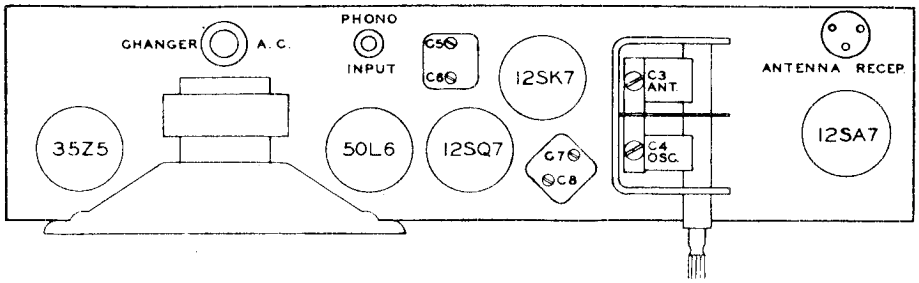
Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	REMARKS	ADJUST FOR MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	Short out osc. tuning gang section C-2; compress C-3	C-8, C-7, C-6, C-5
LOOP	1620 KC	High End of Band	"	Remove short across C-2	C-4
LOOP	1400 KC	Point of Maximum Output	"	Set pointer to 140 on dial	C-3
LOOP	600 KC	Point of Maximum Output	"	Knife C-1 plates for maximum output	
LOOP	1400 KC	1400	"	Recheck Alignment	C-3 if necessary

MODEL 05GAA-992A



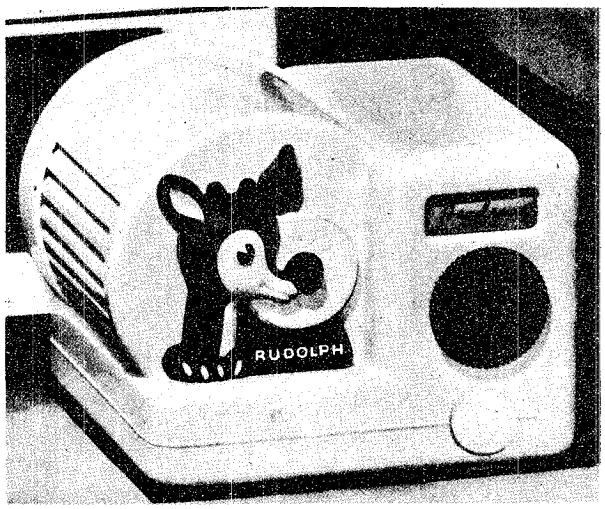
LOCATION OF TUBES



REPLACEMENT PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
		RESISTORS
R1	517	22,000 OHM ½ Watt
R2	615	2.2 Meg OHM ½ Watt
R3		See Capristors
R4	520	47 OHM ½ Watt
R5		See Capristors
R6	401	500,000 OHM Vol. Control with Switch
R7	516	1 Meg OHM ½ Watt
R8, R11	502	510,000 OHM ½ Watt
R9	408	500,000 OHM Tone Control
R10		See Capristors
R12	505	150 OHM ½ Watt
R13	607	1000 OHM 1 Watt
R14	602	270 OHM 1 Watt
R15	534	30 Ohm 1/2 W.
		CAPACITORS
C1, C2	1004A	Tuning Gang and Trimmer Assembly
C3, C4		
C5, C6		Trimmer Condensors in
C7, C8		I.F. Cans.
C9, C22	804	.1 MFD. 200 V.
C10, C11		See Capristors
C12		See Capristors
C13	817	250 MMF. Ceramic
C14	825	.01 MF. Ceramic
C15		See Capristors
C17	824	.005 MF. Ceramic
C18, C19	1003	40-40-20 MFD/150 Volts
C20, C16		20 MFD/25 Volts
C21	803A	.05 400 V. Tubular
		CAPRISTORS
R3, C10	811	100 MMF. 50,000 OHM 100 MMF Dual Shunt Connection
R5, C12	813	.01 MF 5 Meg OHM Common Terminal Connection
R10, C15	814	.01 MF 100,000 OHM Common Terminal Connection
		TRANSFORMERS
T1	1201	Output Transformer
T3, T4	1402	I.F. Transformers
		MISCELLANEOUS
S1	401	On-Off Switch on Volume Control
S2	407	Motor Switch on Changer Assembly
S3	1892	Radio-Phono Slide Switch
PL1	307A	Loop Antenna Plug
PL2	307	Changer A.C. Plug
PL3	305	Pickup Plug
RE1	106A	Loop Antenna Receptacle
RE2	106	Changer A.C. Receptacle
RE3	104	Pickup Receptacle
X1	2534	Pickup Cartridge EV-334
	62-349	.0023 Needle
LS1 - T1	2607	5" Speaker and Output Transformer
	2108	Portable Carrying Case
	2411	Knob
T2	1512	Loop Antenna
	1736A	Dial Pointer
	2307	Dial Bezel
	2127C	Front Panel
	1722B	Dial

MODELS 05GCB-1540A, Rudolph;
05GCB-1541A, Lone Ranger



MODEL 05GCB-1540A "RUDOLPH"

MODEL 05GCB-1541A "LONE RANGER"

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

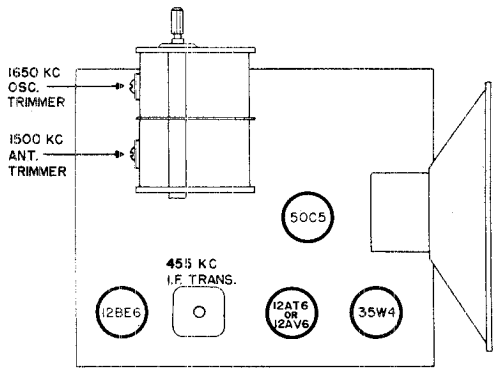
ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows: (1) Connect the high side of 455 KC Signal Generator through a .1 mf capacitor to the stator lug on the rear section of the variable capacitor; the ground lead to one of the lugs on the line on-off switch. Use Isolation Transformer if available. If not, connect a capacitor in series with low side of signal generator and power lug on switch. Connect a suitable output meter across the speaker voice coil. Turn the Volume and Tuning controls to their extreme clockwise positions.

(2) Adjust the trimmers located at the top and bottom of the I-F transformer for maximum indication on the output meter.

(3) Connect the Signal Generator high side to the antenna lug through a 47 mmfd capacitor; the low side remains as in step (1). Set the Signal Generator to 1650 KC.

(4) With Variable Capacitor set at the minimum capacity position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is received. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM

ELECTRICAL SPECIFICATIONS

Frequency Range	540 to 1650 KC
Intermediate Freq.	455 KC
Selectivity	At 1000 Kilocycles, 22 KC at 10 X signal
Sensitivity	400 Microvolts per meter average for .05 watt output.
Power Output	620 Milliwatts undistorted
Loud Speaker	4" P.M., V.C. impedance 3.2 ohms
Tube Complement	12BE6 Converter
	12AT6 or 12AV6 Detector, AVC, audio amplifier
	50C5 Power Amplifier
	35W4 Rectifier
	#47 Pilot Light

MODELS 05GCB-1540A, Rudolph; 05GCB-1541A, Lone Ranger

The signal source must be an accurately calibrated signal generator capable of supplying R.F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurements.

The table below lists the sensitivity at various points. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissible. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				DIAL SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling	Connection to Radio	Ground Connection			
455 KC	.1 mfd condenser	Stator lug Var. Capacitor (rear section)	Lug on Power Switch	Variable Condenser fully open	Trimmers on I.F. transformer	3000 microvolts
1650 KC	47 mmf condenser	To lug of Ant. Hank	Lug on Power Switch	Variable Condenser fully open	Oscillator Trimmer (front section)	———
1500 KC	47 mmf condenser	To lug of Ant. Hank	Lug on Power Switch	1500 KC	Ant. trimmer (front section)	———
400 cycles	.1 mfd condenser	High side of volume control	Lug on Power Switch	———	———	.03 volts

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1	D-4.108-12	1500 mmf ±20% Ceramic
C2A, C2B, C3, C4	2.225	Variable Condenser
C5, C9	D-3.103-11	.05 × 400 volts, Paper
C6	C-4.109-12	47 mmf±20% Ceramic
C7	D-3.103-4	.005 × 600 volts, Paper Tubular
C8	D-3.103-23	.1 × 400 volts, Paper Tubular
C10	5.425	Electrolytic, 25 mfd, 25 volts
C11	D-3.103-7	.01 × 400 volts, Paper Tubular
C12A, C12B	C-5.436-1	Electrolytic, 50-50 mfd., 150 V.D.C.
		RESISTORS
R4	C-8.201-10	2 Meg. Volume Control and Switch
R10	D-7.103-31	47 ohm, 2 watt, 20%
R1	D-7.100-62	12 K ohms, ¼ watt, 10%
R2	D-7.100-178	6.8 meg ohm, ¼ watt, 20%
R3	D-7.100-185	10 meg ohm, ½ watt, 20%
R5	D-7.100-115	220 K ohms, ¼ watt, 20%
R6	D-7.100-125	390 K ohms, ¼ watt, 20%
R7	D-7.101-204	150 ohms, ½ watt, 20%
R8	D-7.102-27	1200 ohms, 1 watt, 10%
R9	D-7.102-215	22 ohms, 1 watt, 20%
		SPEAKER
T4	B-30.332-1	Speaker, 4" P.M., with Transformer
		COILS
T1	B-1.534	Antenna Coil
T2	C-1.402-4	Oscillator Coil
T3	C-1.445-2	I.F. Transformer, 455 K.C.

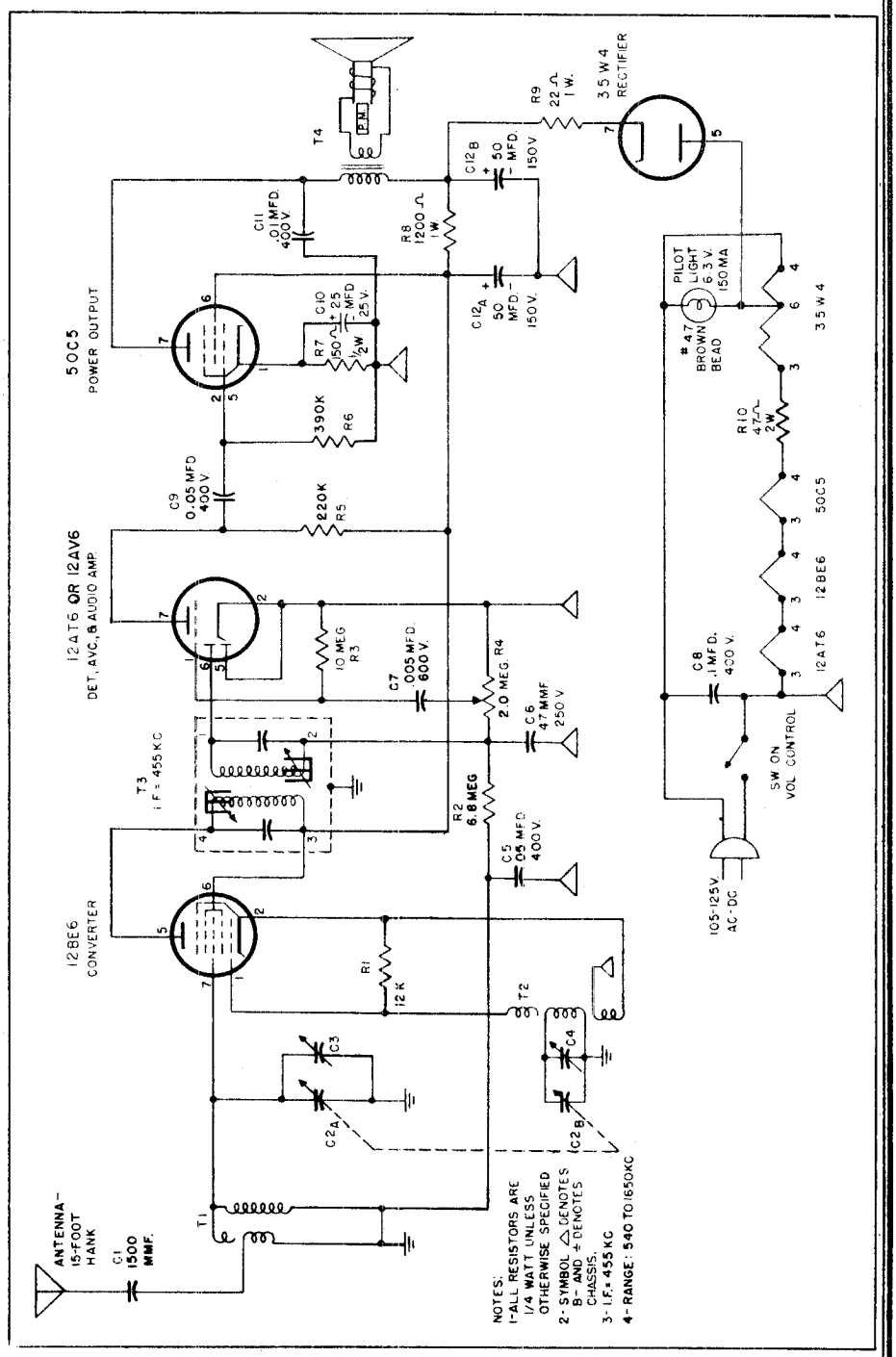
MODELS 05GCB-1540A,
Rudolph; 05GCB-1541A,
Lone Ranger

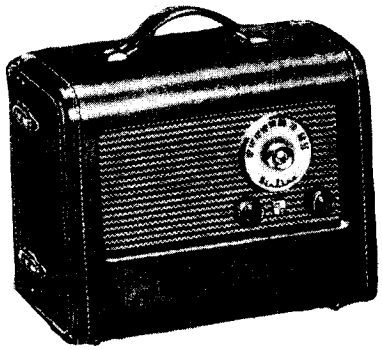
DIAL PARTS

C-13.133	Tuning Knob
B-13.102	Volume Knob

MISCELLANEOUS

D-12.418	Cabinet
C-29.442	Back Cover
20.226	Antenna Hank, 15 Ft.
B-24.235	Socket, Min. 7 Pin
C-20.206	Line Cord, 6 Ft., U.L.
	#47 Pilot Light Bulb, 6.3 volts
C-13.214	Front Plaque, Rudolph
C-13.215	Front Plaque, Lone Ranger





NEVER LEAVE A DISCHARGED BATTERY IN THE SET. After a dry cell is completely exhausted the zinc outer case may be eaten through and the electrolyte inside may leak out. This fluid is very corrosive and can ruin the metal parts of the set if neglected.

BATTERY REQUIREMENTS. The Model 1061A operates from a battery pack which delivers 7½ volts and 90 volts. Wards #33 pack should be used. This battery can be obtained from any Wards Retail Store or Mail Order House. Other batteries which can be used are: RCA VS019, General 60A6F6/5, Sears 6404, Burgess F6A60, Philco P841A, Ray-o-vac B6460 and Western AB994. To install the battery in the set merely place it in position in the bottom of the cabinet and plug the battery cable into the socket in the top of the battery.

ELECTRICAL SPECIFICATIONS

POWER SUPPLY: 105-125 Volts AC or DC and #33 Battery

FREQUENCY RANGE: 540 to 1640 KC

INTERMEDIATE FREQUENCY: 455 KC

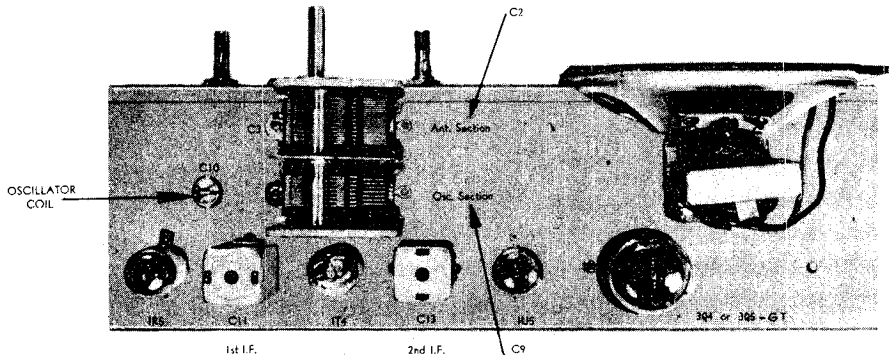
SENSITIVITY (For .05 Watt Output)
150 Microvolts per Meter

POWER OUTPUT: .190 Watt 10% Distortion

TUBE COMPLEMENT:
1—1R5 Converter
1—1T4 I.F. Amplifier
1—1U5 Det. Avc. 1st AF.
1—3Q5 or 3Q4 Power Amplifier

LOUD SPEAKER: 4" PM Dynamic 3.2 VoiceCoil Impedance

TUBE AND TRIMMER CONDENSER LAYOUT



NOTE:
C12 is located on bottom of 1st I.F. Transformer.
C14 is located on bottom of 2nd I.F. Transformer.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf.

Frequency Setting	SIGNAL GENERATOR: Coupling Capacitor	SIGNAL GENERATOR: Connection to Radio	Ground Connection	Variable Condenser Setting	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
455 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	CLOSED	1st AND 2nd I.F. C11-C12-C13-C14
540 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	CLOSED	OSCILLATOR COIL SCREW
1640 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	WIDE OPEN	OSCILLATOR TRIMMER-C10
1400 KC	.1	CONTROL GRID OF 1R5	TO B-BUS BAR	TO 1400 KC SIGNAL	ANTENNA TRIMMER-C3

REPEAT PROCEDURE

PARTS LIST

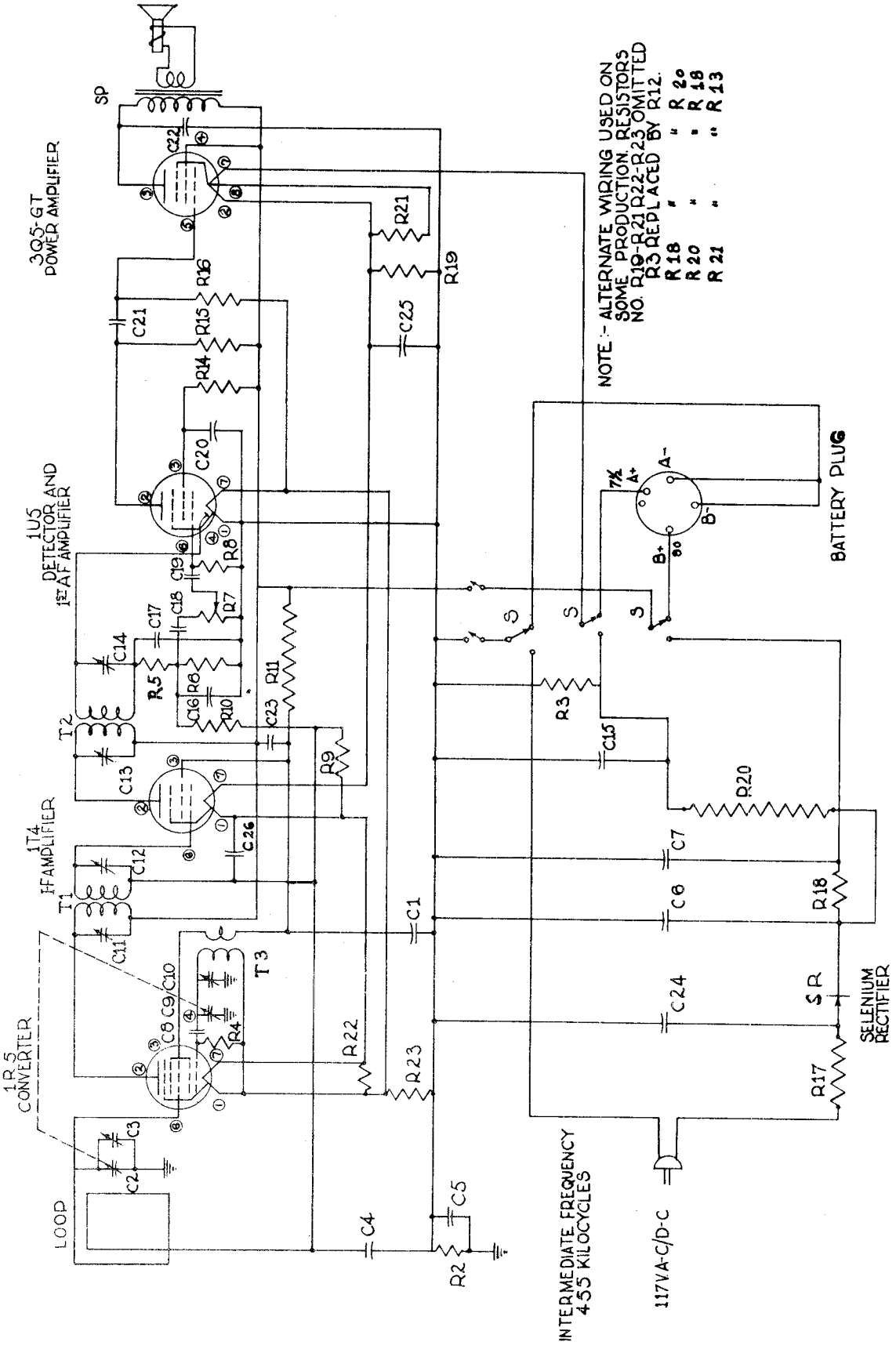
WHEN ORDERING PART, STATE MODEL NO. OF RADIO AND PART NO.

Ref. No.	Part No.	Description
		CONDENSER
C1-20-23 26	PC1	.05-150 V.
C2-C3 C9-C10	PM1	2 Gang Var. Condenser
C4	PC2	.1-150 V.
C5	PC3	.2-200 V.
C6-C7 C15	PC4 "	50 MFD-150 V. (C6-C7) 200 MFD-25 V. (C15) 3 Section Filter Condenser
C8	PC5	50 MMF-150 V.
C11-C12	.....	1st I.F. Trimmers Part of T-1
C13-C14	.....	2nd I.F. Trimmers Part of T-2
C16-C17	PC6	100 MMF-150 V.
C18-C19	PC7	.005-150 V.
C21	PC8	.01-150 V.
C22	PC9	.006-150 V.
C24	PC10	.05-400 V.
C25	PC11	100 MFD-25 V.
		RESISTORS
R2-R15	PR1	470 K — 1/2 Watt
R3	PR2	1800 OHM — 1/2 "
R4	PR3	100 K — 1/2 "
R5	PR4	47 K — 1/2 "
R6	PR5	560 K — 1/2 "
R7	PR6	2 Meg. Vol. Control With Switch
R8-9	PR7	5.6 " — 1/2 Watt
R10	PR8	2.2 " — 1/2 "
R11	PR9	15 K — 1/2 "
R12-R13*	PR10	1 K — 1/2 "
R14	PR11	2.5 Meg. — 1/2 "
R16	PR12	1 Meg. — 1/2 "
R17	PR13	25 OHM — 1 "
R18	PR14	3000 " — 1 "
R19	PR15	470 " — 1/2 "
R20	PR16	2500 " — 10 "
R21-R23	PR17	360 " — 1/2 "
R22	PR18	510 " — 1/2 "

NOTE: Resistors Marked By * Are Used in Earlier Production Only

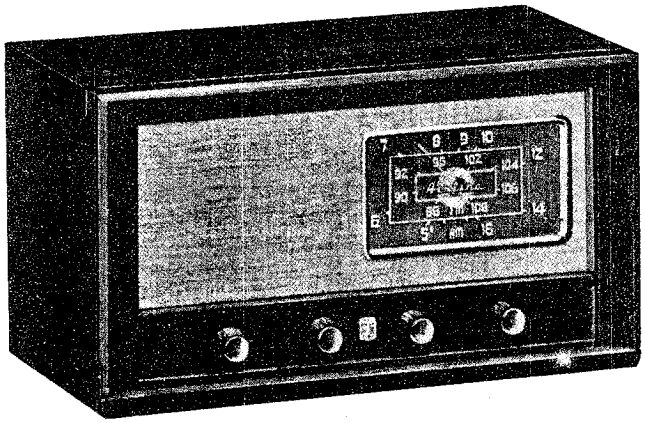
		MISCELLANEOUS
SP	PM2	4" Speaker with Output Trans.
SR	PM3	Selenium Rectifier, 100 Mil.
T1-T2	PM4	I.F. Transformer
.....	PM5	I.F. Trans. Mounting Clip
T3	PM6	Oscillator Coil
S	PM7	Switch, "Electric-Battery"
	PM8	Socket, Tube, Miniature
	PM9	Socket, Tube, Octal
	PM10	Dial, Tuning
	PM11	Knob, "AC-DC-Battery" or "Volume" Specify Push on Knob or Set Screw Knob
	PM12	Loop Antenna
	PM13	Grill Cloth, Plastic
	PM14	Cabinet-Leatherette Covered
	PM15	Line Cord with Plug
	PM16	Battery Plug with Leads

MODEL 05GHM-1061A



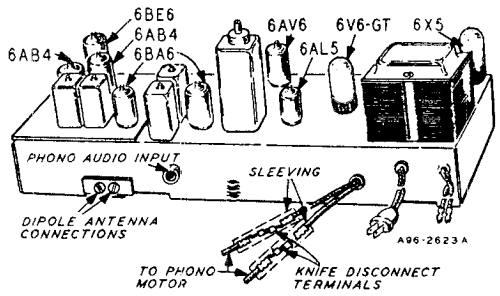
SCHEMATIC DIAGRAM FOR MODEL NO. 05 - GHM - 1061 A

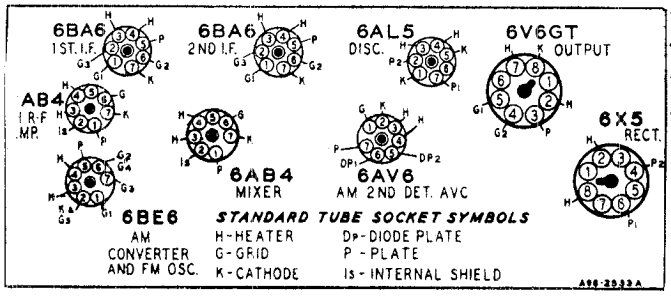
MODEL 05WG-1813A



GENERAL DESCRIPTION

This is a two band, eight tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.





ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 50-60 cycles, 40 watts.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	6" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 6AB4 R-F Amplifier
1 6AB4 Mixer
1 No. 47 Dial Lamp

TUBE SOCKET VOLTAGES

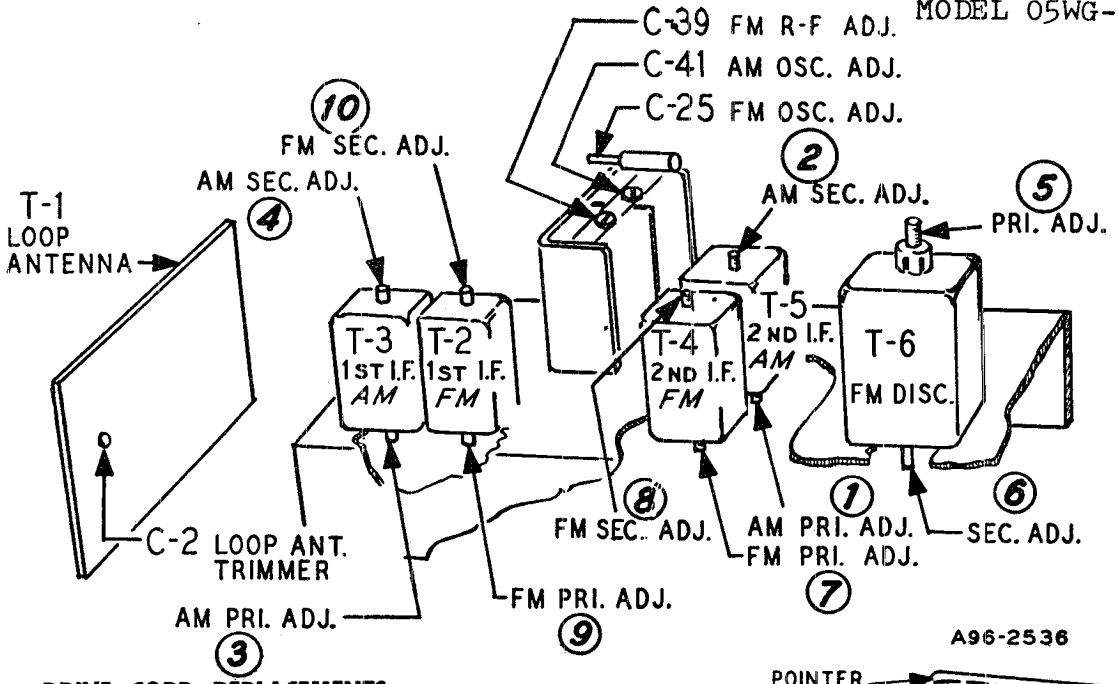
Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter.

Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

MODEL 05WG-1813A



A96-2536

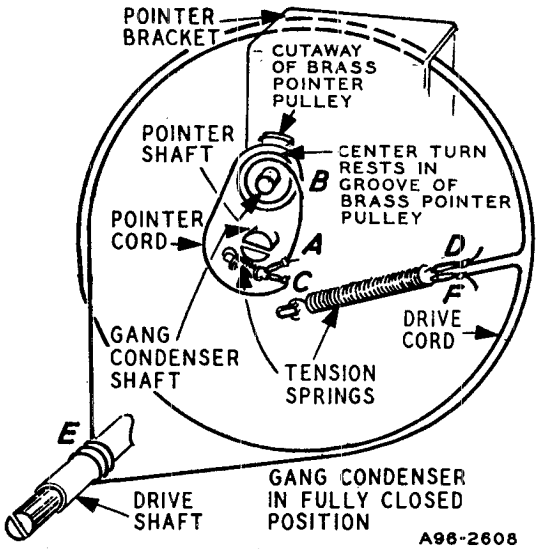
DRIVE CORD REPLACEMENTS

POINTER CORD

Install the cord as shown in the illustration making sure that the center turn of the three turns rests in the groove of the brass pointer pulley.

DIAL CORD

Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



A96-2608

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

MODEL 05WG-1813A

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect hank antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description			Qty. Used in Set
RESISTORS					
		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2 R-3 R-6 R-9	B85102	1000	0.5	Carbon	4
R-4 R-8	B84680	68	0.5	Carbon	2
R-5 R-12 R-13	B84682	6800	0.5	Carbon	3
R-7 R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14 R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18 R-19 R-24 R-26	B85474	470 K	0.5	Carbon	4
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X385	.5 meg.		Volume Control & Switch	1
R-23	40X312	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28	D84821	820	2.0	Carbon	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1
TRANSFORMERS AND COILS					
L-1	35A5	Insulated Choke			1
L-2	9A2103	Parasitic Choke Assembly			1
L-3	35A9	Insulated Choke			1
L-4	35A8	Insulated Choke			1
T-1	9A2182	"B" Range Loop Antenna			1
T-2	9A2060	1st I-F Trans. (FM)			1

Ref. No.	Part No.	Description	Qty. Used in Set
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X152	Output Transformer	1
T-11	53X291	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

CAPACITORS

C-1	14A214	Gang Condenser Assembly	1
C-2	17A256	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (Ist I-F Trans. FM)	
C-8		Part of T-3 (Ist I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X516	20 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A, C-28B, C-28C	45X360	20 mf 20 V, 40 mf 150 V, 40 mf 200 V Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

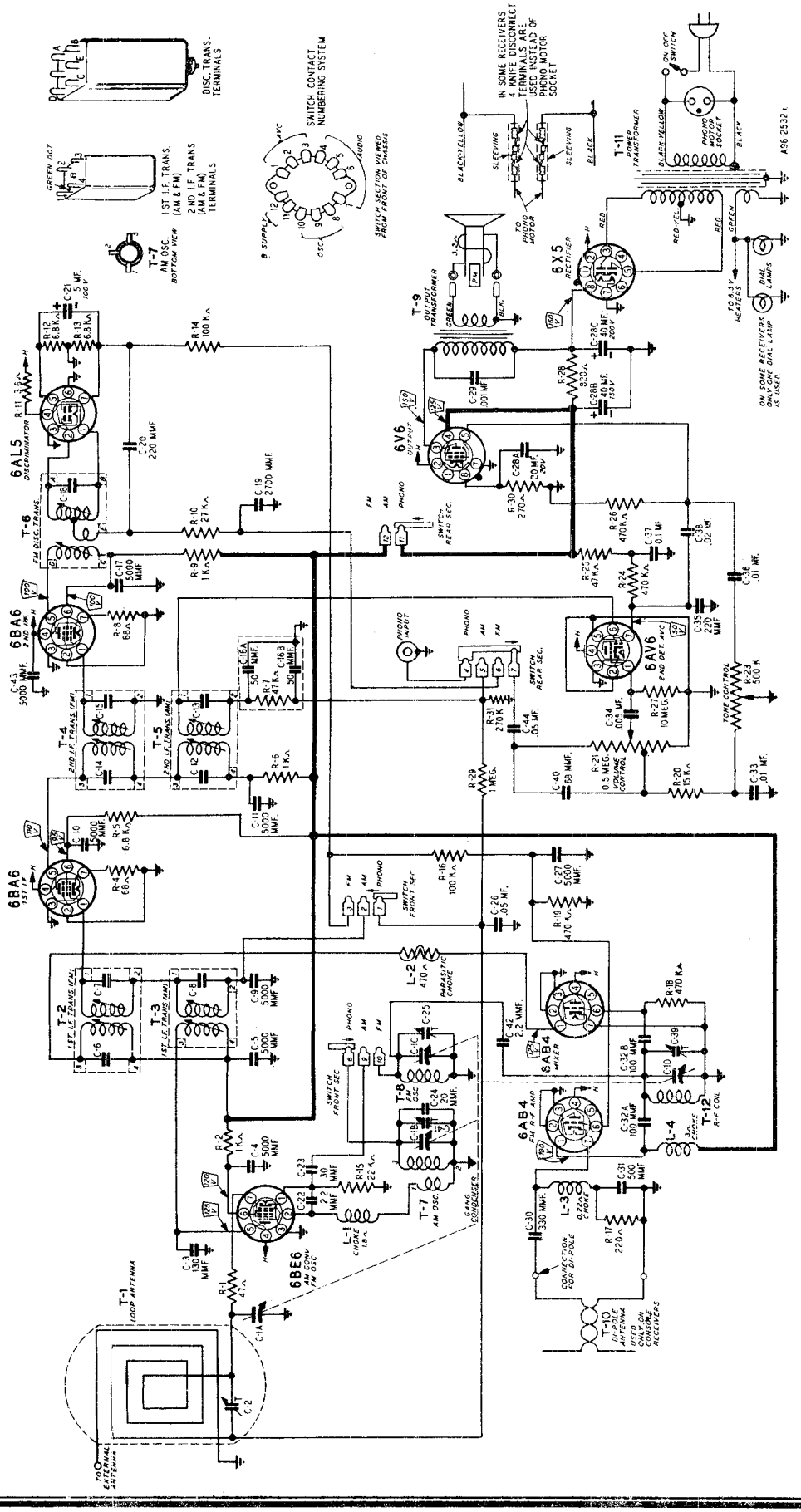
DIAL AND DRIVE ASSEMBLY

58X745	Dial Glass	1
15X253	Pointer	1
7A103	No. 47 Pilot Light Bulb	1
7A226	Pilot Light Socket Assembly	1
26X514	Drive Shaft	1
28X113	Drive Cord Tension Spring	1
10X74	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. Drive Shaft)	2
28X292	Snap Button	4
6X66	Rubber Grommet (Mtg. Gang Condenser)	3
25A1079	Pointer Shaft & Pulley Assembly	1
28X524	Pointer Cord Tension Spring	1
25X1672	Pointer Bracket	1
10X76	Pointer Cord Assembly	1

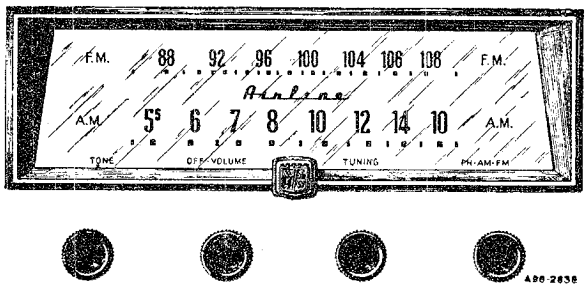
MISCELLANEOUS

12A498	6" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A394	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1120	Escutcheon	1
10A757	Knob	4

MODEL 05WG-1813A



MODEL 05WG-2748F



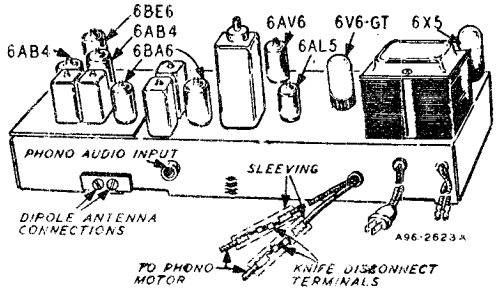
GENERAL DESCRIPTION

This is a two band, eight tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles



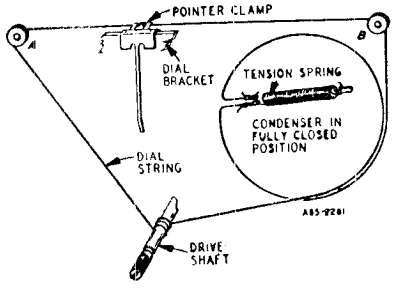
Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 6AB4 R-F Amplifier
1 6AB4 Mixer
2 No. 47 Dial Lamps

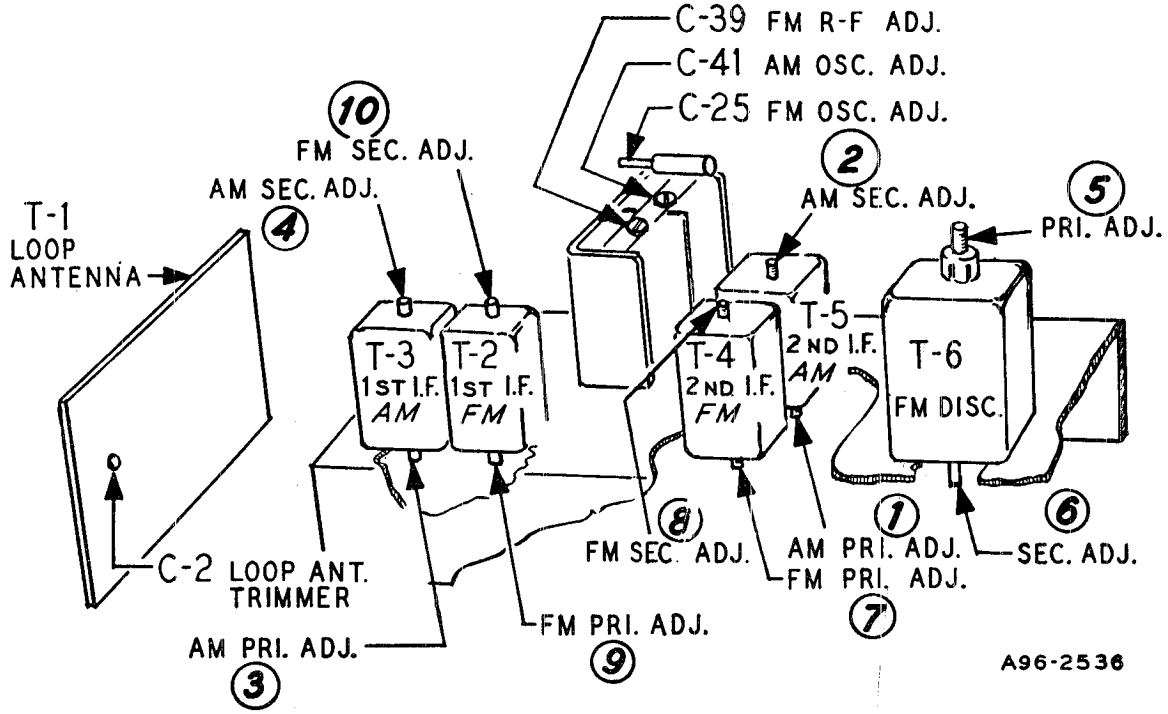
DRIVE CORD REPLACEMENT

DIAL POINTER CORD

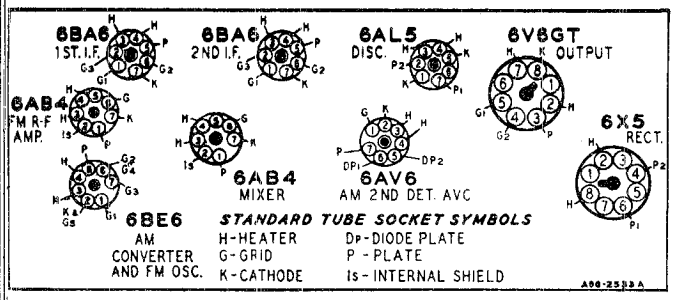
Use a new 10X72 drive cord assembly or a new length of cord 44 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 05WG-2748F



TUBE SOCKET VOLTAGES



Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC*	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A, C-28B, C-28C	45X360	20 mf 20 V, 40 mf 150 V, 40 mf 200 V Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1

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Ref. No.	Part No.	Description			Qty. Used in Set
C-32A, C-32B	76X4	100 mmf		Dual Ceramic	1
C-33	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 mf	200 V	Tubular	1
C-37	D66104	.1 mf	400 V	Tubular	1
C-38	D66203	.02 mf	400 V	Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic	1

RESISTORS

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28	D84821	820	2.0	Carbon	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2146	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X291	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MISCELLANEOUS

12A480	10" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1114	Escutcheon	1
10A759	Knob	4

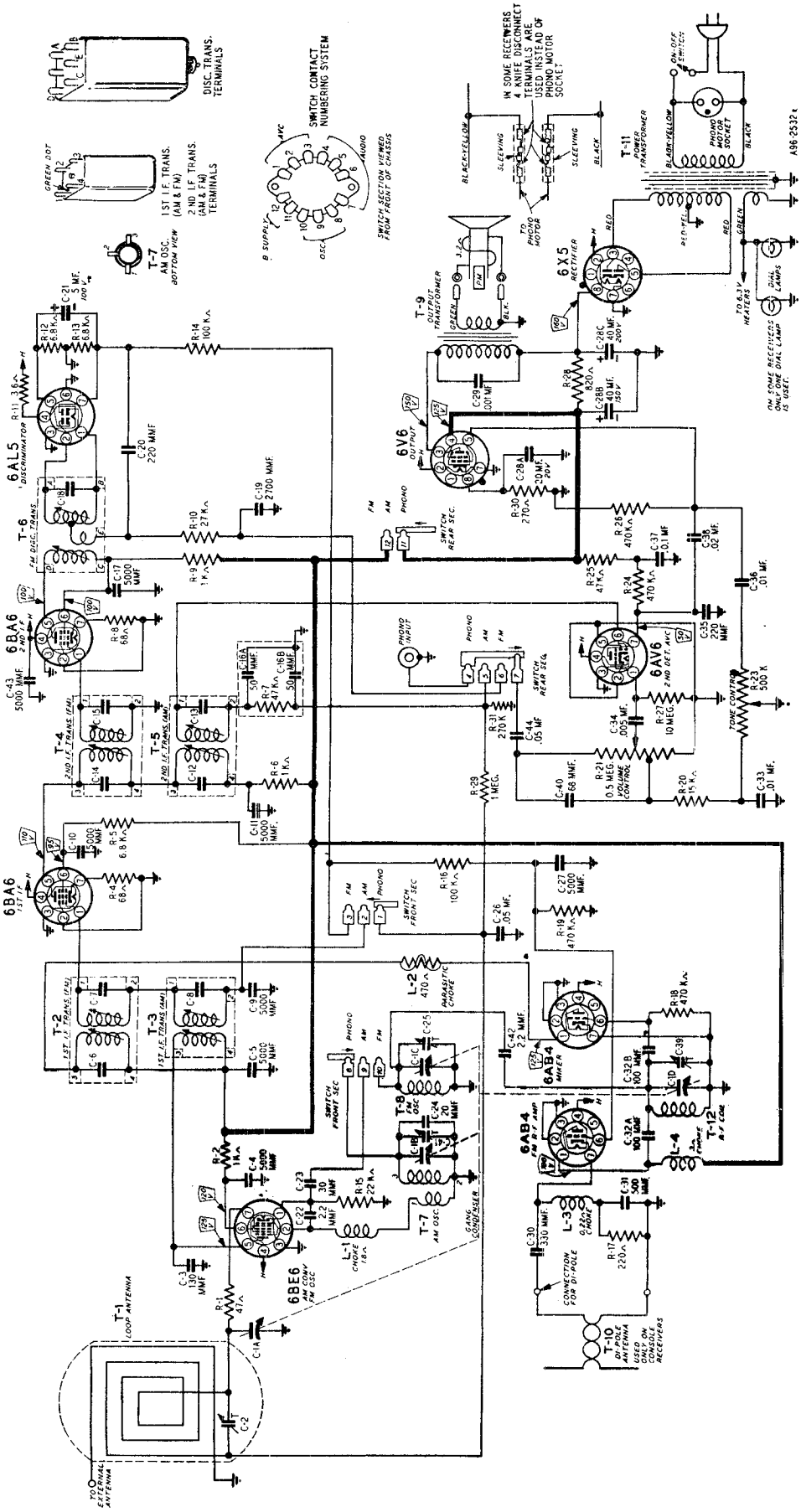
DIAL AND DRIVE ASSEMBLY

58X741	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1650	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X72	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

TYPE G.I. — 28A169 RECORD CHANGER PARTS

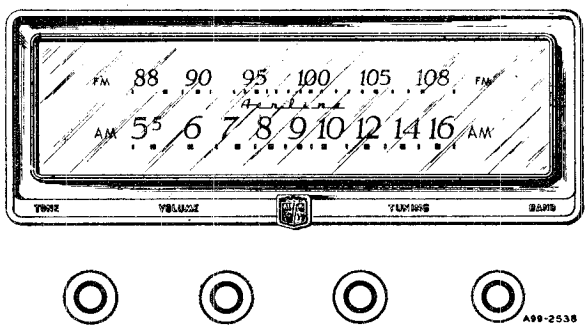
G.I.-56-76507	Motor Assembly, 60 cycles 105-125 Volts AC
G.I.-69-73657	Tone Arm
S-P81	Crystal Cartridge & Needle (Shure)
S-85-35	Needle

MODEL 05WG-2748F



NOTE—C-24 is 10 mmf, C-33 is .02 mf and R-19 is not used.

MODEL 05WG-2749D



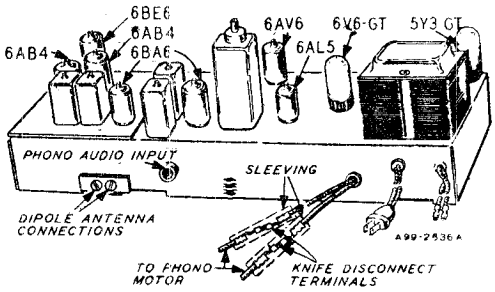
GENERAL DESCRIPTION

This is a two band, eight tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles



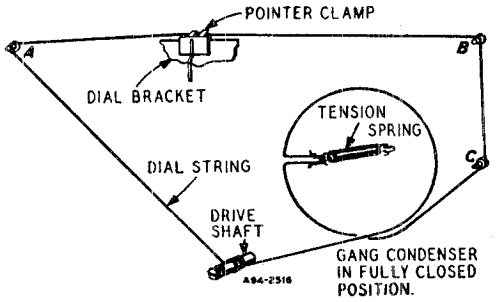
Tube and Dial Lamp Complement

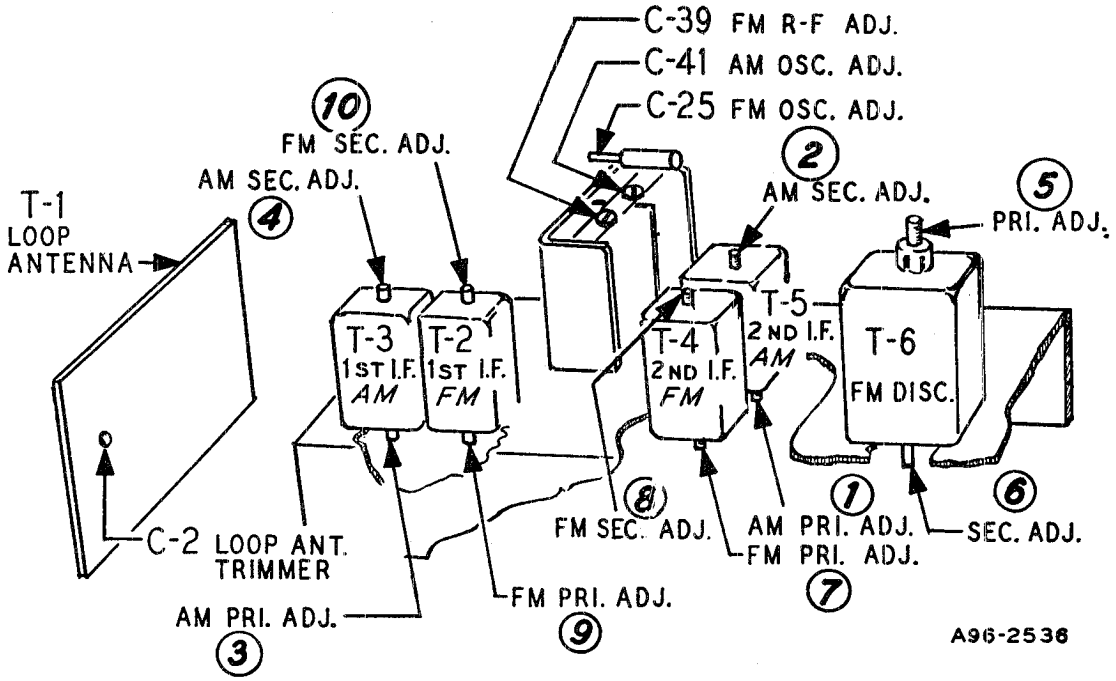
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 6AB4 R-F Amplifier
1 6AB4 Mixer
2 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

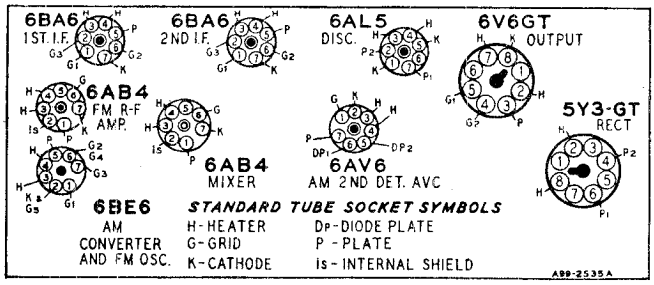
DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.





TUBE SOCKET VOLTAGES



Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter.

Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas -- .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A- If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

MODEL 05WG-2749D

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A, C-28B, C-28C, C-28D	45X359	20 mf 25 V; 20 mf 350 V; 40 mf 350 V; 40 mf 350 V Dry Electrolytic	1

Ref. No.	Part No.	Description	Qty. Used in Set
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33, C-36	B66103	.01 mf 200 V Tubular	2
C-34	D66502	.005 mf 400 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

RESISTORS

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6	B85102	1000	0.5	Carbon	2
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-9	B85222	2200	0.5	Carbon	1
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon	4
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.	Volume Control & Switch		1
R-23	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A	43X224	1000	4.0	Wirewound	1
R-28B		1400	6.0		
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MISCELLANEOUS

12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	3
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A735	Knob	4

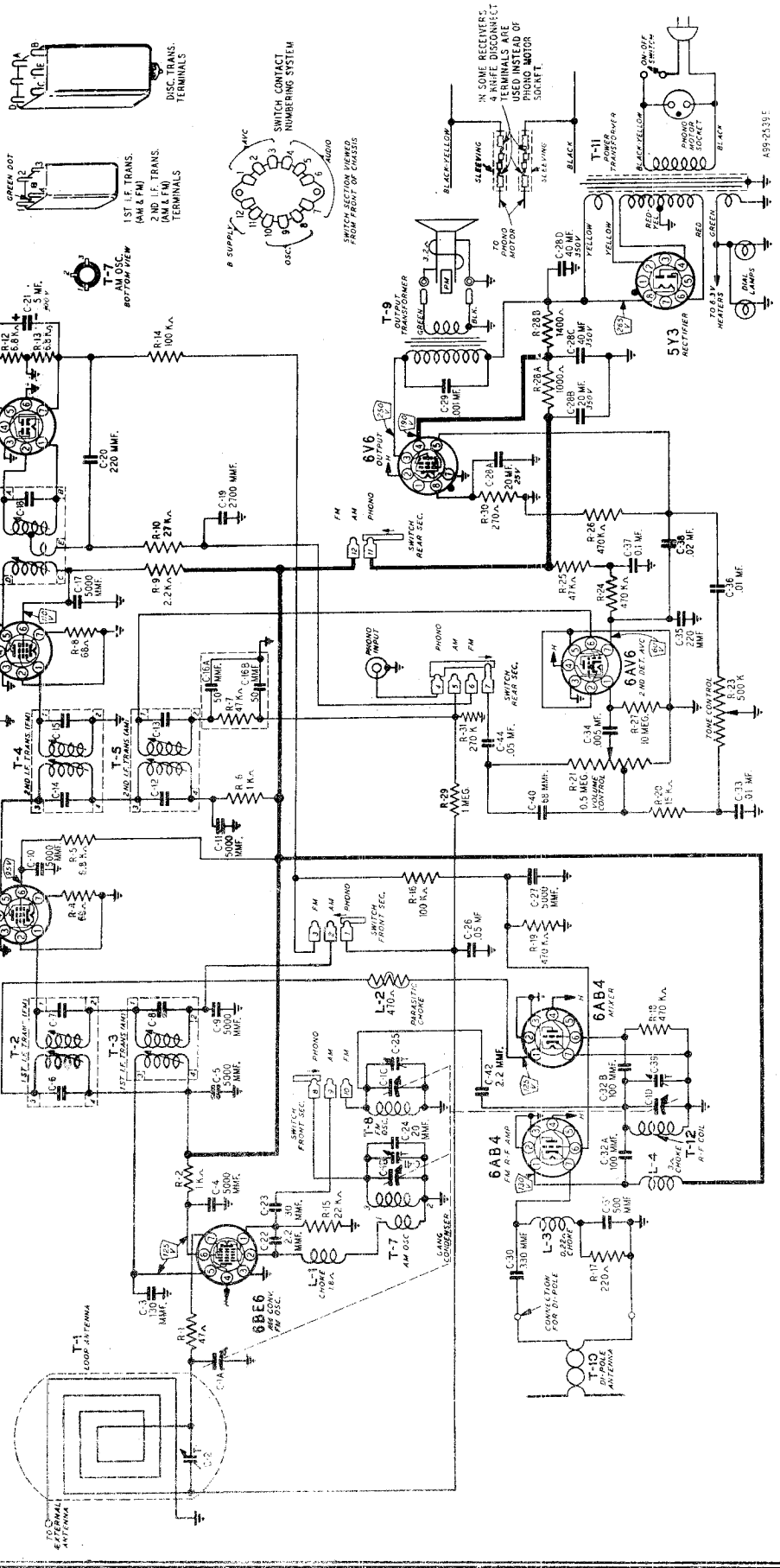
DIAL AND DRIVE ASSEMBLY

58X729	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1616	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

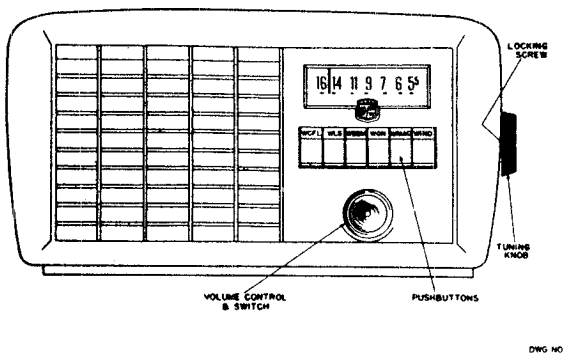
TYPE W-28A176 RECORD CHANGER PARTS

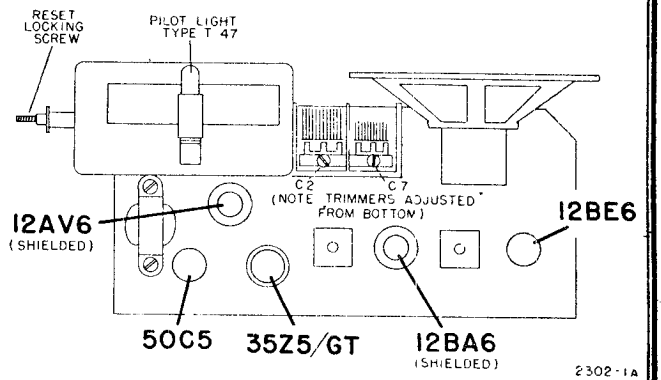
W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

MODEL 05WG-2749D



MODELS 15BR-1536B, 15BR-1537B





CHASSIS VIEW, SHOWING TUBE LOCATIONS

SERVICE DATA

GENERAL DESCRIPTION

This receiver is a single-band, AC-DC set which uses 4 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. AVC voltage is applied to the grid of the IF-amplifier and converter tubes.

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts, DC or 50-60 cycles AC, 35 watts.
Frequency Range	540 to 1600 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc, 55 kc at 1000 x signal.
Sensitivity	140 microvolts average for .05 watt output (By radiation.)
Power Output	0.8 watts undistorted, 1 watt maximum.
Loud Speaker	5" P.M., v.c. impedance 3.2 ohms.
Tube Complement	12BE6, converter, 12BA6, I.F. amplifier. 12AV6, detector, AVC, audio amplifier. 50C5, output amplifier. 35Z5, rectifier.

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

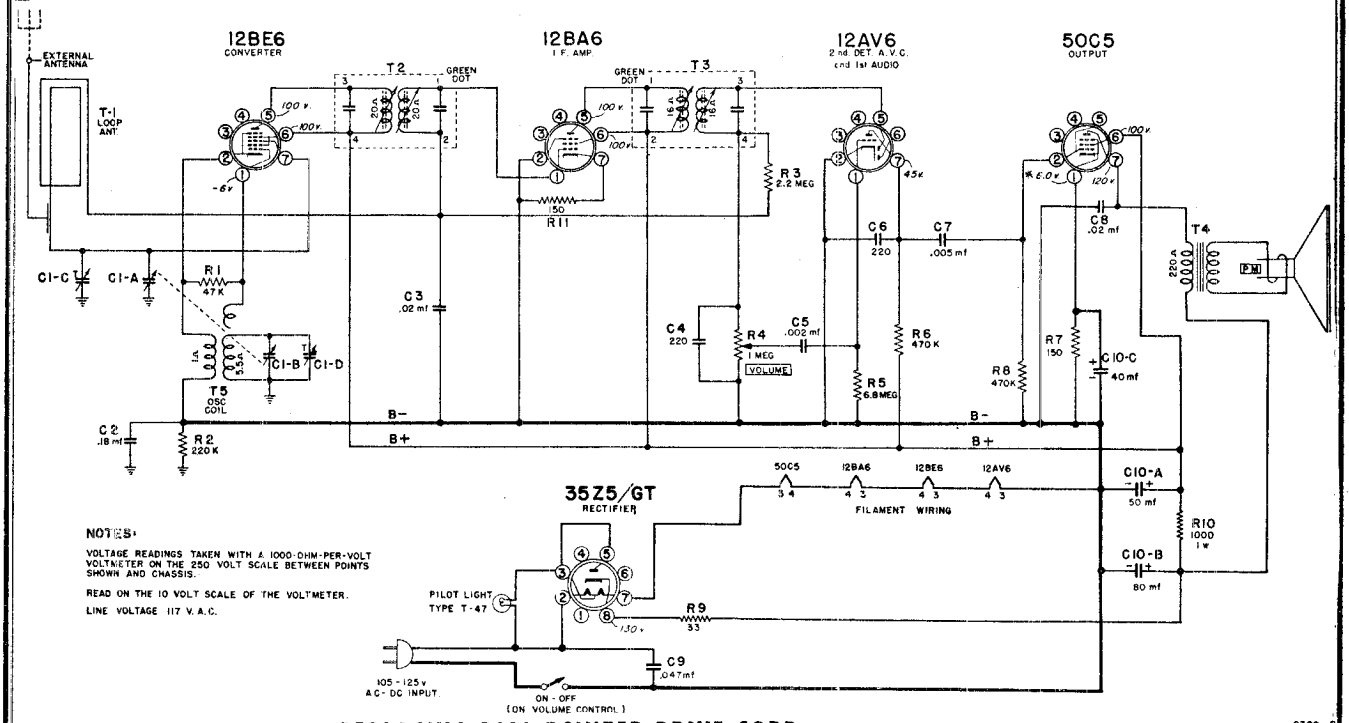
The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurement.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissable. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf.	Pin No. 7 of 12BE6	Buss wire	Rotor full open	Trimmers on output and input I.F. cans	50 microvolts
1700 kc.	.1 mf.	Pin No. 7 of 12BE6	Buss wire	Rotor full open	Oscillator trimmer C7 (on top)	———
1400 kc.	none	See note A	none	Set dial at 1400	Antenna trimmer C2 (on top)	———
1400 kc.	.1 mf.	External antenna clip	Buss wire	1400 kc.	———	50 microvolts
400 cycles	.1 mf.	12AV6, Pin 1	Buss wire	———	———	.03 volts

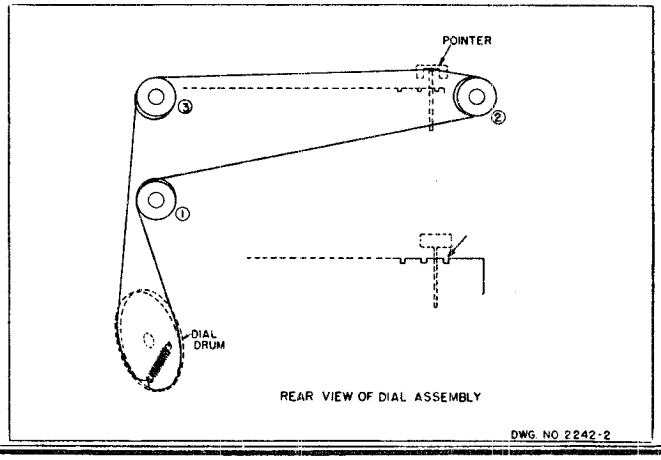
Note A: Lay output lead of generator in back of loop antenna. Turn up generator output. Loop antenna will pick up energy.

MODELS 15BR-1536B,
15BR-1537B



REPLACING DIAL POINTER DRIVE CORD—

1. Rotate tuning knob to extreme clockwise position. This closes the tuning condenser. Knob should remain in this postion until installation of cord is completed.
2. Tie cord to loop in spring in drum. Pass around drum in direction shown.
3. Pass over idler pulley number 1, then around idler pulley number 2 as shown.
4. Pass cord over idler pulley number 3, then down around drum as shown. Tie to loop in spring in such a manner that the spring is partly stretched.
5. Place pointer on top edge of dial plate. Guide cord through the three fingers on the back of the pointer.
6. Make sure the tuning knob is in the extreme clockwise position. Slide the dial pointer along the edge of the dial plate until the left edge of the pointer coincides with the right hand notch on the gold background plate, when viewed from the front.
7. Push the cord firmly into the three fingers and clamp them tightly together.



MODELS 15BR-1536B,
15BR-1537B

SETTING THE PUSHBUTTONS—The pushbuttons may be used, after proper adjustment, for the automatic tuning of any six stations which you select. They can be set up in any order.

1. Turn on the radio. Allow it to warm up for at least one minute.

2. Push out the call letters of the six stations from the call-letter sheets supplied with this manual.

3. Insert one call-letter tab in the rectangular opening in each of the pushbuttons, in any sequence. Press an acetate tab (supplied in small envelope) into each of the pushbuttons.

4. With the screwdriver supplied, check to see that the locking screw in the center of the tuning knob (see illustration) is loose. If it is not, turn it several turns to the left (counterclockwise).

5. Press the first pushbutton down *all the way*. With one hand hold the button down *firmly* and with the other carefully tune in the desired station. Release the pushbutton.

6. Follow this procedure for each of the five other buttons, adjusting each one for a different station.

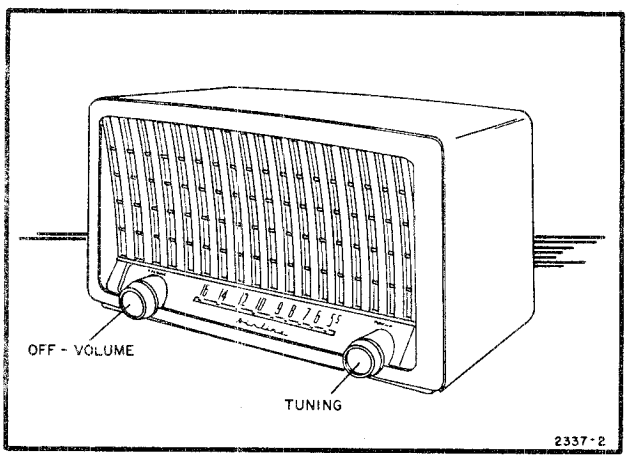
7. Rotate the tuning knob on the side of the cabinet as far to the right as it will go. Tighten the locking screw in the center of the knob. IT IS IMPORTANT THAT THIS SCREW BE TIGHTENED VERY FIRMLY.

8. The pushbuttons are now properly set for automatic tuning. Any of the six stations may now be tuned in simply by pressing the proper button down as far as it will go. If it is desired to reset any of the buttons for a new station, loosen the locking screw in the center of the tuning knob, set the pushbutton as described above, and re-tighten the locking screw.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		TUNER ASSEMBLY
	115448	End plate (right hand bracket)
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washers (12 used on camshaft)
	115143C	Key washer (one used)
	117528	Brass spacer (one used on camshaft)
	117602	Brass spacer (four used on camshaft)
	131181	Spring washer for locking collar
	117604	Locking collar
	117600	Lever shaft
	115361	Lever with roller
	120283	Return spring for levers
	A-2G-15449	Pointer
	A-55A-10989	Dial cord (24")
	C-2C-15428	Dial plate assembly
	A-200-15463	Drum pulley
	A-3H-10299	Idler pulley
	120285	Drum spring
	B-2M-10383	Cinch button
	A-2C-15450	Background plate
		CHASSIS ASSEMBLY
		CAPACITORS
C-1A,B,C,D	B-8A-18708	2-gang, variable condenser
C2	C-8D-11111	.18 mmf x 400 volts
C3, 8	C-8D-10774	.02 mmf x 400 volts
C4, 5, 6, 7	A-201-14397	Audio coupling plate
C9	C-8J-16081	.047 mfd x 400 volts
C10, A, B, C	A-8C-18713	Electrolytic condenser
		RESISTORS
R1	C-9B1-82	47K ohms, 1/2 watt, 10%
R2	C-9B1-27	220K ohms, 1/2 watt, 20%
R3	C-9B1-33	2.2 megohms, 1/2 watt, 20%
R4	A-10A-10626	Volume control and switch
R5	C-9B1-36	6.8 megohms, 1/2 watt, 20%
R6, 8	C-9B1-29	470K ohms, 1/2 watt, 20%
R7, 11	C-9B1-52	150 ohms, 1/2 watt, 10%
R9	C-9B1-44	33 ohms, 1/2 watt, 10%
R10	C-9B2-62	1K ohm, 1 watt, 10%
		TRANSFORMERS
T1	C-13E-18714	Loop antenna assembly
T2	B-13B-17731	Input IF transformer
T3	B-13B-17731	Output IF transformer
T4	B-12C-18723	Output transformer
T5	B-12D-18741	Oscillator coil
		MISCELLANEOUS
	A-18A-18712	5" PM speaker
	A-46A-10793	Pilot light, T-47
	A-47A-15451	Pilot light assembly
	A-15C-16007	7-prong, miniature tube socket
	A-2M-17589	Tube shield base
	A-2H-17588	Tube shield
	A-2D-15279	Loop mounting bracket
	A-2M-17580	Coil locking clip
	B-14M-10088-5	AC line cord and plugs
	A-23A-10344	Line cord lock
	A-15B-10440	Octal tube socket
		CABINET ASSEMBLY
	5C-14286-36	Cabinet (62-1536)
	5C-14286-82	Cabinet (62-1537)
	C-6D-15422	Dial Scale
	134123	Rubber bumper (bottom of cabinet)
	B-2M-15200	Cinch button (for dial scale)
	B-5B-18717-78	Volume knob (62-1537)
	B-5B-18717-74	Volume knob (62-1536)
	A-5B-10994-77	Tuning knob (62-1537)
	B-5B-10994-36	Tuning knob (62-1536)
	B-5B-14298-78	Pushbutton
	120388	Locking spring (for tuning knob)
	A-3F-10995	Locking screw (for tuning knob)
	A-23L-11900	Call letters, set
	A-6C-14299	Acetate tabs (call letters set)
	A-2H-10996	Reset key
	13141	Cinch buttons to cover trimmer holes in cabinet

MODELS 15BR-1543A,
15BR-1544A



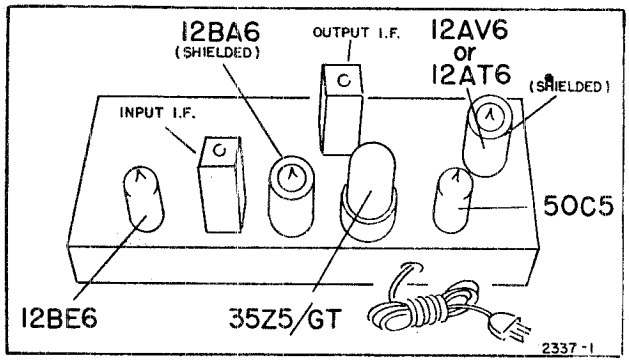
Front Cabinet View

SERVICE DATA

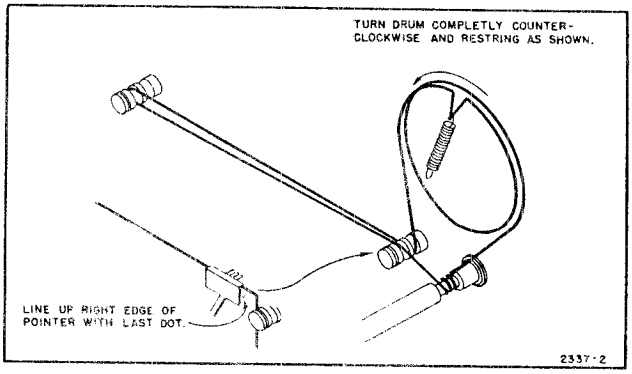
Power Supply	115 volts, DC or 50-60 cycle AC, 24 watts.
Frequency Range	540 to 1600 Kc.
Intermediate Freq.	455 Kc.
Selectivity	At 1000 Kc., 60 Kc. at 1000 x signal
Sensitivity	150 u. v. per meter.
Power Output	0.8 watts undistorted, 1.0 watt max.
Loud Speaker	4" PM., v.c. impedance, 3.2 ohms.

Tube Complement

12BE6, Converter
12BA6, IF Amplifier
12AV6 or 12AT6, Detector, AVC, Audio
50C5, Audio output
35Z5, Rectifier



Top Chassis View



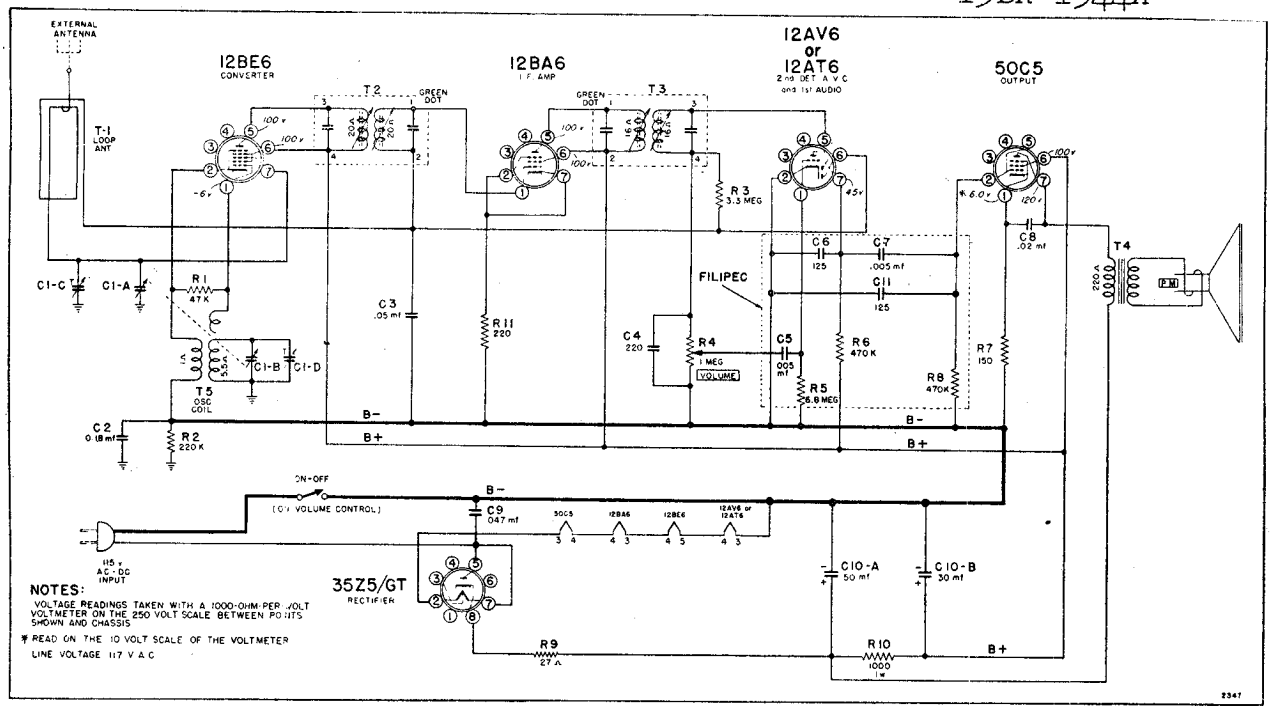
Dial Stringing Diagram

ALIGNMENT PROCEDURE

- Loop must be connected and set volume to maximum.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	HEAVY BUSS LEAD ACROSS CENTER OF CHASSIS	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	65 microvolts
1620 kc.	.1 mf	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang	70 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	70 microvolts
1400 kc.	———	Lay generator lead near back of cabinet		Tune in 1400 kc. signal	Antenna trimmer C-1C on gang	200 to 400 microvolts
400 cycles	.1 mf	12AT6, Pin 1		———	———	.06 volts

MODELS 15BR-1543A,
15BR-1544A



NOTE: Capacitor C4 is included in filpec.

SCHEMATIC DIAGRAM

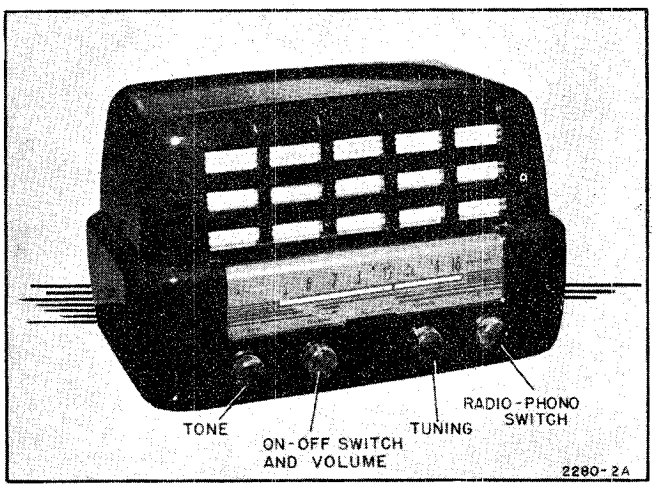
REPLACEMENT PARTS LIST

Please specify part number and chassis model number when ordering replacements.
Use only Genuine Factory Replacement Parts

Ref. No.	Part No.	Description
		CAPACITORS
C1A, B	8A-17377	2-gang condenser
C1C, D		Trimmers on gang
C2	8D-11111	.18 mfd x 400 volts
C3	8D-10770	.05 mfd x 200 volts
C4		Included in filpec
C5-6-7-11- and R5-6-8	201-19303	Filpec
C8	8D-10774	.02 mfd x 400 volts
C9	8J-16081	.047 mfd x 400 volts
C10A, B	8C-17391	Electrolytic condenser
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2	9B1-27	220K ohms, 1/2 watt, 20%
R3	9B1-34	3.3 megohms, 1/2 watt, 20%
R4	10A-19616	Volume control and switch
R5-6-8		See Filipec
R7	9B1-52	150 ohms, 1/2 watt, 10%
R9	9B1-43	27 ohms, 1/2 watt, 10%
R10	9B2-62	1000 ohms, 1 watt, 10%
R11	9B1-54	220 ohms, 1/2 watt, 10%
		TRANSFORMERS AND COILS
T1	13E-19621	Loop antenna assembly
T2-3	13B-17731	IF transformer
T4	12C-19302 or	Output transformer
	12C-17595	Output transformer
T5	13D-17583	Oscillator coil
		DIAL PARTS
	3A-19617	Tuning shaft
	40A-17591	Bushing

Ref. No.	Part No.	Description
	29E-17592	Spring washer
	43D-17609	Tinnerman clip
	29C-10630	"C" washer
	53A-18547	Dial string (approx 20")
	49A-10078	Take up spring
	2C-19619	Pointer plate
	2G-19620	Pointer
	3M-19623	String guide
	37A-19626	Dial background
	6D-19625	Dial scale
	2M-19624	Dial mounting strip
		MISCELLANEOUS
	5C-19532-9	Cabinet (Ivory)
	5C-19532-36	Cabinet (Walnut)
	5B-19790-8	Knob (Ivory)
	5B-19790-74	Knob (Walnut)
	23J-19627	Grill cloth and baffle board
	18A-19618	Speaker, 4" PM
	43D-12779	Tinnerman clip
	2H-17588 or	Tube shield
	2H-19188	Tube shield
	2M-17589 or	Tube shield base
	2M-19187	Tube shield base
	2M-17580	IF locking clip
	15C-16007	7-prong, socket
	15B-10440	Octal socket
	14M-10088-4	AC line cord and plug
	2D-15432-1	Loop mounting bracket
	23A-10344	Line cord lock
	42A10-19851	Chassis mounting bolt
	29A-3528	Steel washer
	29J-16690	Rubber washer

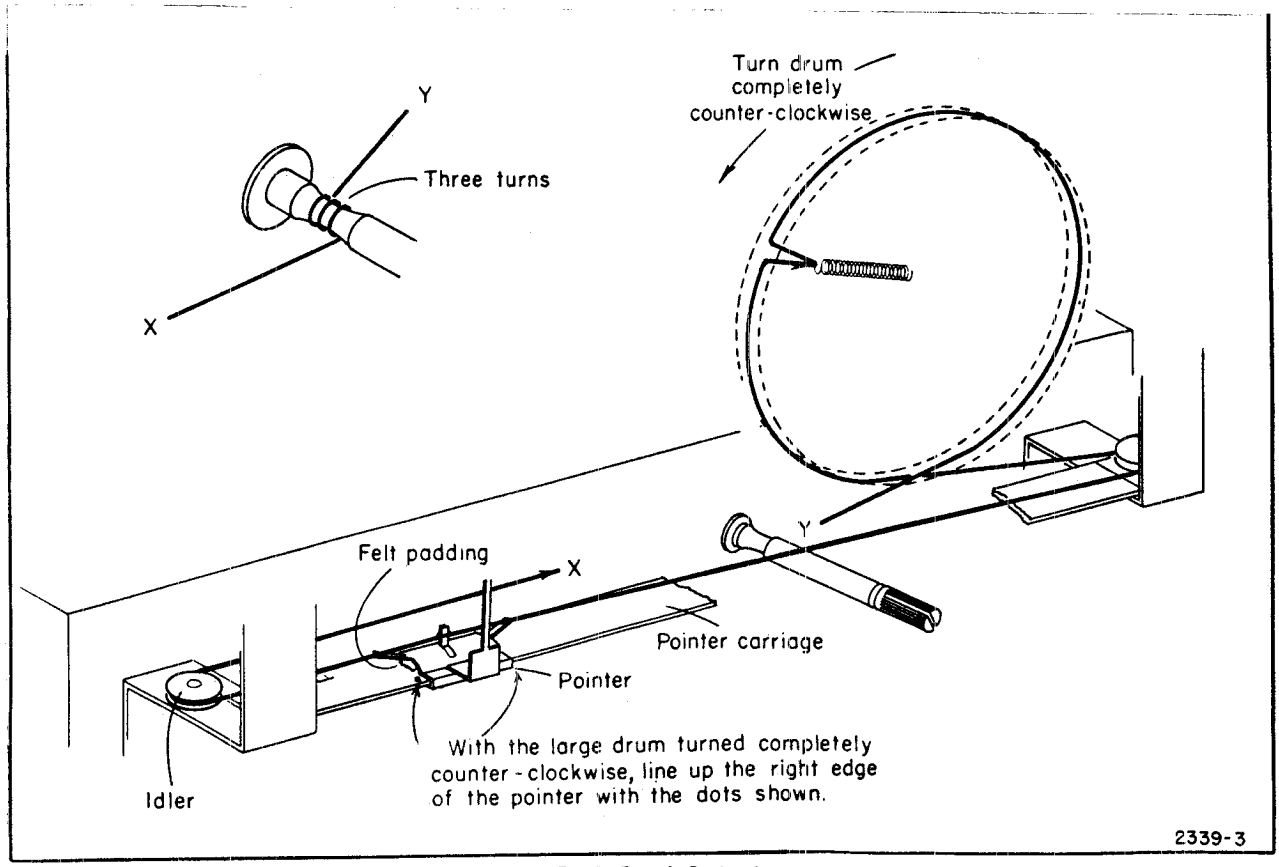
MODEL 15BR-1547A



SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts; 60-cycle AC, 60 watts.	Sensitivity	20 microvolts average for .05 watts output.
Frequency Range	540 to 1600 kc.	Power Output	1.0 watts undistorted, 2.0 watts maximum.
Intermediate Freq.	455 kc.	Loud Speaker	5 x 7 P. M., v.c. impedance 3.2 ohms.
Selectivity	At 1000 kc. 50 kc. at 1000 x signal		



Dial Cord Stringing

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

Alignment must be done in the cabinet.

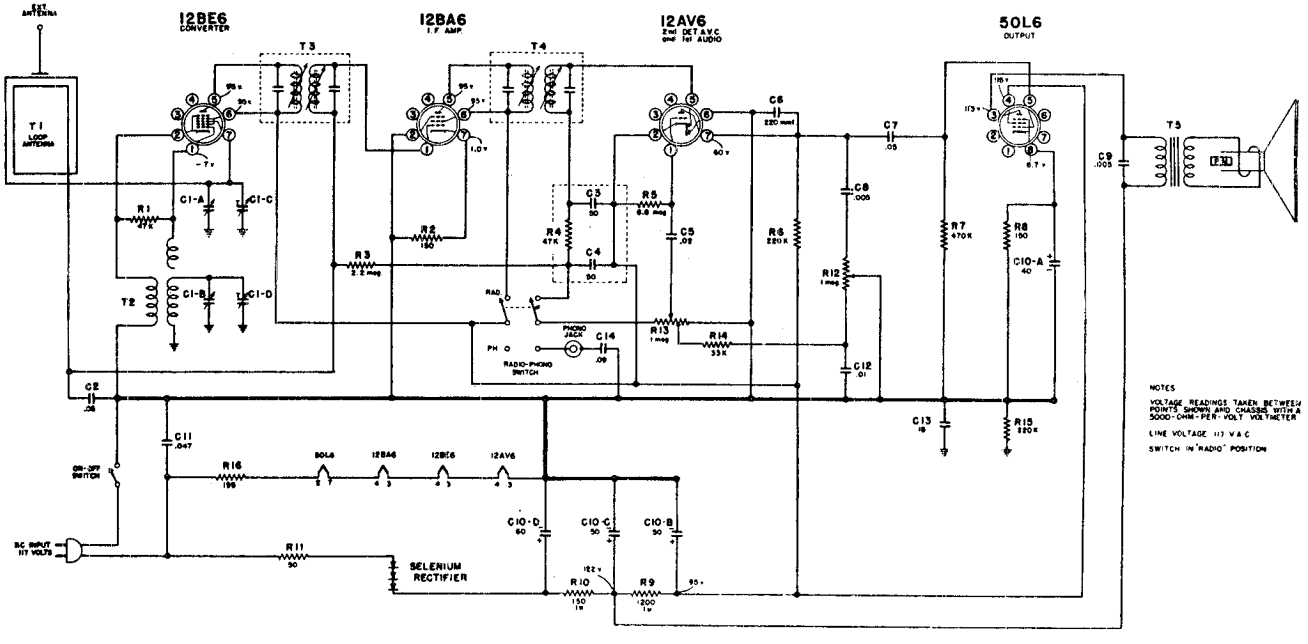
The signal source must be an accurately calibrated signal generator capable of supplying 455 Kc and up to 1620 Kc signals modulated 30% with a 400-cycle audio signal.

To connect the output meter, disconnect the speaker and substitute a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. Connect output meter across 3.2 ohm resistor.

- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc.	.1 mf.	12BE6, Pin 7	B MINUS POINT BUSS LEAD	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans
1620 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range
1400 kc.	———	Lay Generator lead near back of cabinet.		Set dial pointer at 1400 kc.	Antenna trimmer C1-C on gang

SCHEMATIC DIAGRAM WITH VOLTAGES



NOTE: Either a 12AT6 or a 12AV6 tube may be used.

MODEL 15BR-1547A

TUBE COMPLEMENT

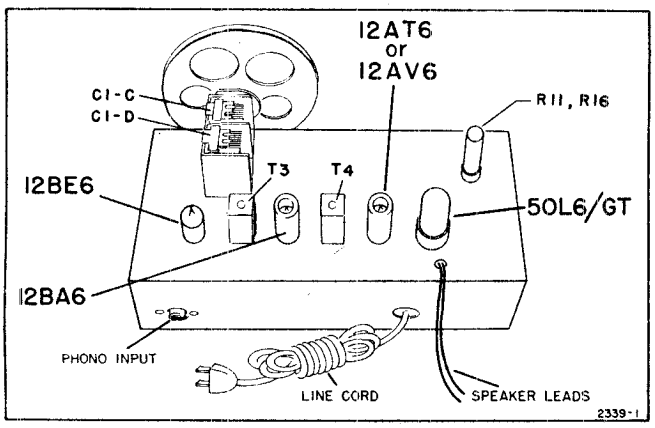
12BE6, Converter.

12BA6, I.F. Amplifier.

12AT6 or 12AV6, Detector, AVC, audio amplifier.

50L6, Output amplifier.

Selenium rectifier.



Top Chassis View

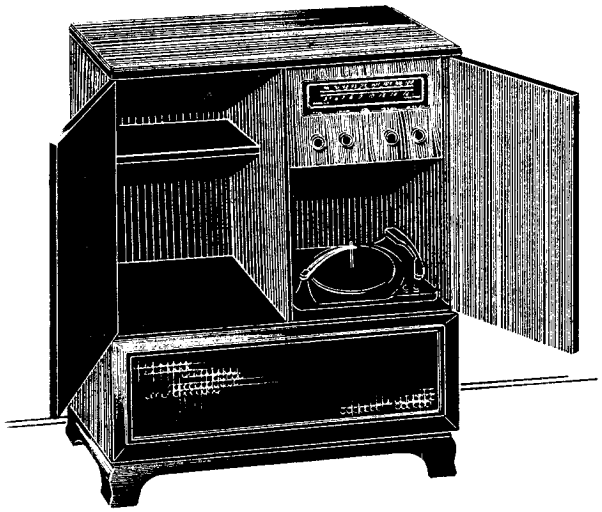
REPLACEMENT PARTS LIST

Please specify PART number and chassis Model Number when ordering replacements.

Ref. No.	Part No.	Description
		CAPACITORS
C1A,B	8A-18997	2 gang condenser
C1C,D		Trimmer on gang
C2-7	8D-10770	.05 mfd x 200 volts, paper
C3-4 and R4	201-15005	Filpec
C5	8D-11304	.02 mfd x 200 volts, paper
C6	8G-14459	220 mmf, ceramic
C8-9	8D-10935	.005 mfd x 600 volt, paper
C10A,B,C,D	8C-19829	Electrolytic condenser
C11	8J-16081	.047 mfd x 400 volt, molded case
C12	8D-17258	.01 mfd x 200 volt, paper
C13	8D-11111	.18 mfd x 400 volt, paper
C14	8D-11251	.09 mfd x 400 volts, paper
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2-8	9B1-52	150 ohms, 1/2 watt, 10%
R3	9B1-33	2.2 megohms, 1/2 watt, 20%
R4		See Filipec
R5	9B1-36	6.8 megohms, 1/2 watt, 20%
R6-15	9B1-90	220K ohms, 1/2 watt, 10%
R7	9B1-29	470K ohms, 1/2 watt, 10%
R9	9B2-63	1200 ohms ,1 watt, 10%
R10	9B2-52	150 ohms, 1 watt, 10%
R11-16	9M-19778	Clarostat resistor 50 ohms, 4 watts, 10% 195 ohms, 4 1/2 watts, 10%
R12	11B-15852	Tone control (1 meg.)
R13	10A-19606	Volume control & switch (1 meg.)
R14	9B1-80	33K ohms, 1/2 watt, 10%
		TRANSFORMERS AND COILS
T1	13E-19830	Loop antenna
T2	13D-19064	Oscillator coil
T3-4	13B-17731	IF transformer
T5	12C-19009-1	Output transformer

Ref. No.	Part No.	Description
		DIAL PARTS
	3A-18116	Tuning shaft
	2D-10033	Tuning shaft bracket
	29E-466	Spring washer
	29C-10393	"C" washer
	29J-18188	Rubber washer
	2D-17627	Pointer bar bracket
	2M-19825	Pointer bar
	3M-10299	Pulley
	27A-10102	Shoulder rivet
	2G-18119	Dial pointer
	53A-18547	Dial string (approx. 60")
	49A-11324	Tension spring
	50A-16434	Felt strip for pointer
	2M-18440	Dial mounting bracket
	2M-19777	Dial scale
		MISCELLANEOUS
	2M-17580	IF clip
	20A-19660	Radio Phono switch
	43F-15390	Pal nut
	23J-19826	Background plate
	21J-19594	Selenium rectifier
	2H-10974	Tube shield
	15C-16007	7-pin, tube socket
	2H-17008	Tube shield base
	15B-10440	8-pin, tube socket
	23A-10344	Line cord lock
	14M-11479-5	Line cord and plug
	19B-12170	Pickup socket
	39A-14155	Insulator
	2D-15432-1	Loop mounting bracket
	5C-18396-36	Bakelite cabinet
	23K-19822	Grille cloth
	24M-18433-1	Baffle board
	18A-19896 or 18A-17637	Speaker, 7" PM
	5B-11131-74	Knob
	5B-16057-74	Knob (with dot)

MODELS 15BR-2756B,
15BR-2757A



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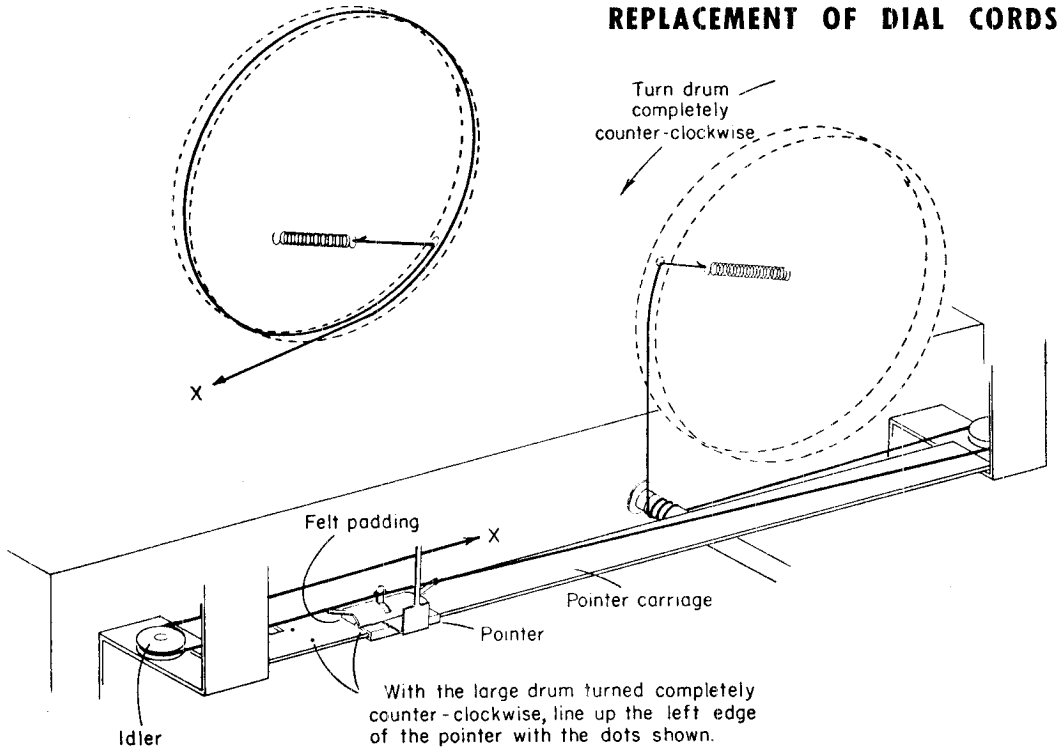
REPLACEMENT OF DIAL CORDS



Pointer Stringing and Alignment

2268-2

ELECTRICAL SPECIFICATIONS

Power Supply	115 volts, AC, 60-cycles; radio only 75 watts, with phono operation 100 watts.
Frequency Ranges	Broadcast Band—540 to 1600 kc. FM Band—88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-47 kc. broad at 1000 times signal, measured at 1000 kc. I.F. FM-230 kc. broad at 2 times down. I.F. FM-470 kc. broad at 10 times down.
AM Sensitivity	(For .5 watt output)—200 microvolts per meter average.
FM Sensitivity	(For .5 watt output)—12 microvolts average.
Power Output	2.0 watts. 10% distortion. 4.5 watts maxmium.
Loud Speaker	8" PM. Voice coil impedance 3.2 ohms, 400 cycles.
Tube Complement	12AT7, FM-RF amp. mixer; 6BA7, AM converter, FM oscillator; 6BA6, IF amplifier; 6AU6, FM driver; T-44, Pilot light; 6AL5, FM detector; 6AV6, AM detector and 1st audio; 6V6 output; 5Y3, rectifier.
Automatic Changer	See Manual 5089A.

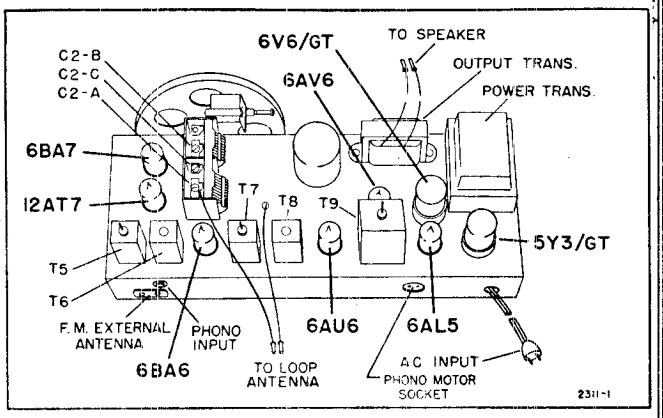
MODELS 15BR-2756B,
15BR-2757A

ALIGNMENT PROCEDURE

Broadcast Band Section I. F. and R. F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of 500 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.27 volts AC across this resistor will be approximately equivalent to 500 milliwatt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissable.



Chassis View

AM—I. F. ALIGNMENT

Band Switch in AM Position, Gang Open, Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
400 cycles. Use 65 millivolts	High Side of Volume Control and chassis	None	Maximum output Should be 500 Milliwatts
455 Kc. Use 3300 microvolts	Pin 1 of 6BA6 I.F. Amp. and chassis	Primary and Secondary of T8. See chassis view.	Maximum output Should be 500 Milliwatts
455 Kc. Use 55 microvolts	Pin 7 of 6BA7 Converter and chassis	Primary and Secondary of T6. See chassis view.	Maximum output Should be 500 Milliwatts

BROADCAST BAND—R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the left hand edge of dial marker at the extreme left when gang is closed.
For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	SET POINTER AT	CONNECT TO RADIO	ADJUST
1600 Kc.	Extreme Right Calibration Marker	RADIATION COUPLING Use six turn loop across generator output. Place close to cabinet back.	Oscillator trimmer C2-B for maximum
1400 Kc.	Third Calibration from Right		Antenna Trimmer C2-A for maximum

Check tracking at 1000 Kc, 600 Kc, and 535 Kc to be sure oscillator is set correctly.

MODELS 15BR-2756B,
15BR-2757A

ALIGNMENT PROCEDURE

FM Band Section I. F. and R. F.

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over a long period of time.

NOTE

The following alignment is based on the use of the vacuum tube voltmeter which has a "floating ground". In other words, the meter, when used as a vacuum tube voltmeter, can have both the positive and negative sides connected to points above ground and still give true readings. (See note "C" below).

A standard AM signal generator is required.

FM — I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .05 volt	Pin No. 1 of 6AU6	Pin No. 7 of 6AL5 and chassis	Bottom Core Primary of T9 Ratio Detector	Resonance should be about 3 volts
10.7 Mc. Use about .05 volt	Pin No. 1 of 6AU6	See note "A"	Top Core Secondary of T9 Ratio Detector	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 1800 microvolts	Pin No. 1 of 6BA6	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T7. FM Driver IF See chassis view	Resonance should be about 3 volts
10.7 Mc. Use about 400 microvolts	Top end of C2-C	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T5. FM Input IF See chassis view	Resonance should be about 3 volts

NOTES ON FM — I. F. ALIGNMENT

NOTE "A"—Connect two resistors in series, 100K OHMS each, from Pin No. 7 of 6AL5 to chassis (Pin No. 5). These resistors must be matched within 5%. Connect vacuum tube voltmeter between the midpoint of the resistors and point zz.

NOTE "B"—If T9 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

NOTE "C"—To use a VTVM which does not have the "floating ground" feature, in step 2 above, connect "ground" side of VTVM to midpoint of resistors (Note "A") and "high" side to point zz.

GENERAL—Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM—R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the left hand edge of dial marker at the extreme left when gang is closed.

For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	POINTER	CONNECTION TO RADIO	ADJUST	V T V M CONNECTIONS
108 mc.	108 mc. Marker	FM antenna terminals	FM Osc. C3 for maximum	Pin No. 7 of 6AL5 to chassis.
98 mc.	Tune in Gen. Signal	See Note "B" below	FM Mixer C2-C for maximum	

NOTE "A"—If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube voltmeter as above for resonance indication. A weak carrier, however, will not produce 3 volts.

NOTE "B"—Connect 300 ohms in series with "hot" side of generator and connect to left hand screw of external FM Antenna Terminals. Connect cold side of generator to right hand screw.

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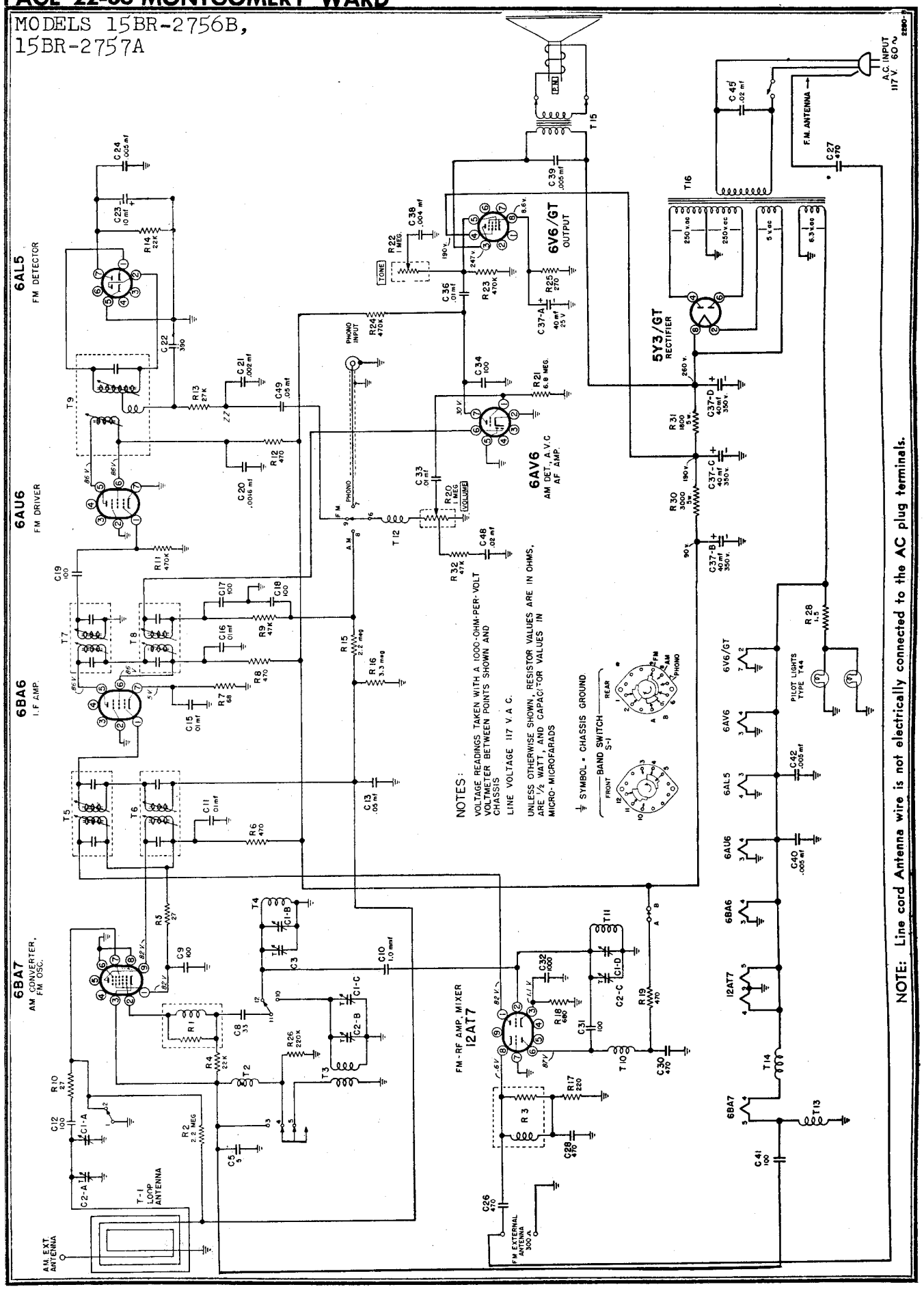

MODELS 15BR-2756B,
15BR-2757A

REPLACEMENT PARTS INFORMATION

Please specify *PART* number and chassis model number when ordering replacements.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1A,B,C,D	B-8A-17673	Gang tuning condenser
C2A,B,C,		Trimmers on gang
C3	A-201-15142	Trimmer condenser
C5	C-8G-12166	5 mmf, ceramic, 10%
C8	C-8G-14172	33 mmf, ceramic, 10%
C9-31-41	C-8G-12759	100 mmf, ceramic, 10%
C10	A-8G-12495-1	1.0 mmf, ceramic, 20%
C11-16-36	C-8D-17270	.01 mfd, 400 volts, 20%
C12	C-8G-13131	100 mmf, ceramic, 10%
C13-49	C-8D-10770	.05 mfd, 200 volts, 20%
C15-33	C-8D-11738	.01 mfd, 200 volts, 20%
C17-18	A-8F-13127	100 mmf, dual mica +30% —20%
C19-34	C-8G-11734	100 mmf, ceramic, 10%
C20	C-8D-19565	.0016 mfd, 600 volts, 10%
C21	C-8G-16049	.002 mfd, ceramic, 10%
C22	C-8F3-120	390 mmf, mica, 10%
C23	A-8C-18128	10 mfd, 50 volts
C24-40-42	A-8G-13962	.005 mfd, ceramic
C26-27-28-30	C-8G-11732	470 mmf, ceramic, 20%
C32	C-8G-13201	1000 mmf, ceramic
C37-A-B-C-D	A-8C-18125	40 mfd x 25 volts, 40-40-40 mfd x 350 volts
C38	C-8D-10788	.004 mfd, 600 volts, 20%
C39	C-8D-10935	.005 mfd, 600 volts, +40% —15%
C45	C-8J-11321	.02 mfd, 600 volts, 20%
C48	C-8D-11304	.02 mfd, 200 volts, 20%
		RESISTORS
R1	A-16B-16615	Suppressor
R2-15	C-9B1-33	2.2 megohms, 1/2 watt, 20%
R3	A-16B-16616	Suppressor
R4-14	C-9B1-78	22K ohms, 1/2 watt, 10%
R5-10	C-9B1-43	27 ohms, 1/2 watt, 10%
R6-8-12-19	C-9B1-58	470 ohms, 1/2 watt, 10%
R7	C-9B1-48	68 ohms, 1/2 watt, 10%
R9-32	C-9B1-82	47K ohms, 1/2 watt, 10%
R11-23-24	C-9B1-94	470K ohms, 1/2 watt, 10%
R13	C-9B1-79	27K ohms, 1/2 watt, 10%
R16	C-9B1-34	3.3 megohms, 1/2 watt, 20%
R17	C-9B1-54	220 ohms, 1/2 watt, 10%
R18	C-9B1-60	680 ohms, 1/2 watt, 10%
R20	A-10A-17971	1 megohm, (volume control and switch)
R21	C-9B1-36	6.8 megohms, 1/2 watt, 20%
R22	A-11B-16502	1 megohm, (tone control)
R25	C-9B1-55	270 ohms, 1/2 watt, 10%
R26	C-9B1-27	220K ohms, 1/2 watt, 20%
R28	C-9C2-1065	1.5 ohms, 1 watt, 10%
R30	C-9C12-2059	3000 ohms, 5 watts, 5%
R31	C-9C12-1102	1800 ohms, 5 watts, 10%

Ref. No.	Part No.	Description
		COILS, TRANSFORMERS, CHOKES
T1	C-13E-18924-1	Loop antenna assembly
T2-T13-T14	A-16B-16023	RF choke coil assembly
T3	B-13D-18996	Oscillator coil (AM)
T4	A-13D-16617	Oscillator coil (FM)
T5	B-13A-18567	Input IF transformer (FM)
T6	B-13A-16662	Input IF transformer (AM)
T7	B-13B-18568	Output IF transformer (FM)
T8	B-13A-16662	Output IF transformer (AM)
T9	B-13M-19356	Ratio detector transformer
T10	A-16B-16613	RF choke coil
T11	A-13E-16618	RF coil (FM)
T12	A-16A-18676	RF choke coil
T15	B-12C-18143-1	Output transformer
T16	B-12A-18137	Power transformer
		MISCELLANEOUS
	A-15B-13430	9-prong, miniature tube socket
	A-15B-10440	8-prong, octal socket
	A-15C-16007	7-prong, miniature tube socket
	B-20A-19475	Band change switch
	B-14M-11479-3	AC line cord and plug
	A-23A-10344	Line cord lock
	A-19B-12170	Phono pick-up socket
	A-7B-13050	Dipole socket
	B-47A-18870	Pilot light assembly
	A-46A-11971	Pilot light bulb, T-44
	A-19B-12468	Phono motor socket
	B-18A-18872	Speaker, 8" PM
	B-2G-18868	Escutcheon
	B-30A-18869	Dial scale
	B-5B-18876-74	Knob
	B-5B-18877-74	Knob (with indicator)
		DIAL PARTS
	A-3A-18548	Tuning shaft
	A-2D-10033	Tuning shaft bracket
	A-2M-16034	Dial mounting bracket
	B-6M-17622	Background diffuser
	B-2M-16656	Pointer bar
	A-2D-17627	Pointer bar bracket
	A-3M-10299	Pulley
	B-27A-10102	Shoulder rivet
	B-2G-18119	Dial pointer
	A-50A-16434	Felt Strip for Pointer
	A-49A-11324	Tension spring
		PHONO PARTS
	C-21H-19575	Record Changer assembly, (GI model 700F)
		Shure P-81 cartridge
		Needle
	A-39A-17837	45 RPM fiber inserts

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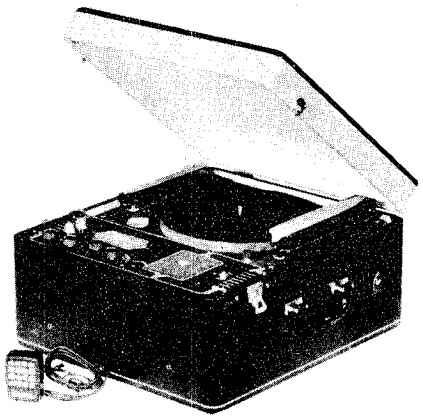

Power Output . . .	8.9 watts maximum; 2.4 watts, 10% distortion
Loud Speaker . . .	5" permanent magnet dynamic - 1.47 oz. Alnico 5 magnet - voice coil impedance 3.2 ohms at 400 cycles.
Tubes and Dial Light Complement .	1 6SA7 GT Mixer 1 6SK7 GT IF Amplifier 1 6SQ7 GT 2nd. Det. 1st AF 1 6V6 GT Power Amp. 1 6X5 GT Rectifier 1 6SQ7 GT Mike Amp. 2 NE-51 Neon Lamps 1 No. 47 Dial Lamp
Recorder Unit . . .	General Industries - Model GI-R90L - 115 volts 60 cycle AC - Part No. 2305
Microphone	Crystal - Electro Voice Model 915, Part No. 2510

SPECIAL INSTRUCTIONS

REMOVAL OF RADIO CHASSIS

Remove the four sheet metal screws at the edge of the metal panel. Remove the two machine screws from the front of the cabinet. Lift chassis enough to remove the small three-prong (antenna) plug from the top of the chassis. Then disconnect the three plugs from the rear of the chassis, and lift the chassis out of the cabinet.

NOTE: In cabinets that have a panel in bottom, remove this panel and disconnect the four plugs through this opening; then proceed as above.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC, 60 cycles, 45 watts normal, 75 watts recorder operating.
Frequency Range. . .	535-1620 KC
Intermediate Frequency	455 KC
Selectivity	36 KC broad at 1000 times signal, 1000 KC
Sensitivity	(for 0.5 watt output - with loop antenna) 200 microvolts per meter average.

REMOVAL OF RECORDER UNIT

After the radio chassis has been removed, unscrew the four machine screws at the corners of the unit. Lift "Recorder" arm three inches, swing it halfway towards the turntable center and then lower it. Grasp the unit at the edges and lift it out.

When testing the radio, the loop antenna should be removed from the cabinet and reconnected to the chassis.

OPERATING INSTRUCTIONS

Operating the AIRLINE Radio Recorder is not complicated or difficult. However, the better you understand it the better your results will be. Read these instructions carefully so that you may derive the greatest pleasure and satisfaction from your Radio-Recorder.

INSTALLATION

IMPORTANT During shipment the base plate, on which are mounted the *motor* and the *recording* and *play-back arms*, is secured firmly to case by four bolts located at each corner of the base plate. *These bolts must be loosened about 2 complete turns* to allow the recording assembly to float freely on the rubber shock absorbers under the plate.

Before connecting your Radio-Recorder, make certain that the line voltage is 105-125 volts AC, 60 Cycles.

For best results the unit must be operated on a firm and level support. This is important to insure proper "tracking" of the arms when making or playing recordings.

OPERATION

TO OPERATE RADIO

Turn *"Function Selector"* switch knob to *Radio* position. Turn *OFF-ON* switch to the right and allow time for tubes to warm up, then tune in desired station. Adjust the *Tone* and *Volume* controls to the most pleasing tonal balance.

TO RECORD FROM RADIO

1. Raise the *Recording Arm* and insert the cutting needle in the cutting head, making sure that the point of the retaining screw bears against the flattened shank of the needle. Tighten the screw firmly with your fingers - *DO NOT USE PLIERS*. *RE-TIGHTEN* the screw after each recording.
2. Turn *"Function Selector"* switch to *Radio* position and tune in station desired.
3. Turn *"Function Selector"* switch knob to *Record Radio* position. Turn *Tone Control* all the way to the right-Treble position. *THIS IS IMPORTANT*. Recordings made with the *Tone Control* in any other position will have a tendency to sound muffled. Adjust *Volume Control* to a point where the lower neon indicator lamp will glow continuously while the upper one will light up only during loud passages of music or speech. The correct setting of the *Volume Control* is very IMPORTANT. Either excessive or insufficient volume will result in poor recording. Too much volume will produce distorted recordings while insufficient volume will cause excessive groove and surface noise. *WARNING - Excessive volume can permanently damage the crystal recording head. NEVER ADVANCE the VOLUME CONTROL any farther than is required to light up the upper neon indicator lamp on loud passages of music or speech.*
4. Place a blank recording disc on the turntable so that the *Retractable Pin* protrudes through the small hole near the center hole of the recording disc.
5. The AIRLINE Radio-Recorder is equipped with a two-speed recording unit. Recordings can be made either at the standard speed (78 RPM) or the professional slow speed (33-1/3 RPM). At 33-1/3 RPM the recording time is almost doubled. For example: at 78 RPM on a 10 inch record the recording time is approximately 4½ minutes, while at 33-1/3 RPM on a 10 inch record the time is approximately 9½ minutes. Select the recording speed desired and start the turntable. Raise the *Recording Arm* about three inches, move horizontally and place on the recording disc. The record is now being cut and a fine thread or shaving cut from the record will be directed toward the center post. Allow this shaving to collect around the center post until the recording is finished. When the recording is finished, raise the *Recording Arm* about 3 inches and return it to the arm rest. Turn motor off and remove the shavings that have collected around the center post.

TO RECORD FROM MICROPHONE

Turn *"Function Selector"* knob to *Record Microphone* position and follow the same procedure as outlined in *To Record From Radio*. The microphone should be used as far away from the recorder as possible to reduce possible acoustic feedback, a howl that results from excessive sound from the loud speaker re-entering the microphone. For best results the microphone should be used from 6 to 8 inches from the source of the sound to be recorded.

TO PLAY RECORDS

Turn *"Function Selector"* knob to *"Phonograph"* position. Select the proper speed 33 or 78 RPM, start the turntable and place the *"Playback arm"* on the record. Adjust tone and Volume to pleasing setting. LP microgroove records are played with speed selector in "33" position.

TO USE AS PUBLIC ADDRESS SYSTEM

Turn *"Function Selector"* knob to *Public Address* position. As in *Recording From Microphone*, the microphone should be used as far away from the recorder as possible to reduce possible acoustic feedback. The setting of the volume control will depend on the position and the distance of the microphone in relation to the loud speaker.

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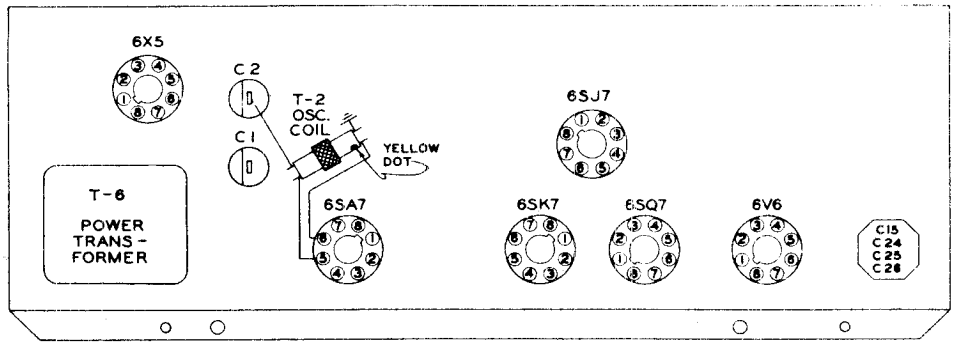
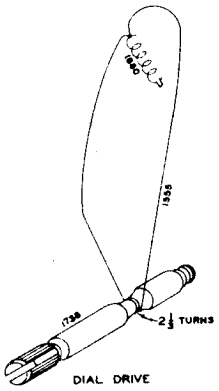
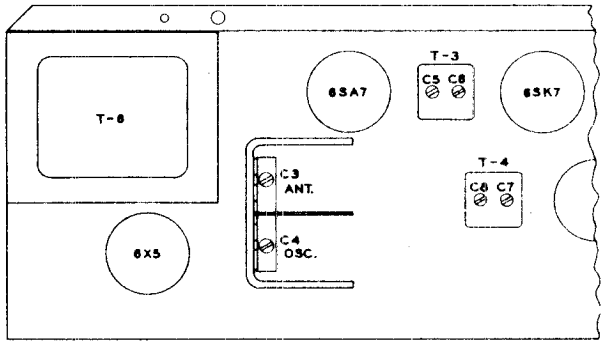


CHASSIS - BOTTOM VIEW



DIAL DRIVE



CHASSIS - TOP VIEW
ALIGNMENT TRIMMER LOCATION

ALIGNMENT PROCEDURE

The following equipment is required for aligning:

A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

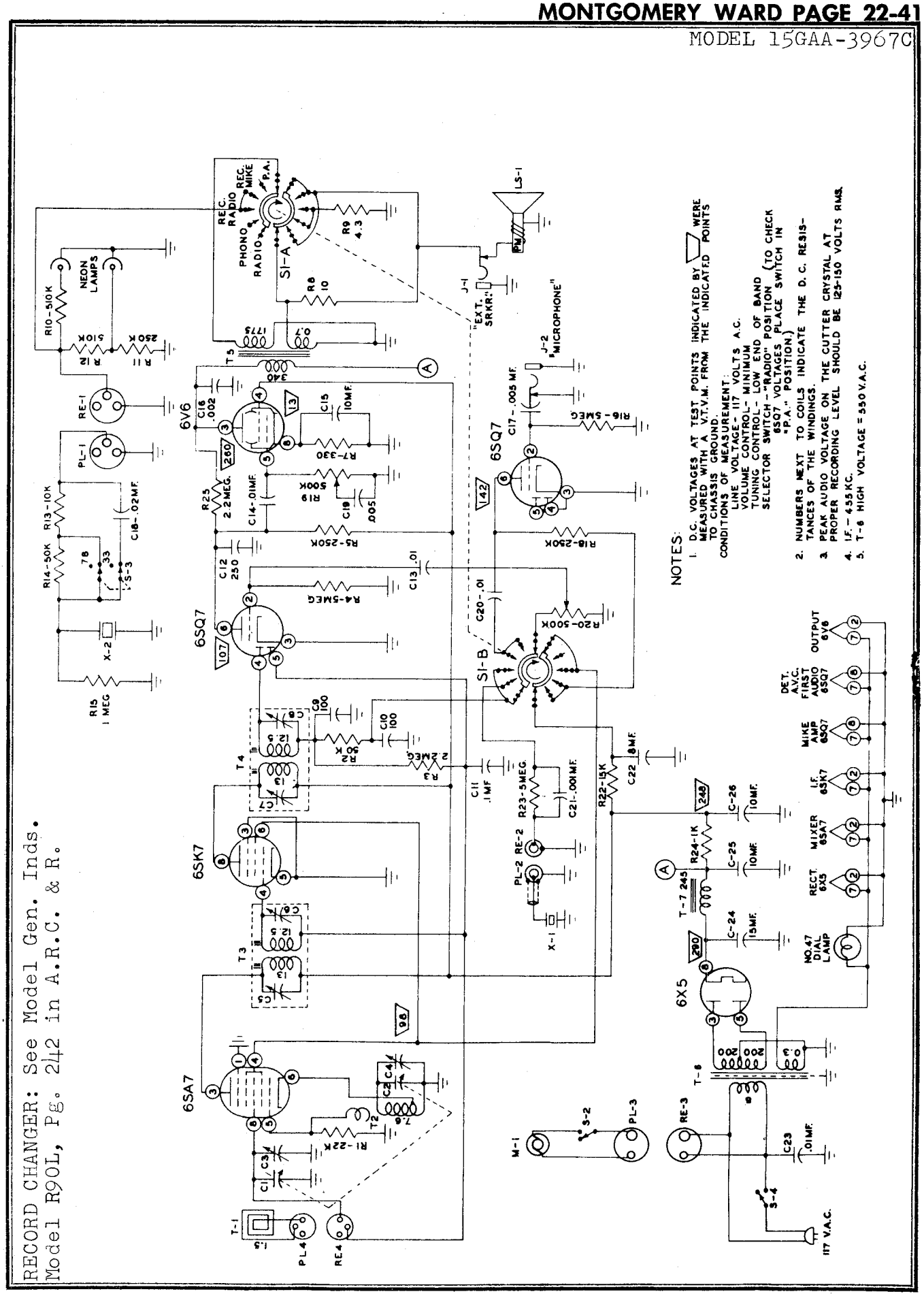
Radiation Loop: 2-turn loop, 6 inches in diameter.

Conditions for Alignment:

Tone - Treble
Volume - Maximum
Selector Switch - "Radio" position
Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	REMARKS	ADJUST FOR MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	Short out osc. tuning gang section C-2; compress C-3	C-8, C-7, C-6, C-5
LOOP	1620 KC	High End of Band	"	Remove short across C-2	C-4
LOOP	1400 KC	Point of Maximum Output	"	Set pointer to 140 on dial	C-3
LOOP	600 KC	Point of Maximum Output	"	Knife C-1 plates for maximum output	
LOOP	1400 KC	1400	"	Recheck alignment.	C-3 if necessary

MODEL 15GAA-3967C



RECORD CHANGER: See Model Gen. Inds.
Model R90L, Pg. 242 in A.R.C. & R.

MODEL 15GAA-3967C

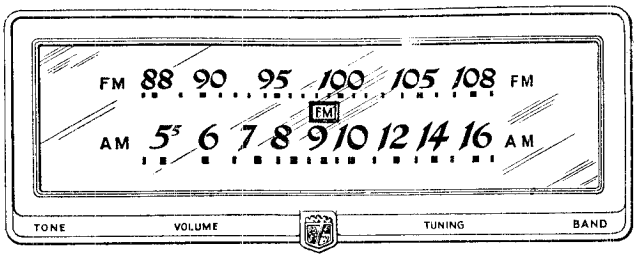
RADIO REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used
		CAPACITORS	
C-1, C-2 C-3, C-4	1004	Tuning Gang and Trimmer Assembly	1
C-5, C-6 C-7, C-8		Part of I. F. Assemblies	
C-11	807	.1 uf 400 V Tubular	1
C-12	809	250 uuf Ceramic	1
C-15 C-24 C-25 C-26	1005	10 uf 25 V 14 uf 450 V Dry 8 uf 450 V Electrolytic 8 uf 450 V	1
C-16	810	.002 uf 600 V Tubular	1
C-18	808	.02 uf 400 V Tubular	1
C-23	802-A	.01 uf 600 V Tubular	1
C-17 C-19		5000 MMF. Ceramic Cond.	
C-22		8 MF - 350 V Cond.	
		CAPRISTORS (Combination Capacitors and Resistors)	
C-9, C-10 R-2	811	100 uuf - 50 K OHM - 100 uuf Dual Shunt Connection	1
C-13, R-4	813	.01 uf - 5 Meg Ohm, Common Terminal Connection	1
C-14, R-5 C-20, R-18	814	.01 uf - 250 K Ohm, Common Terminal Connection	2
C-21, R-23	812	.001 uf - 5 Meg Ohm, Parallel Connection	1
		RESISTORS	
R-1	517	22,000 Ohm 0.5 Watt Carbon	1
R-3, R-25	615	2.2 Meg. 0.5 Watt Carbon	2
R-10, R-12	501	510,000 Ohm 0.5 Watt Carbon	2
R-7	602	330 Ohm 1.0 Watt Carbon	1
R-8	527	10 Ohm 0.5 Watt Carbon	1
R-9	526	4.3 Ohm 1.0 Watt Wire	1
R-11	529	250,000 Ohm 0.5 Watt Carbon	1
R-13	522	10,000 Ohm 0.5 Watt Carbon	1

RADIO REPLACEMENT PARTS LIST (Cont.)

Ref. No.	Part No.	Description	Qty. Used
R-14	523	50,000 Ohm 0.5 Watt Carbon	1
R-15	516	1.0 Meg. Ohm 0.5 Watt Carbon	1
R-16	525	5.0 Meg. Ohm 0.5 Watt Carbon	1
R-19	408	500,000 Ohm Tone Control	1
R-20, S-4	401	500,000 Ohm Volume Control, Off-On Switch	1
R-22	606	15,000 Ohm 2.0 Watt Carbon	1
R-24	607	1,000 Ohm 1.0 Watt Carbon	1
		TRANSFORMERS AND COILS	
T-1	1512	Loop Antenna	1
T-2	1403	Oscillator Coil	1
T-3, T-4	1402	I.F. Transformer and Can Assembly	2
T-5	1202	Output Transformer	1
T-6	1101	117 Volt, 60 Cycle Standard Power Transformer	1
T-7	1301	Filter Choke	1
		DIAL DRIVE AND PANEL ASSEMBLY	
	1722	Dial Scale	1
	1736	Dial Pointer	1
	2307	Dial Bezel	1
	1738	Tuning Shaft	1
	1879	Fiber Washer for Tuning Shaft	1
	1878	Hairpin Cotter	1
	1555	Dial Cable	1
	1880	Dial Cable Spring	1
	1513	Pilot Lamp Assembly	1
	2202-A	NE-51 Neon Lamp	2
	2306	Neon Protector - plastic	2
J-1, J-2	1875	Shorting Type Jack	2
	2406	Knob, Walnut Plastic	1
	2407	Knob, Walnut Plastic with White dot.	2
	2409	Knob, Walnut Plastic - white dot - Steel insert	1
	2127-A	Front Panel, Metal	1
	2131	Speaker Grille with emblem	1
	2103-A	Case, Plywood, leatherette covered.	1

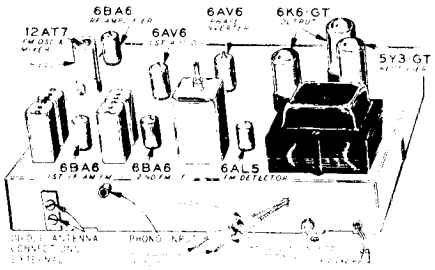
MODEL 15WG-2745C



GENERAL DESCRIPTION

This is a two band, nine tube (plus rectifier tube) AM and FM receiver with an automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, push-pull pentode power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.



DRIVE CORD REPLACEMENT

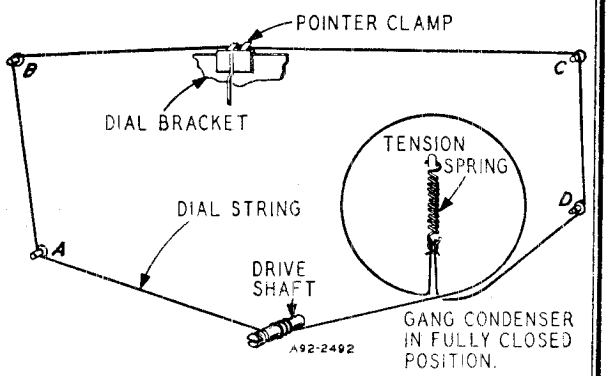
Use a new 10X54 drive cord assembly or a new length of cord 48 inches long for the installation, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation, rotate the drive shaft a few turns to take up the slack in the cord.

ELECTRICAL SPECIFICATIONS

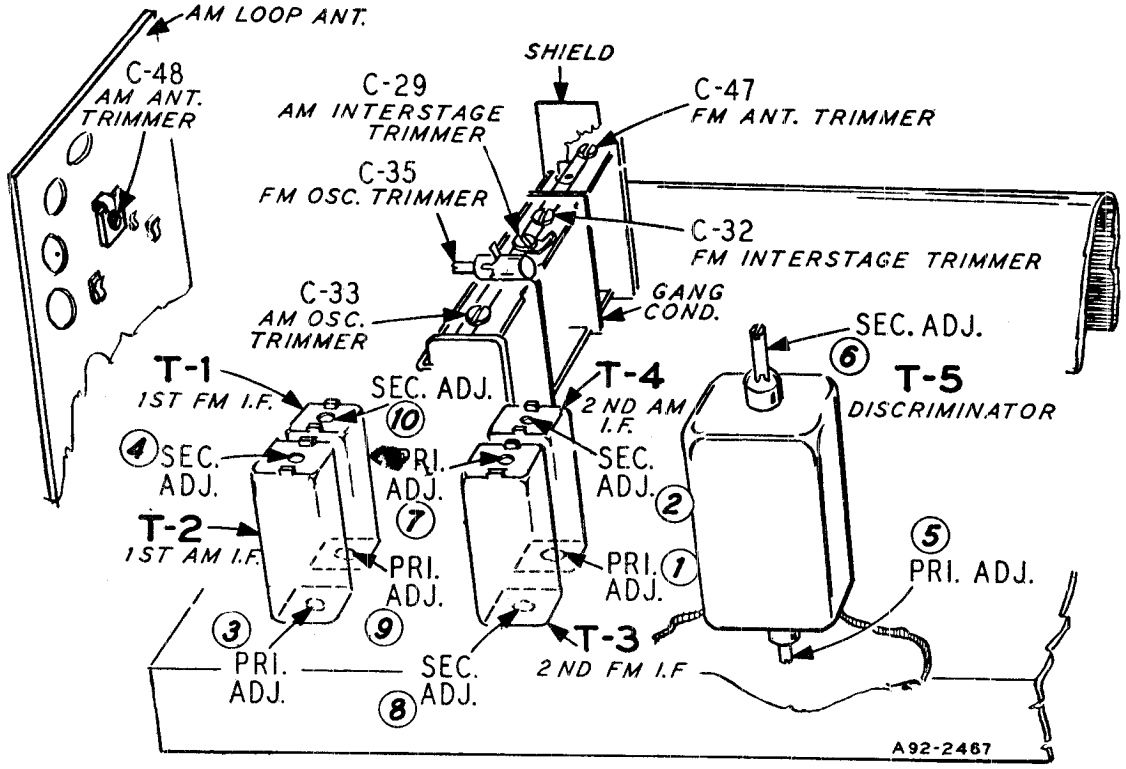
Power Supply	105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—43 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—760 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity	(For .5 watt output) 30 microvolts average
Power Output	8.5 watts maximum 6.0 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM & AM Osc. & Mixer
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6K6-GT Audio Output
1 5Y3-GT Rectifier
1 6AV6 Phase Inverter
2 No. 47 Dial Lamps

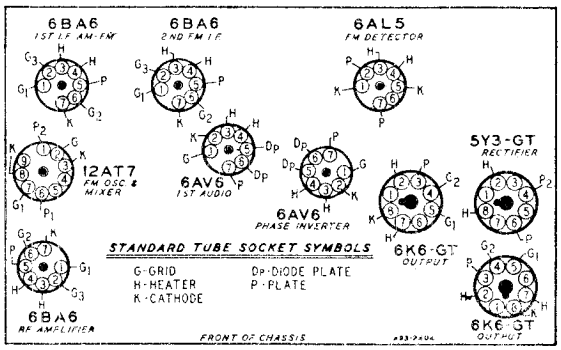


MODEL 15WG-2745C



NOTE—T-5 discriminator transformers with Part No. 9A1970 stamped on the can must be aligned as outlined in this service manual.

Discriminator transformers with Part No. 9A2064 stamped on the can have the primary adjustment at the top and the secondary adjustment at the bottom.



TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas —.1 mf, 200 mmf.

Volume Control—Maximum all Adjustments
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
I-F	455 kc	12A17 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. (1) & (2) 1st I-F Pri. & Sec. (3) & (4)	Maximum Output
Broadcast	1620 kc	External ant. term.	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. term.	200 mmf	Broadcast	Turn Rotor to Max. Output Set pointer to	Broadcast Interstage C-29	
	1400 kc	External ant. term.	200 mmf	Broadcast	1400 kc See Note A	Loop Antenna C-48	

Note A—If the pointer is not at 1400 KC on dial, reset pointer at the 1400 KC mark on the dial scale.

MODEL 15WG-2745C

FM STAGES

The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 1000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

Allow chassis and signal generator to warm up for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the junction of resistor R-22 and condenser C-18 for all adjustments except the discriminator secondary adjustment, for which See Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and connect to junction of R-18 and C-62. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency above signal frequency.

NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	14A207	Gang Condenser	1
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	47X507	5000 mmf Ceramic	11
C-4	47X497	100 mmf Ceramic	1
C-5	47X499	47 mmf Ceramic	1
C-8	47X498	47 mmf Ceramic	1
C-10, C-65	Part of T-1	1st I-F (FM)	
C-11, C-28	47X550	100 mmf Ceramic	2
C-15	Part of T-3	2nd I-F (FM)	
C-21	Part of T-5	Discriminator	
C-22, C-24, C-31, C-51	47X501	68 mmf Ceramic	4
C-23	45X361	5 mf 100 V Dry Electrolytic	1

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Ref. No.	Part No.	Description			Qty. Used in Set
C-25, C-26, C-45	47X496	500 mmf		Ceramic	3
C-29, C-32, C-33, C-47	Part of Gang Condenser				
C-30	47X552	15 mmf		Ceramic	1
C-34, C-46	47X516	20 mmf		Ceramic	2
C-35	26A489	1-8 mmf		Trimmer	1
C-36, C-64	47X549	5 mmf		Ceramic	2
C-37, C-65	F66403	.04 mf	600 V	Tubular	2
C-38, C-39	Part of T-2 1st I-F (AM)				
C-40	B66503	.05 mf	200 V	Tubular	1
C-41, C-43	Part of T-4 2nd I-F (AM)				
C-44A, C-44B	47X112	50-50 mmf		Dual Mica	1
C-48	Part of T-7 (Loop Antenna)				
C-50A	45X374	40 mf	450 V	Dry Electrolytic	1
C-50B		40 mf	450 V		
C-50C		40 mf	25 V		
C-52	F66103	.01 mf	600 V	Tubular	1
C-53	47X468	220 mmf		Ceramic	1
C-54, C-59	F66203	.02 mf	600 V	Tubular	2
C-55, C-60	F66102	.001 mf	600 V	Tubular	2
C-56	B66203	.02 mf	200 V	Tubular	1
C-57	F66602	.006 mf	600 V	Tubular	1
C-58	B66502	.005 mf	200 V	Tubular	1
C-61	47X471	68 mmf		Ceramic	1
C-62	47X492	2700 mmf		Molded Mica	1
C-63	46X328	.01 mf	120 V	Tubular	1

RESISTORS

		Ohms	Watts		
R-1, R-10, R-22	B85105	1 meg.	0.5	Carbon	3
R-2, R-12, R-15	B83680	68	0.5	Carbon	3
R-3, R-11	B84563	56K	0.5	Carbon	2
R-4, R-6, R-8, R-13	B84102	1000	0.5	Carbon	4
R-5	B85104	100K	0.5	Carbon	1
R-7	B84103	10K	0.5	Carbon	1
R-9	B85225	2.2 meg.	0.5	Carbon	1
R-14	B85473	47K	0.5	Carbon	1
R-16	C84393	39K	1.0	Carbon	1
R-17	B85222	2200	0.5	Carbon	1
R-18	B84273	27K	0.5	Carbon	1
R-19	43X233	3.6	0.5	Wire wound	1
R-20, R-21	B83682	6800	0.5	Carbon	2
R-23	43X242	1400	5.0	Wirewound	1
R-25	36X383	0.5 meg.		Volume Control	1
R-26	B85153	15K	0.5	Carbon	1
R-27	40X285	3 meg.		Tone Control	1
R-28, R-33	B85106	10 meg.	0.5	Carbon	2
R-29, R-34	B85274	270K	0.5	Carbon	2
R-30	D83561	560	2.0	Carbon	1
R-31, R-35, R-38	B85474	470K	0.5	Carbon	3
R-32	B84822	8200	0.5	Carbon	1
R-36	B84682	6800	0.5	Carbon	1
R-37	B84562	5600	0.5	Carbon	1

TRANSFORMERS AND COILS

L-2	9A2025	Interstage Coil (AM)	1
L-3	9A2024	Interstage Coil (FM)	1
L-4	9A2022	Oscillator Coil (AM)	1
L-5	35A5	Insulated Choke	1
L-6	9A1881	Filament Choke	1
L-7	9A2023	Oscillator Coil (FM)	1
L-8	35A7	Mixer Choke (FM)	1
L-9	9A2027	Antenna Coil (FM)	1
T-1	9A2043	1st I-F Trans. (FM)	1
T-2	9A2029	1st I-F Trans. (AM)	1
T-3	9A2030	2nd I-F Trans. (FM)	1
T-4	9A2042	2nd I-F Trans. (AM)	1
T-5	9A1970	Discriminator Coil	1
OR			
T-5	9A2064	Discriminator Coil	1
T-6	9A2004	Dipole Antenna	1
T-7	9A2041	"B" Range Loop Antenna	1
T-8	53X286	Power Transformer	1
T-9	51X142	Output Transformer	1

DIAL AND DRIVE ASSEMBLY

58X723	Dial Glass	1
25X1634	Dial Bracket	1
41X88	Dial Light Reflector	2
15X251	Pointer	1
10X54	Drive Cord Assembly	1
28X113	Drive Cord Spring	1
7A103	No. 47 Pilot Light	2
7A199	Pilot Light Socket Assembly	1
19X192	"C" Washer (mtg. Drive Shaft)	2
26X512	Drive Shaft	1
6X67	Rubber Grommet	4

MODEL 15WG-27450

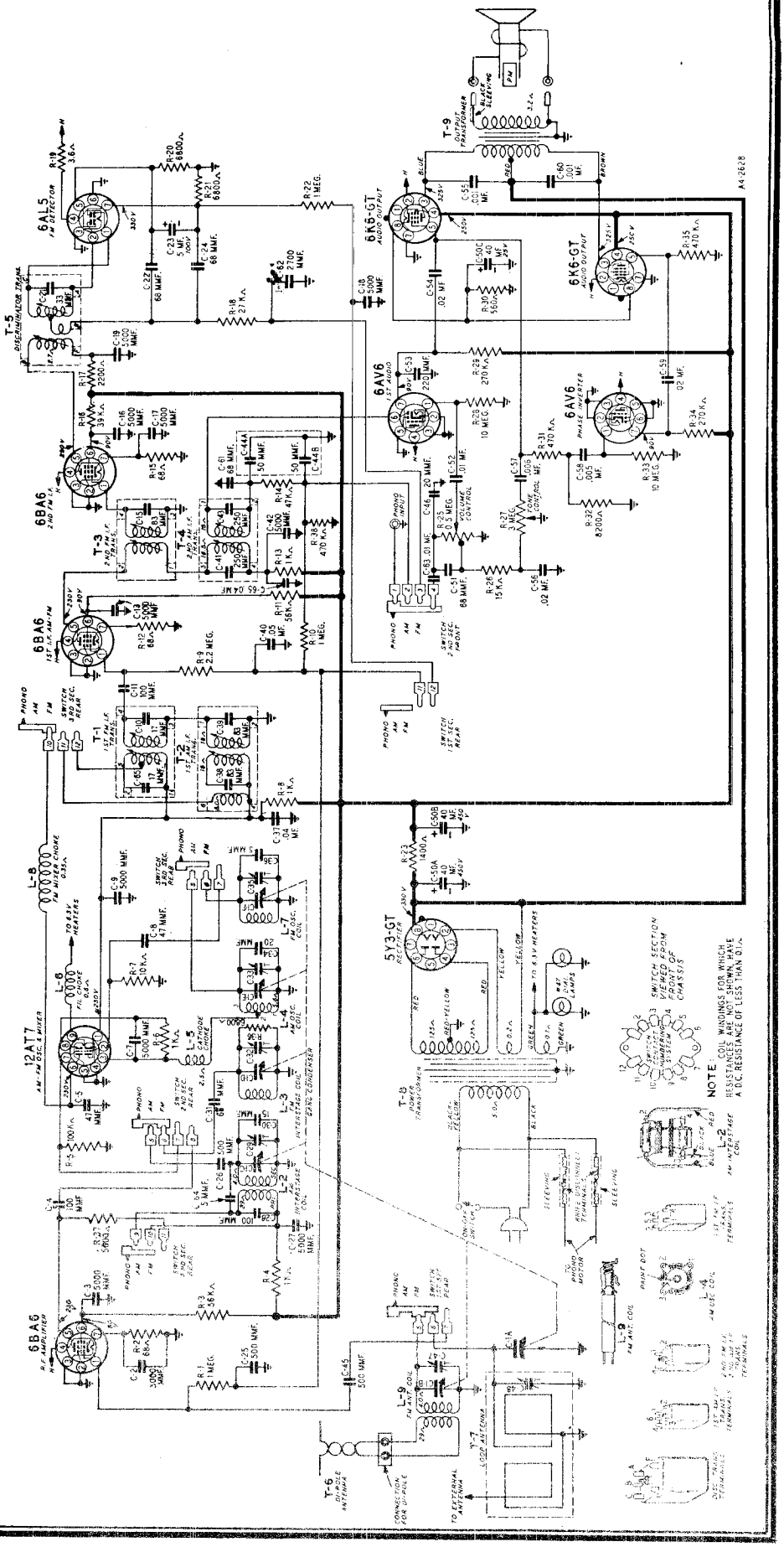
TYPE W-28A175 RECORD CHANGER PARTS

W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
S-P77V	Crystal Cartridge & Needle (Shure Bros.)	1
S-85-18	Needle, Microgroove (Red)	1
S-85-16	Needle, Regular	1

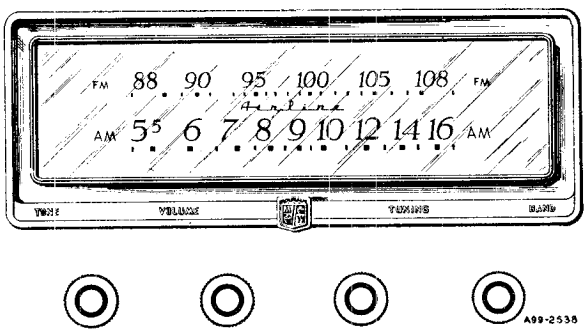
MISCELLANEOUS

12A502	Speaker 12" P.M.	1
3A305	Phono Socket—Single Pin Tip	1
3A435	Tube Socket—Octal (8 prong) Molded	3
3A436	Tube Socket—Noval (miniature)	1
32X368	Tube Shield—Noval	1
32X390	Tube Shield (miniature)	1
3A439	Tube Socket (miniature)	6
2A391	Band Change Switch	1
13X546	Line Cord & Plug Assembly	1
10A713	Knobs	4
4X1049	Escutcheon	1

RECORD CHANGER: See Webster Chgo. Model 100, Pgs. RCD.CH.21-1 to RCD.CH.21-10.



MODEL 15WG-2749E



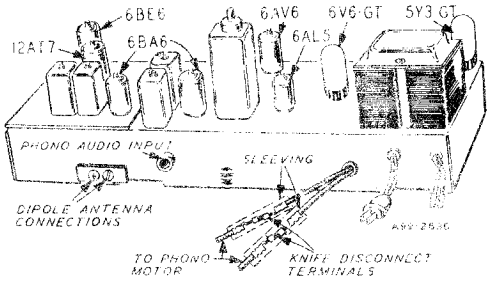
GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles



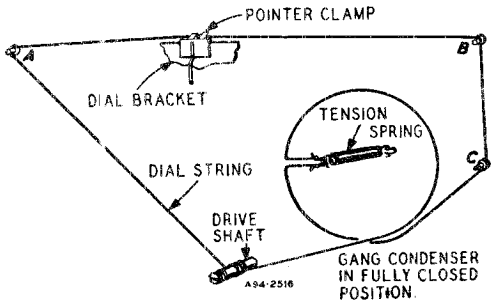
Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps

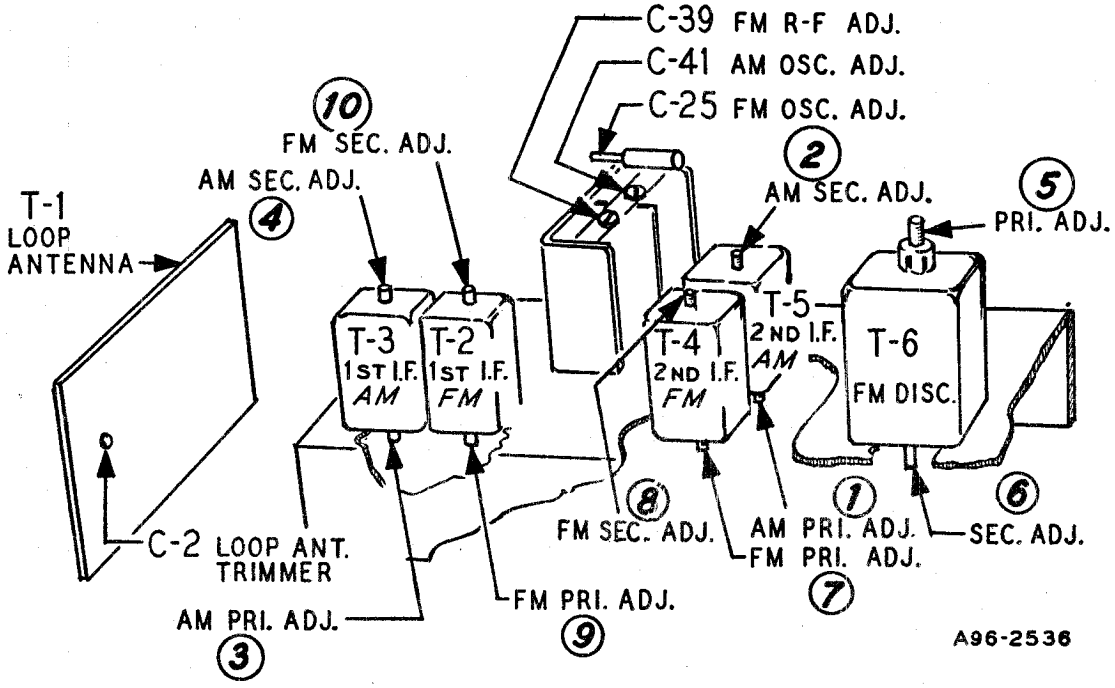
DRIVE CORD REPLACEMENT

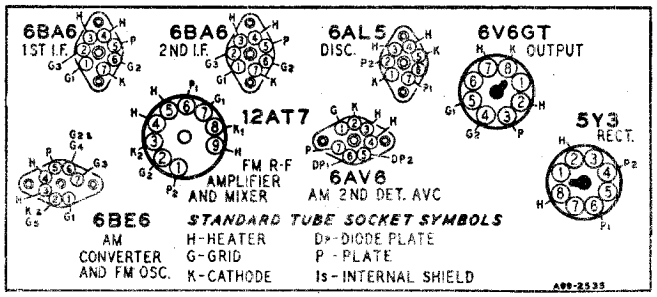
DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 15WG-2749E





TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage ..... 117 Volts AC
Signal Input ..... None

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST *	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V	
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1

MODEL 15WG-2749E

Ref. No.	Part No.	Description			Qty. Used in Set
C-32A, C-32B	76X4	100 mmf		Dual Ceramic	1
C-33	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 mf	200 V	Tubular	1
C-37	D66104	.1 mf	400 V	Tubular	1
C-38	D66203	.02 mf	400 V	Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic	1

RESISTORS

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A	43X224	1000	4.0	Wirewound	1
R-28B		1400	6.0		
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MISCELLANEOUS

12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	1
3A443	Tube Socket (12AT7)	1
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A735	Knob	4

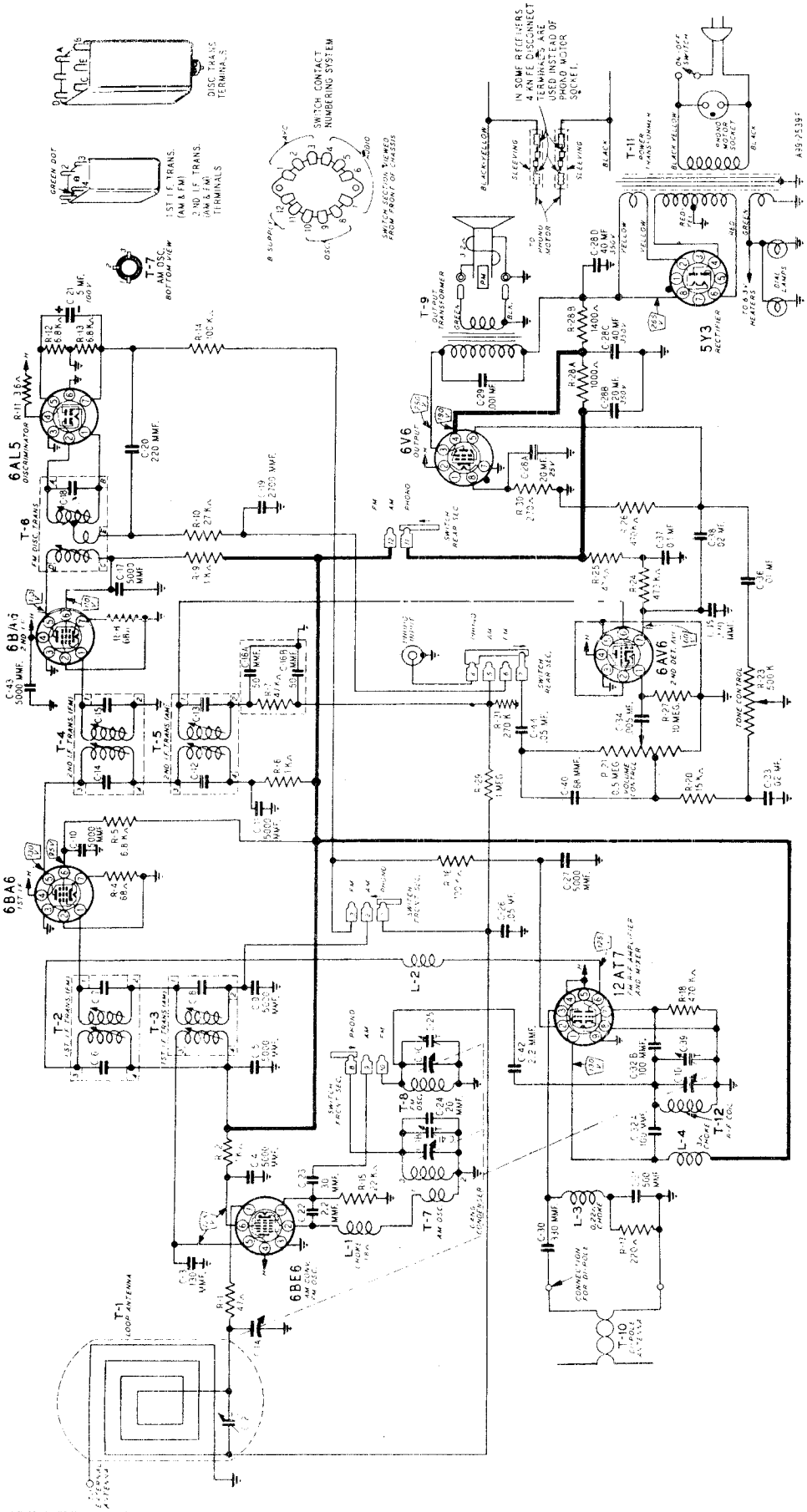
DIAL AND DRIVE ASSEMBLY

58X729	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1616	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

TYPE W-28A176 RECORD CHANGER PARTS

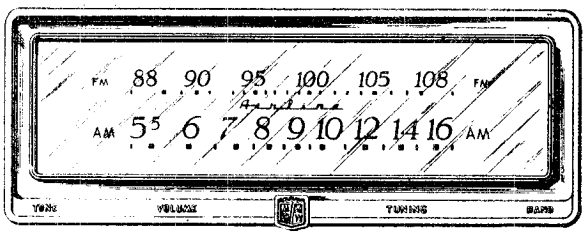
W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

MODEL 15WG-2749E



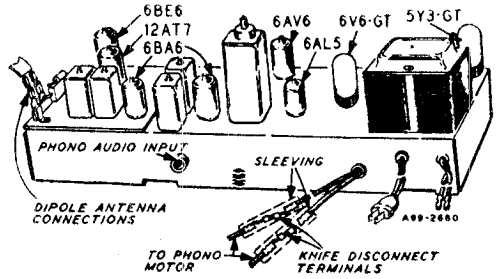
RECORD CHANGER: See Webster Chgo. Model 100, Pgs. RCD.CH.21-1 to RCD.CH.21-10.

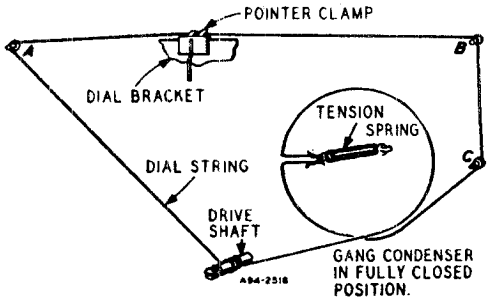
MODEL 15WG-2749F



GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.





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DRIVE CORD REPLACEMENT

DIAL POINTER CORD

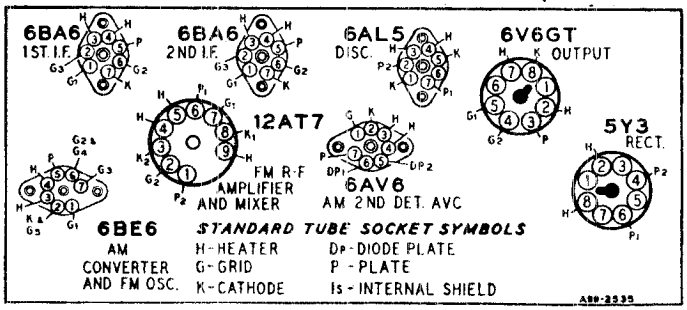
Use a new 10X38 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
Intermediate Frequency	AM—455 KC FM—10.7 MC
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
FM Sensitivity	(For .5 watt output) 25 microvolts average
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
Loud Speaker	8" PM Dynamic
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual 5096A

Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter.

Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURES

MODEL 15WG-2749F

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas -- .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Bdse	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	•Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

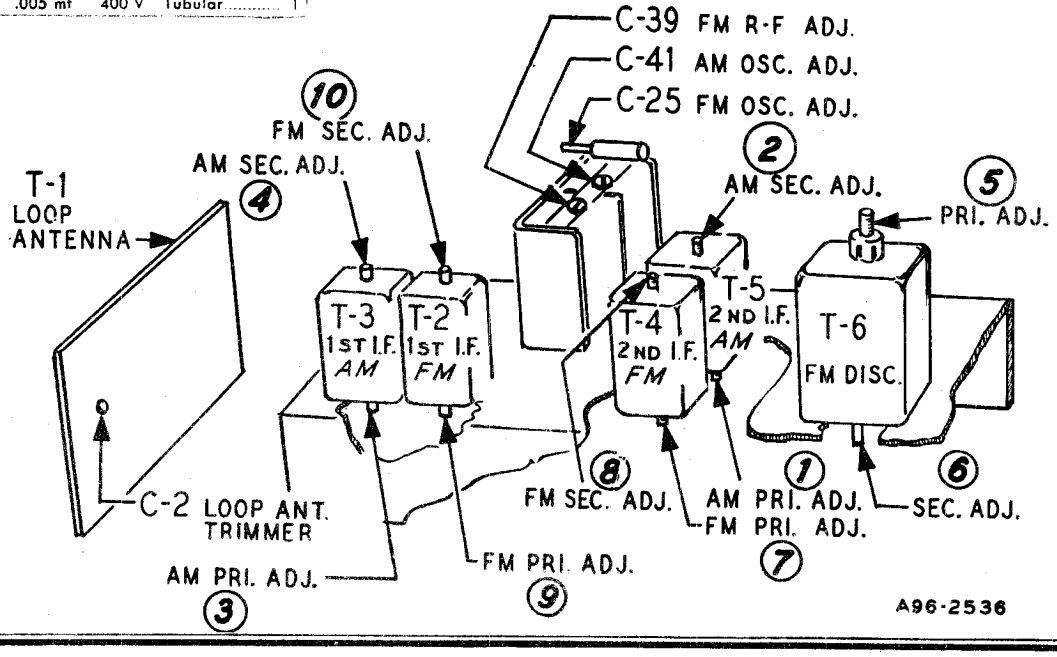
MODEL 15WG-2749F

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V Dry Electrolytic	
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

Ref. No.	Part No.	Ohms	Watts		
RESISTORS					
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X341	1.0 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A	43X224	1000	4.0	Wirewound	1
R-28B		1400	6.0		
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

Ref. No.	Part No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2209	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1
MISCELLANEOUS			
	12A505	8" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A439	Tube Socket (Miniature)	3
	3A443	Tube Socket (12AT7)	1
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1049	Escutcheon	1
	10A735	Knob	4
DIAL AND DRIVE ASSEMBLY			
	58X729	Dial Glass	1
	24X446	Idler Pulley	2
	15X251	Pointer	1
	25X1616	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A199	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X88	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1

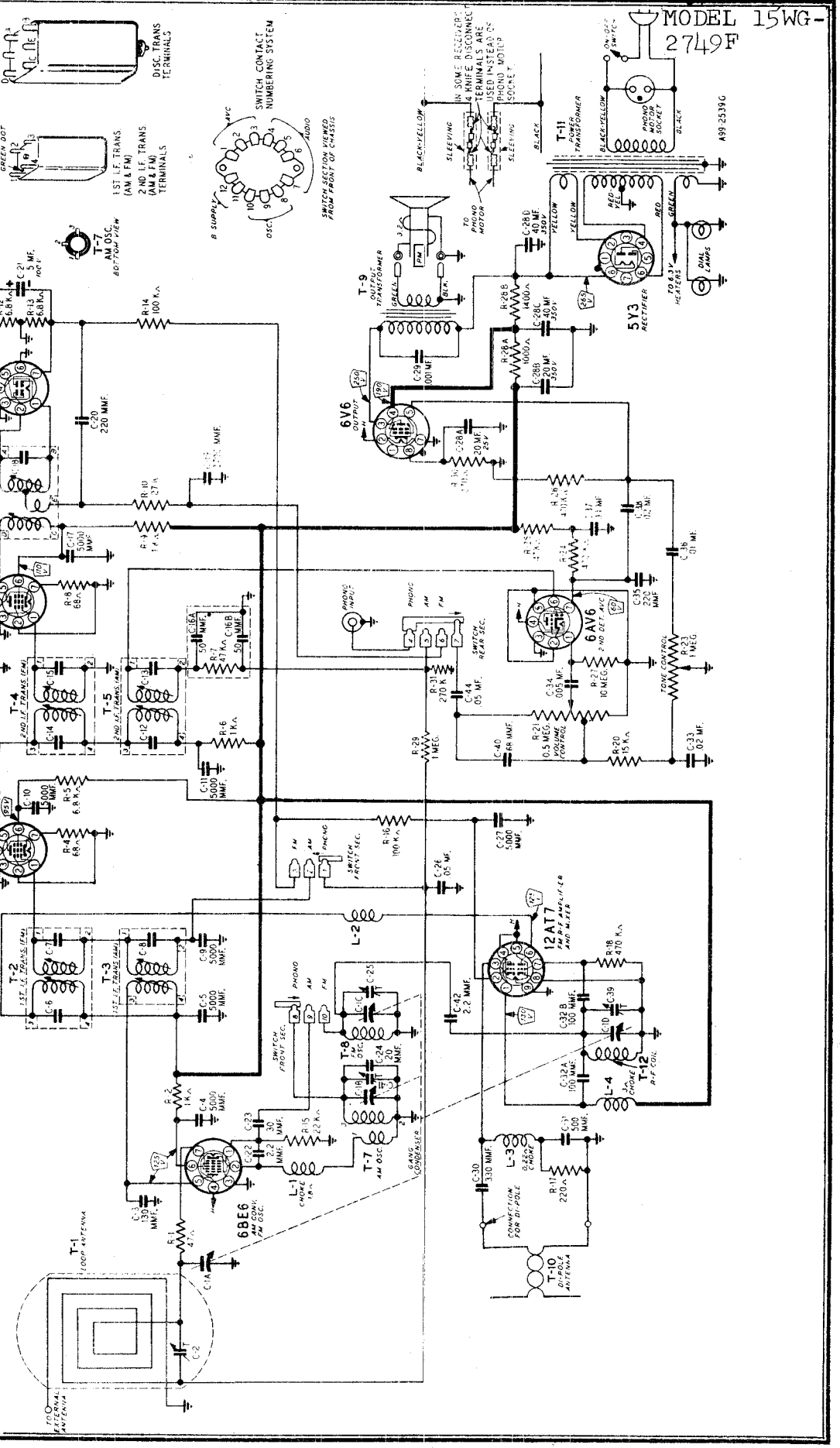


MODEL 15WG-2749F

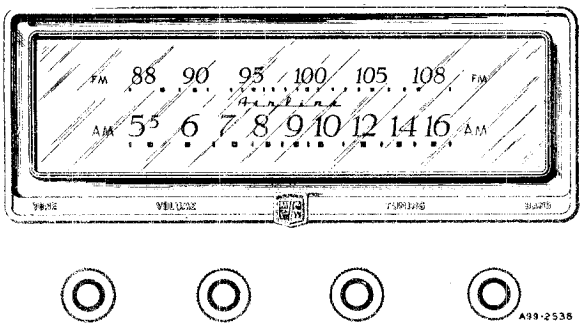
TYPE V-28A172 RECORD CHANGER PARTS

		See Note
10X38	Drive Cord Assembly 1	Motor Assembly, 60 cycles 105-125 Volts AC 1
19X192	"C" Washer (Mtg. drive Shaft) 2	V-3429B Pickup Arm 1
6X66	Rubber Grommet (Mtg. gang cond.) 3	W-R-A1M Crystal Cartridge & Needles 1

W-R-13017 Needle, Microgroove (Red) 1
W-R-13016 Needle, Regular 1
NOTE—Specify part number stamped on motor assembly.



MODEL 15WG-2752D



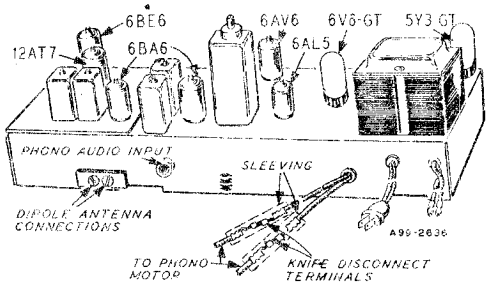
GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver with automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles



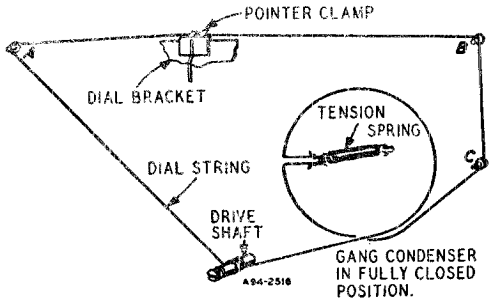
Tube and Dial Lamp Complement

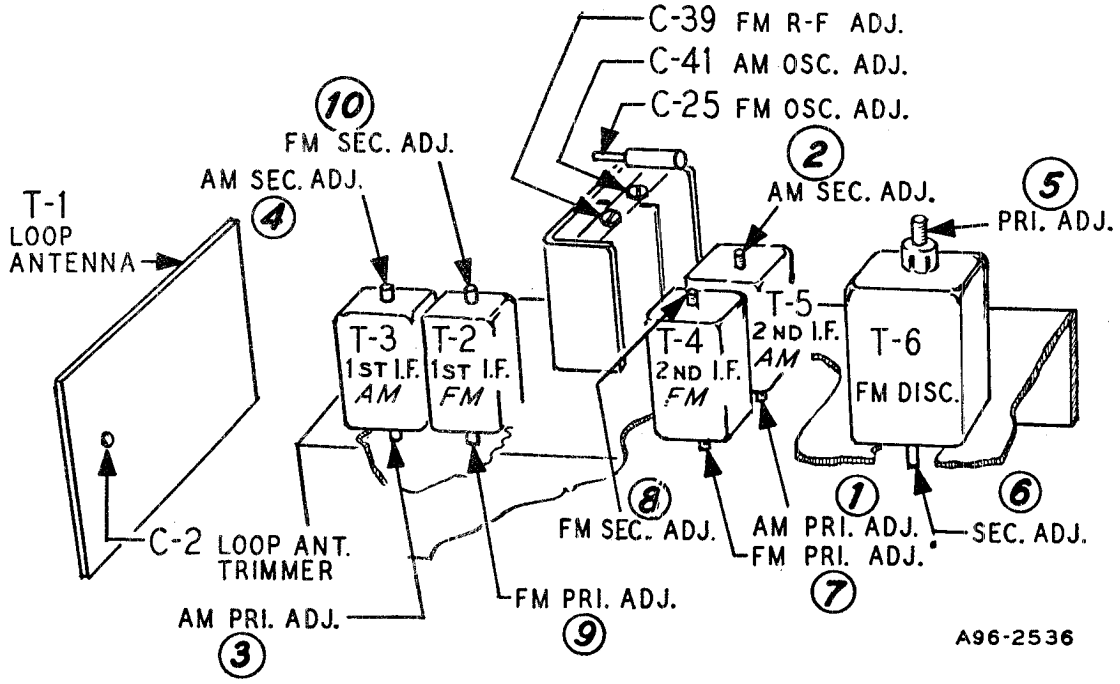
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps

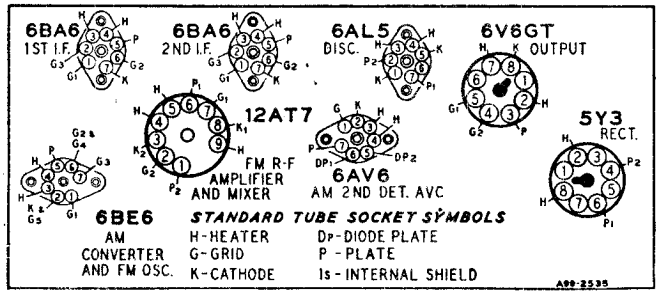
DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.







TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

MODEL 15WG-2752D

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V	
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V	
		Dry Electrolytic	1
C-29	H66102	.001 mf 800 V Tubular	1

MODEL 15WG-2752D

Ref. No.	Part No.	Description			Qty. Used in Set
C-30	47X470	330 mmf		Molded Mica	1
C-31	47X508	500 mmf		Ceramic	1
C-32A, C-32B	76X4	100 mmf		Dual Ceramic	1
C-33	B66203	.02 mf	200 V	Tubular	1
C-34	D66502	.005 mf	400 V	Tubular	1
C-36	B66103	.01 mf	200 V	Tubular	1
C-37	D66104	.1 mf	400 V	Tubular	1
C-38	D66203	.02 mf	400 V	Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic	1

RESISTORS

		Ohms	Watts		
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28A, R-28B	43X224	1000 1400	4.0 6.0	Wirewound	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MISCELLANEOUS

12A502	12" P.M. Speaker	1
3A435	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket (1st 6BA6)	1
3A427	Tube Socket	1
3A443	Tube Socket (12AT7)	1
3A439	Tube Socket (Miniature)	3
3A305	Phono Socket—Single Pin Tip	1
2A393	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
4X1049	Escutcheon	1
10A754	Knob	4

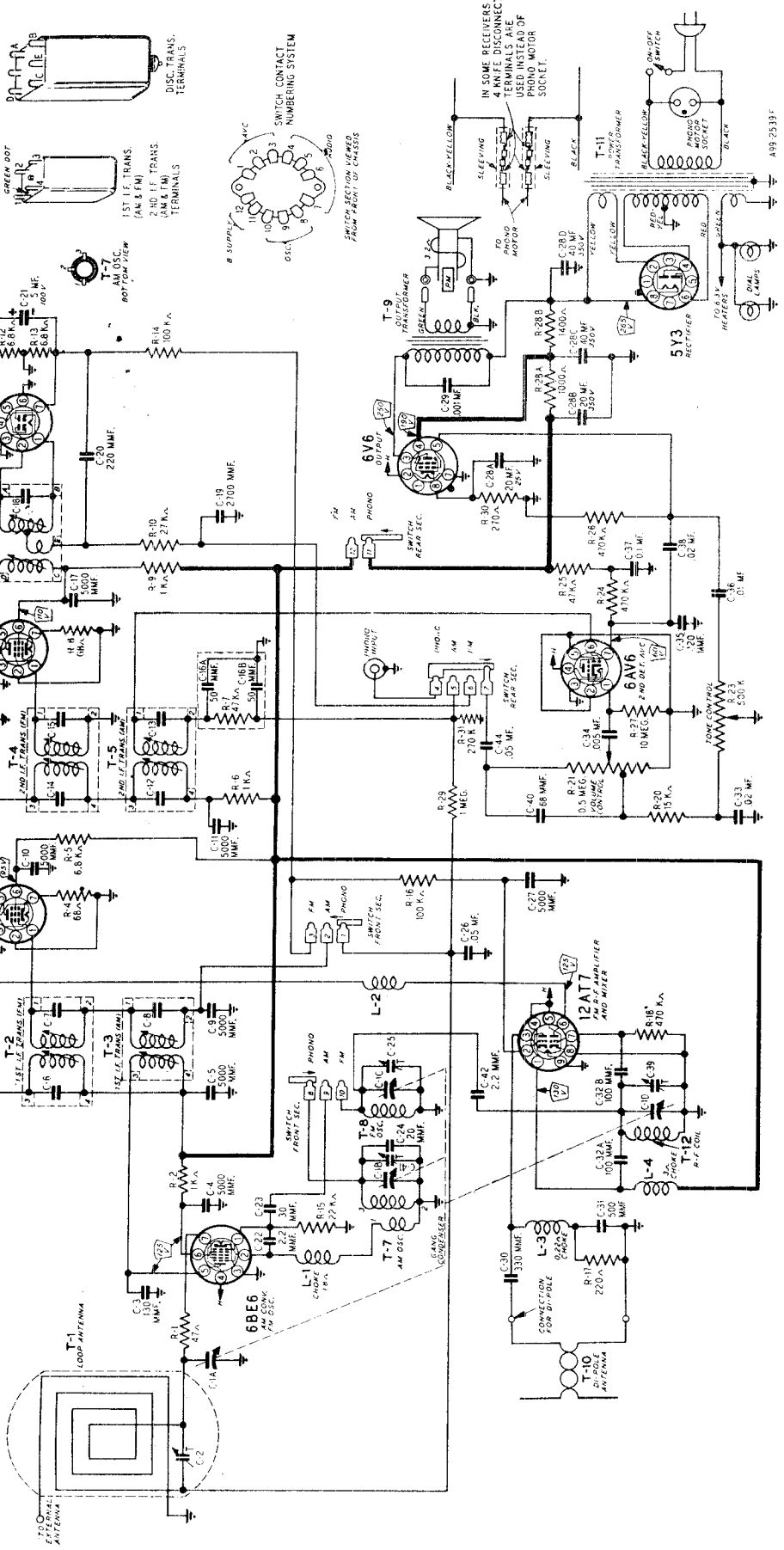
DIAL AND DRIVE ASSEMBLY

58X729	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1616	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	*Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

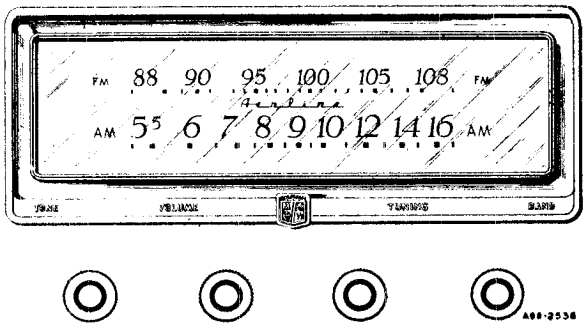
TYPE W-28A176 RECORD CHANGER PARTS

W-15X106-26	Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C	Pickup Arm	1
W-R A7M-1	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

MODEL 15WG-2752D

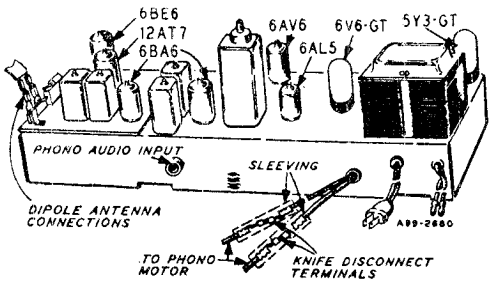


MODEL 15WG-2752E



GENERAL DESCRIPTION

This is a two band, seven tube (plus rectifier tube) AM and FM receiver. Controls are provided at the front of the cabinet for tuning, volume, tone and band or phono selection. A phono input socket is provided at the rear of the receiver to which a record player may be connected. The I-F stages use high gain miniature type tubes. Air-Wave Aerials are provided for the FM and Broadcast bands. Features include, a grounded grid R-F amplifier stage on the FM band, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.



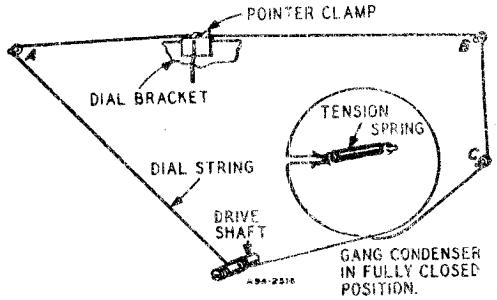
ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	8" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual 5096A
Tube and Dial Lamp Complement	1 6BE6 AM Converter & FM Osc. 1 6BA6 1st I-F Amplifier 1 6BA6 2nd I-F Amplifier 1 6AL5 FM Discriminator 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC 1 6V6GT Audio Output 1 5Y3GT Rectifier 1 12AT7 R-F Amplifier & Mixer 2 No. 47 Dial Lamps

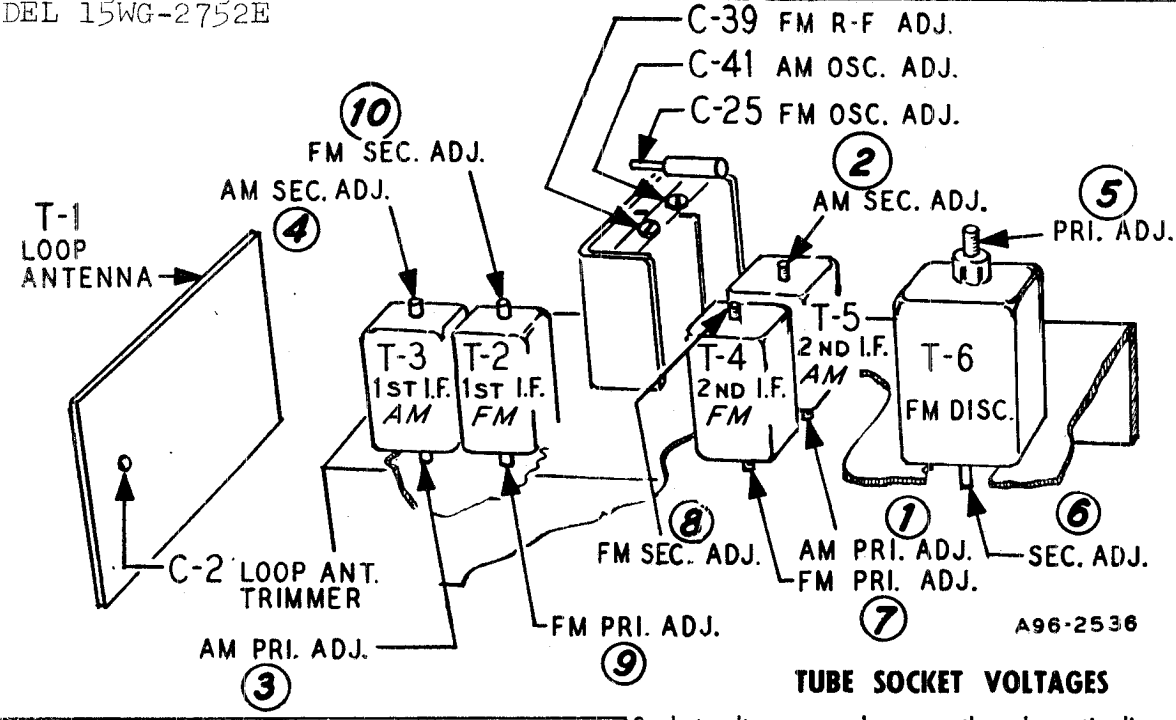
DRIVE CORD REPLACEMENT

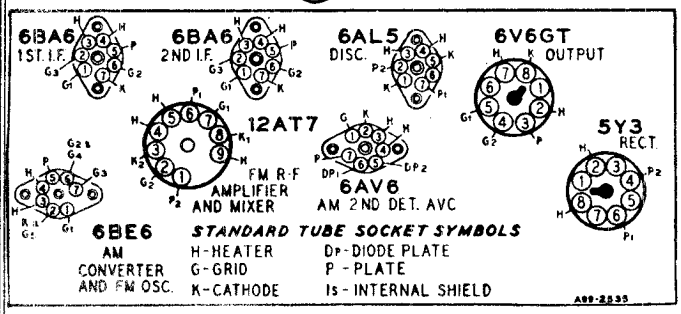
DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 15WG-2752E





TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter.

Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A variation of ±10% is usually permissible.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X359	20 mf 25 V Dry Electrolytic	1
C-28B		20 mf 350 V	
C-28C		40 mf 350 V	
C-28D		40 mf 350 V	
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

REPLACEMENT PARTS LIST (continued)

Ref. No.	Part No.	Description	Qty. Used in Set
		RESISTORS	
		Ohms / Watts	
R-1	B85470	47 / 0.5 Carbon	1
R-2, R-6, R-9	B85102	1000 / 0.5 Carbon	3
R-4, R-8	B84680	68 / 0.5 Carbon	2
R-5, R-12, R-13	B84682	6800 / 0.5 Carbon	3
R-7, R-25	B85473	47 K / 0.5 Carbon	2
R-10	B85273	27 K / 0.5 Carbon	1
R-11	43X233	3.6 / 0.5 Wirewound	1
R-14, R-16	B85104	100 K / 0.5 Carbon	2
R-15	B85223	22 K / 0.5 Carbon	1
R-17	B84221	220 / 0.5 Carbon	1
R-18, R-24, R-26	B85474	470 K / 0.5 Carbon	3
R-20	B85153	15 K / 0.5 Carbon	1
R-21	36X372	.5 meg. Volume Control & Switch	1
R-23	40X341	1.0 meg. Tone Control	1
R-27	B85106	10 meg. / 0.5 Carbon	1
R-28A	43X224	1000 / 4.0 Wirewound	1
R-28B		1400 / 6.0	
R-29	B85105	1 meg / 0.5 Carbon	1
R-30	B84271	270 / 0.5 Carbon	1
R-31	B84274	270 K / 0.5 Carbon	1
		TRANSFORMERS AND COILS	
L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A1972	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2209	Dipole Antenna	1
T-11	53X290	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A505	8" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A439	Tube Socket (Miniature)	3
	3A443	Tube Socket (12AT7)	1
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1049	Escutcheon	1
	10A754	Knob	4

DIAL AND DRIVE ASSEMBLY

58X729	Dial Glass	1
24X446	Idler Pulley	2
15X251	Pointer	1
25X1616	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A199	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X88	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X38	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive Shaft)	2
6X66	Rubber Grommet (Mtg. gang cond.)	3

TYPE V-28A172 RECORD CHANGER PARTS

See Note	Motor Assembly, 60 cycles 105-125 Volts AC	1
V-3429B	Pickup Arm	1
W-R-A1M	Crystal Cartridge & Needles	1
W-R-13017	Needle, Microgroove (Red)	1
W-R-13016	Needle, Regular	1

NOTE—Specify part number stamped on motor assembly.

MODEL 15WG-2752E

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR						
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

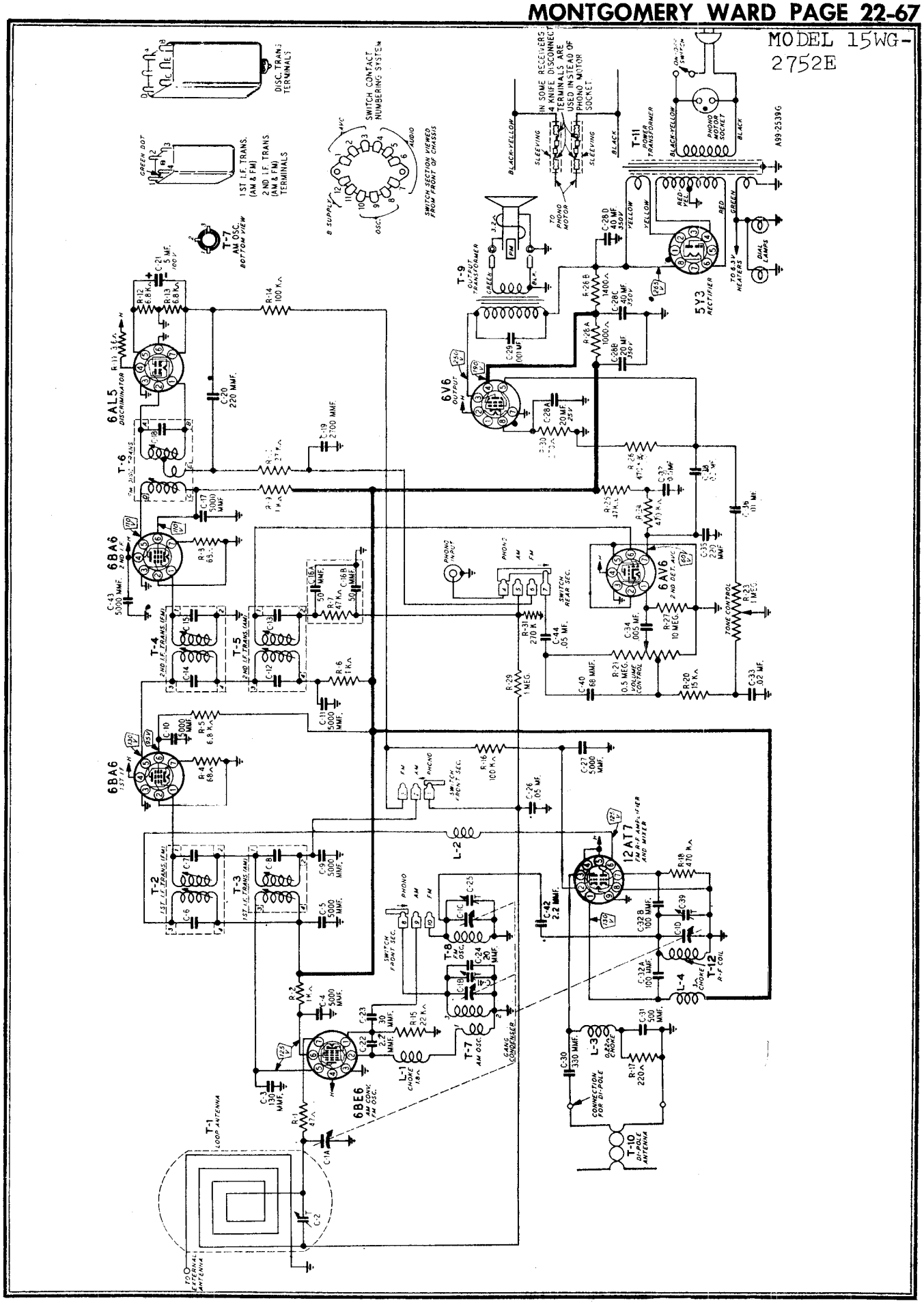
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

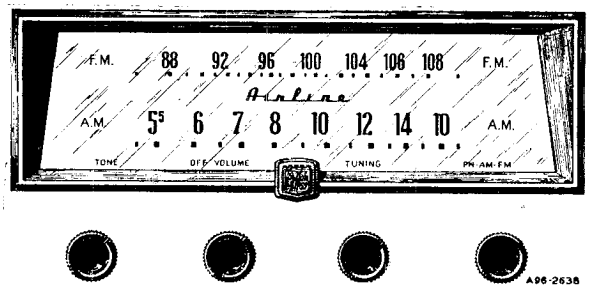
NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

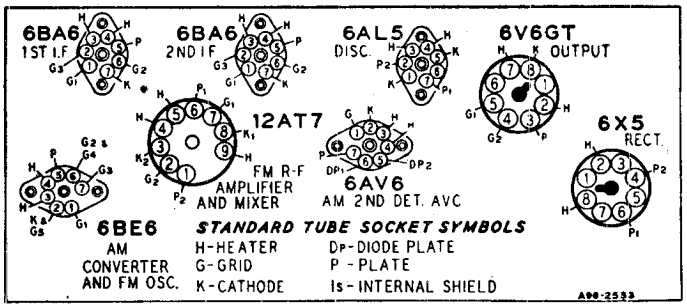
NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

MODEL 15WG-2752E



MODEL 15WG-2758A





ELECTRICAL SPECIFICATIONS

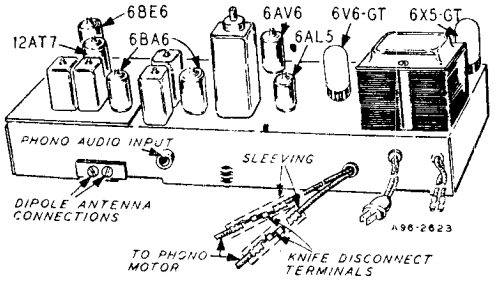
Power Supply	105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 25 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	1.9 watts maximum 0.8 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual 5089A
Tube and Dial Lamp Complement	1 6BE6 AM Converter & FM Osc. 1 6BA6 1st I-F Amplifier 1 6BA6 2nd I-F Amplifier 1 6AL5 FM Discriminator 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC 1 6V6GT Audio Output 1 6X5GT Rectifier 1 12AT7 R-F Amplifier & Mixer 2 No. 47 Dial Lamps

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

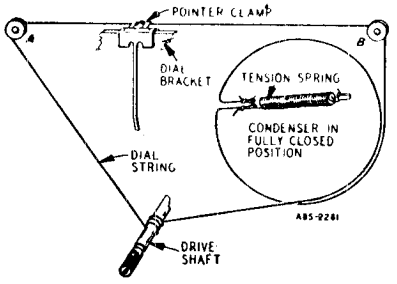
A variation of ±10% is usually permissible.



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X72 drive cord assembly or a new length of cord 44 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 15WG-2758A

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas .1 mf, and 50 mmf.
Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

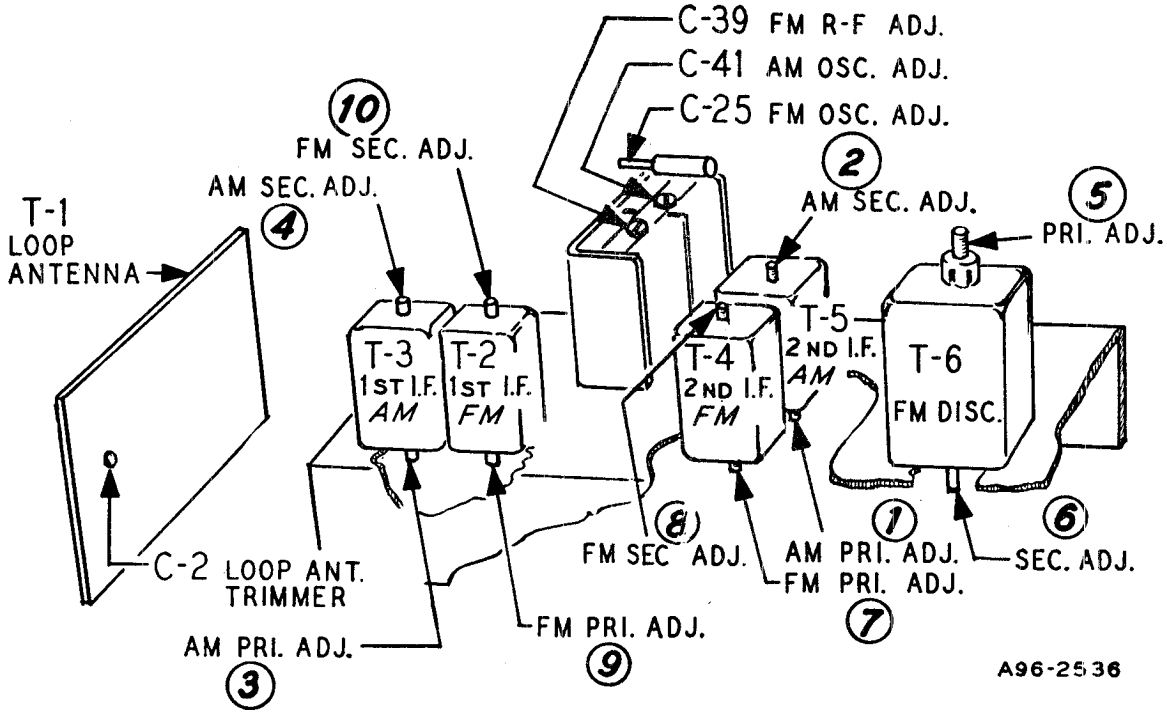
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

MODEL 15WG-2758A



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A480	10" P.M. Speaker	1
	3A435	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket (1st 6BA6)	1
	3A427	Tube Socket	1
	3A443	Tube Socket (12AT7)	1
	3A439	Tube Socket (Miniature)	3
	3A305	Phono Socket—Single Pin Tip	1
	2A393	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	4X1114	Escutcheon	1
	10A759	Knob	4

Ref. No.	Part No.	Description	Qty. Used in Set
		DIAL AND DRIVE ASSEMBLY	
	58X741	Dial Glass	1
	15X251	Pointer	1
	25X1650	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A199	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X88	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X72	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive Shaft)	2
	6X66	Rubber Grommet (Mtg. gang cond.)	3
		TYPE G.I. — 28A169 RECORD CHANGER PARTS	
	G.I.-56-76507	Motor Assembly, 60 cycles 105-125 Volts AC	
	G.I.-69-73657	Tone Arm	
	S-P81	Crystal Cartridge & Needle (Shure)	
	S-85-35	Needle	

MODEL 15WG-2758A

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	14A209	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3	47X559	130 mmf Ceramic	1
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf Ceramic	8
C-6, C-7		Part of T-2 (1st I-F Trans. FM)	
C-8		Part of T-3 (1st I-F Trans. AM)	
C-12, C-13		Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15		Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	47X112	50-50 mmf Dual Mica	1
C-18		Part of T-6 (Discriminator Trans.)	
C-19	47X492	2700 mmf Molded Mica	1
C-20, C-35	47X468	220 mmf Ceramic	2
C-21	45X361	5 mf 100 V Dry Electrolytic	1
C-22, C-42	47X557	2.2 mmf Ceramic	2
C-23	47X558	30 mmf Ceramic	1
C-24	47X523	10 mmf Ceramic	1
C-25	17A255	1-8 mmf Trimmer	1
C-26, C-44	B66503	.05 mf 200 V Tubular	2
C-28A	45X360	20 mf 20 V	
C-28B		40 mf 150 V Dry Electrolytic	1
C-28C		40 mf 200 V	
C-29	H66102	.001 mf 800 V Tubular	1
C-30	47X470	330 mmf Molded Mica	1
C-31	47X508	500 mmf Ceramic	1
C-32A, C-32B	76X4	100 mmf Dual Ceramic	1
C-33	B66203	.02 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-36	B66103	.01 mf 200 V Tubular	1
C-37	D66104	.1 mf 400 V Tubular	1
C-38	D66203	.02 mf 400 V Tubular	1
C-39, C-41		Part of C-1 (Gang Condenser)	
C-40	47X471	68 mmf Ceramic	1

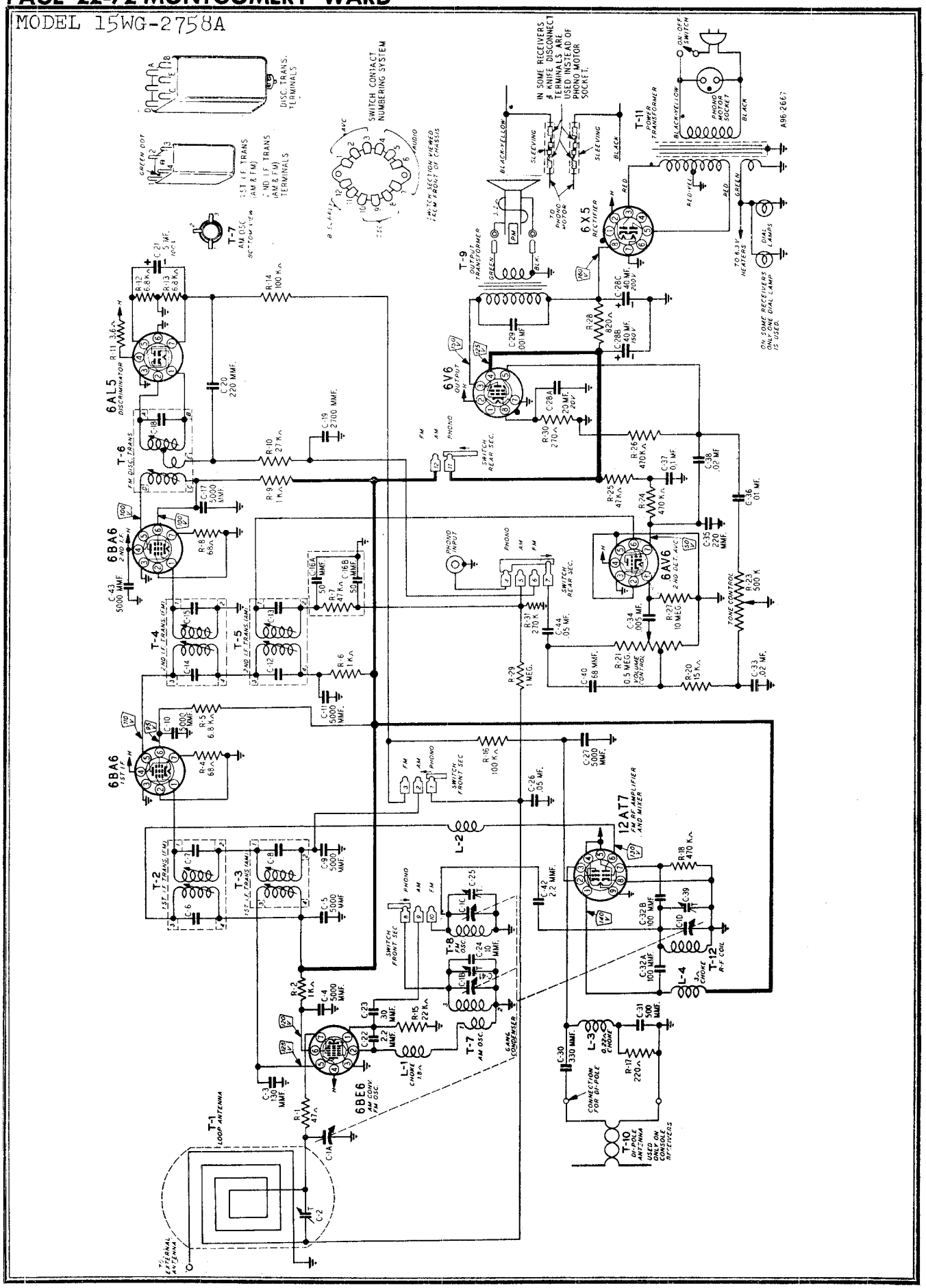
RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B85470	47	0.5	Carbon	1
R-2, R-6, R-9	B85102	1000	0.5	Carbon	3
R-4, R-8	B84680	68	0.5	Carbon	2
R-5, R-12, R-13	B84682	6800	0.5	Carbon	3
R-7, R-25	B85473	47 K	0.5	Carbon	2
R-10	B85273	27 K	0.5	Carbon	1
R-11	43X233	3.6	0.5	Wirewound	1
R-14, R-16	B85104	100 K	0.5	Carbon	2
R-15	B85223	22 K	0.5	Carbon	1
R-17	B84221	220	0.5	Carbon	1
R-18, R-24, R-26	B85474	470 K	0.5	Carbon	3
R-20	B85153	15 K	0.5	Carbon	1
R-21	36X372	.5 meg.		Volume Control & Switch	1
R-23	40X310	.5 meg.		Tone Control	1
R-27	B85106	10 meg.	0.5	Carbon	1
R-28	D84821	820	2.0	Carbon	1
R-29	B85105	1 meg.	0.5	Carbon	1
R-30	B84271	270	0.5	Carbon	1
R-31	B84274	270 K	0.5	Carbon	1

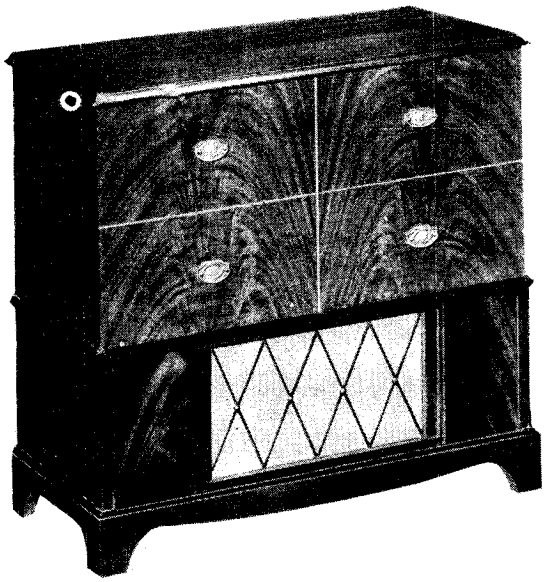
TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke	1
L-2	9A2103	Parasitic Choke Assembly	1
L-3	35A9	Insulated Choke	1
L-4	35A8	Insulated Choke	1
T-1	9A2146	"B" Range Loop Antenna	1
T-2	9A2060	1st I-F Trans. (FM)	1
T-3	9A2062	1st I-F Trans. (AM)	1
T-4	9A2061	2nd I-F Trans. (FM)	1
T-5	9A2063	2nd I-F Trans. (AM)	1
T-6	9A2161	Discriminator Transformer	1
T-7	9A2065	Oscillator Coil (AM)	1
T-8	9A2067	Oscillator Coil (FM)	1
T-9	51X134	Output Transformer	1
T-10	9A2004	Dipole Antenna	1
T-11	53X291	Power Transformer	1
T-12	9A2066	Antenna Coil (FM)	1

MODEL 15WG-2758A



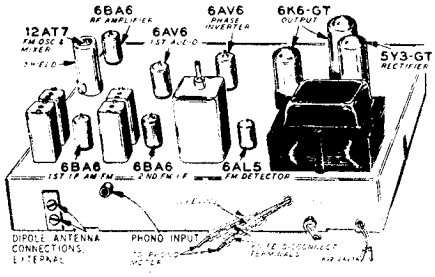
MODEL 15WG-2765A

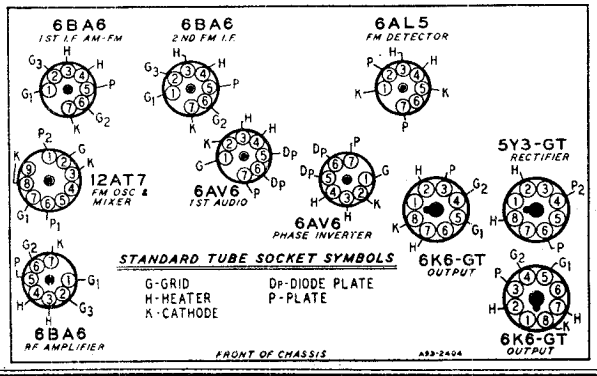


GENERAL DESCRIPTION

This is a two band, nine tube (plus rectifier tube) AM and FM receiver with an automatic record changer. The I-F stages use high gain miniature type tubes. Built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, push-pull pentode power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.





ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—43 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—760 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity	(For .5 watt output) 30 microvolts average
Power Output	8.5 watts maximum 6.0 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Record Changer	See Manual No. 5098A

Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM & AM Osc. & Mixer
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6K6-GT Audio Output
1 5Y3-GT Rectifier
1 6AV6 Phase Inverter
2 No. 47 Dial Lamps

TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage ..... 117 Volts AC
Signal Input ..... None
A variation of ±10% is usually permissible.

MODEL 15WG-2765A

ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas —.1 mf, 200 mmf.

Volume Control—Maximum all Adjustments
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
I-F	455 kc	12AT7 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. (1) & (2) 1st I-F Pri. & Sec. (3) & (4)	Maximum Output
Broadcast	1620 kc	External ant. term.	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. term.	200 mmf	Broadcast	Turn Rotor to Max. Output	Broadcast Interstage C-29	
	1400 kc	External ant. term.	200 mmf	Broadcast	Set pointer to 1400 kc See Note A	Loop Antenna C-48	

Note A—If the pointer is not at 1400 KC on dial, reset pointer at the 1400 KC mark on the dial scale.

FM STAGES

The following equipment is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 1000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)
Allow chassis and signal generator to warm up for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the junction of resistor R-22 and condenser C-18 for all adjustments except the discriminator secondary adjustment, for which See Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and connect to junction of R-18 and C-62. Adjust for zero voltage indication.

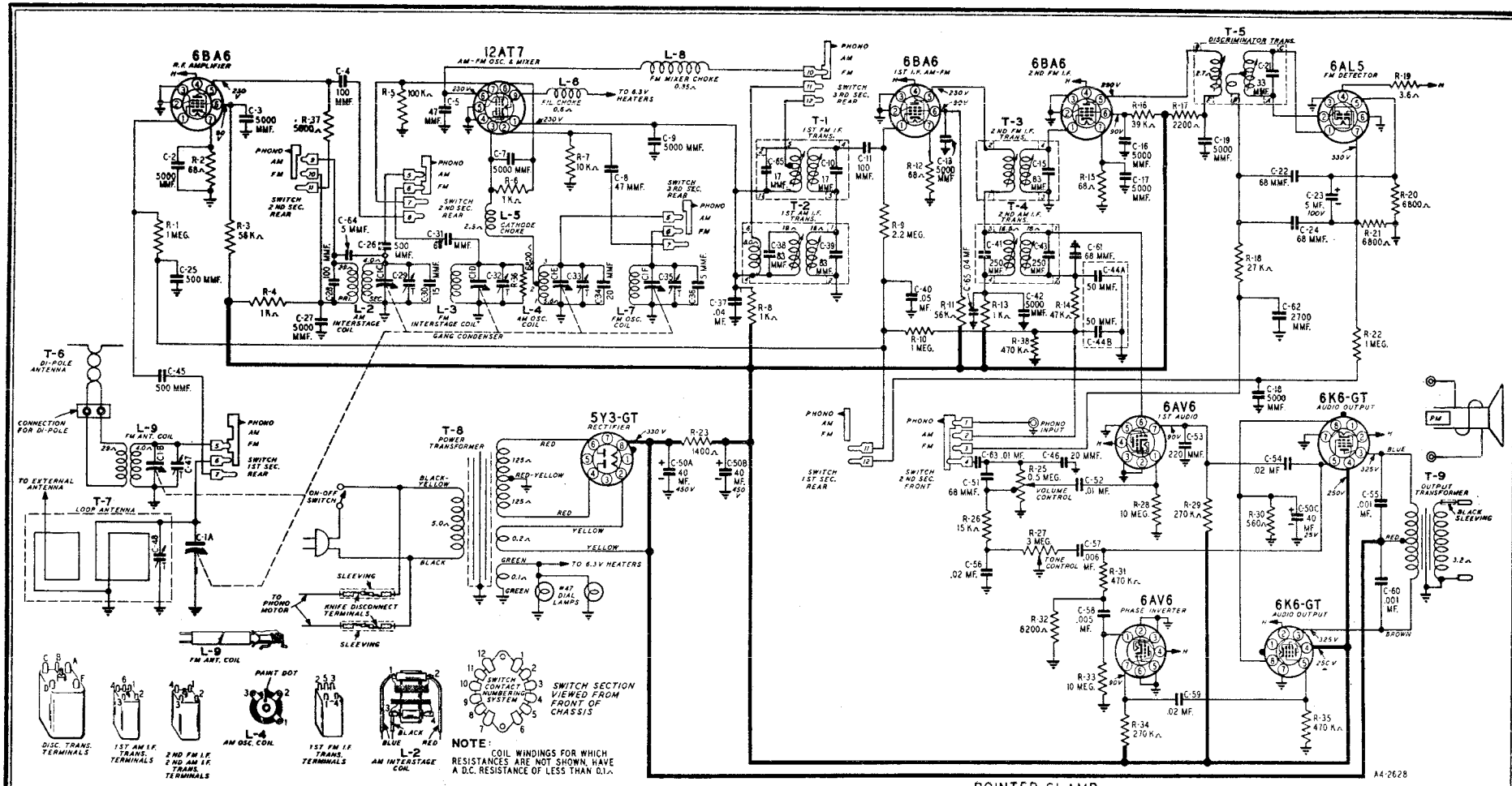
NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE F—Input can be reduced to 10,000 microvolts.

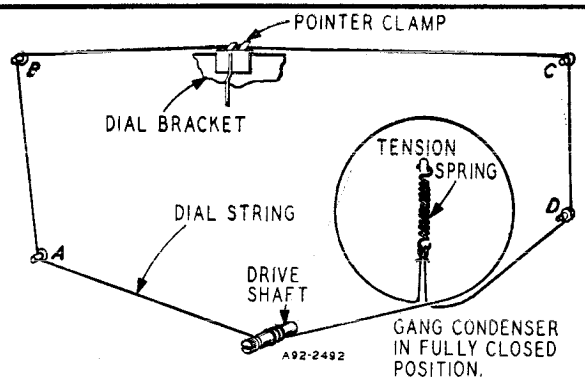
NOTE G—Oscillator frequency above signal frequency.

NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.

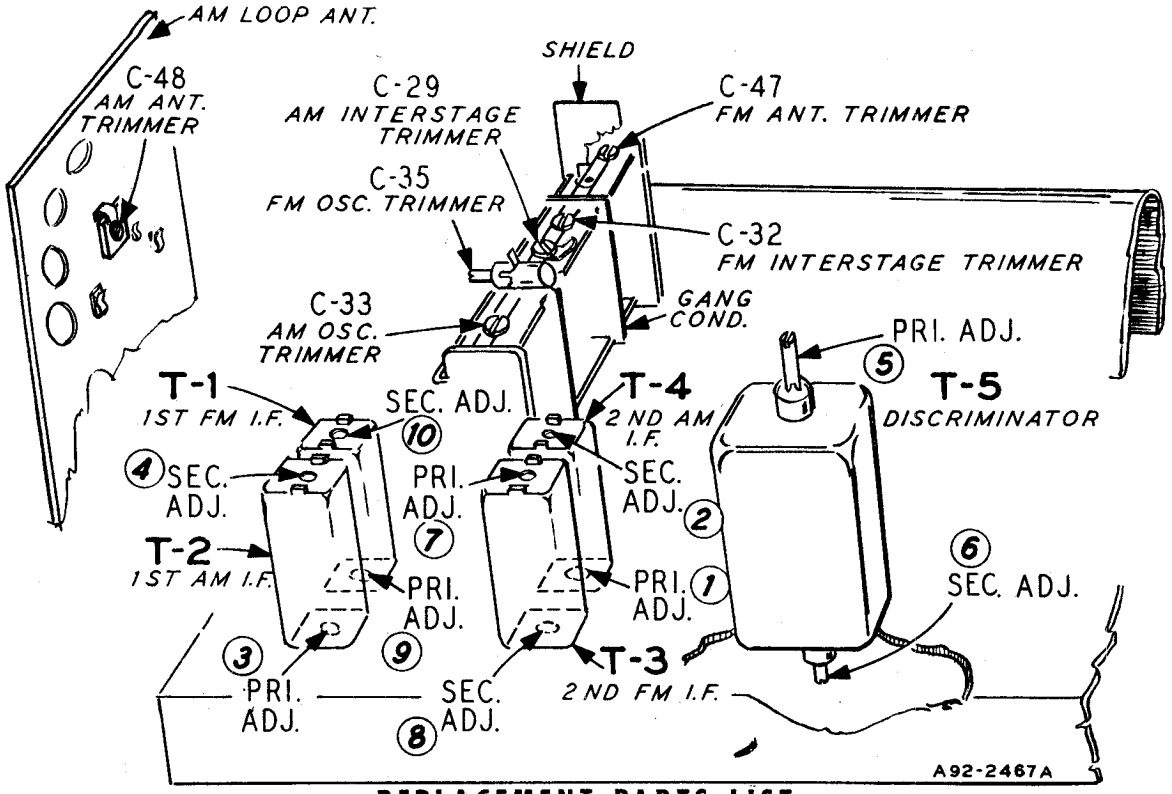


DRIVE CORD REPLACEMENT

Use a new 10X54 drive cord assembly or a new length of cord 48 inches long for the installation, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation, rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 15WG-2765A



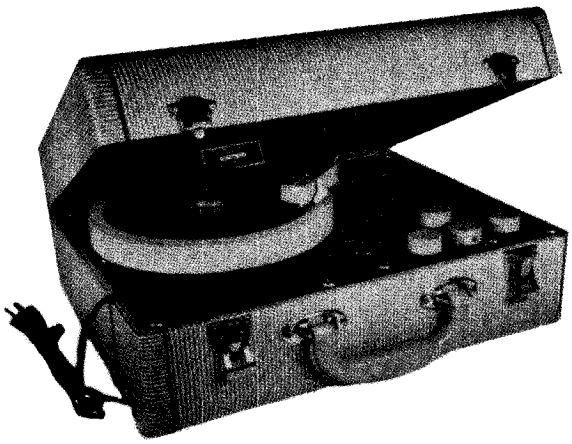
REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS	
C-1	14A207	Gang Condenser	1
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	47X507	5000 mmf Ceramic	11
C-4	47X497	100 mmf Ceramic	1
C-5	47X499	47 mmf Ceramic	1
C-8	47X498	47 mmf Ceramic	1
C-10, C-65		Part of T-1 1st I-F (FM)	
C-11, C-28	47X550	100 mmf Ceramic	2
C-15		Part of T-3 2nd I-F (FM)	
C-21		Part of T-5 Discriminator	
C-22, C-24, C-31, C-51	47X501	68 mmf Ceramic	4
C-23	45X361	5 mf 100 V Dry Electrolytic	1
C-25, C-26, C-45	47X496	500 mmf Ceramic	3
C-29, C-32, C-33, C-47		Part of Gang Condenser	
C-30	47X552	15 mmf Ceramic	1
C-34, C-46	47X516	20 mmf Ceramic	2
C-35	26A489	1-8 mmf Trimmer	1
C-36, C-64	47X549	5 mmf Ceramic	2
C-37, C-65	F66403	.04 mf 600 V Tubular	2
C-38, C-39		Part of T-2 1st I-F (AM)	
C-40	B66503	.05 mf 200 V Tubular	1
C-41, C-43		Part of T-4 2nd I-F (AM)	
C-44A, C-44B	47X112	50-50 mmf Dual Mica	1
C-48		Part of T-7 (Loop Antenna)	
C-50A, C-50B, C-50C	45X374	40 mf 450 V, 40 mf 450 V, 40 mf 25 V Dry Electrolytic	1
C-52	F66103	.01 mf 600 V Tubular	1
C-53	47X468	220 mmf Ceramic	1
C-54, C-59	F66203	.02 mf 600 V Tubular	2
C-55, C-60	F66102	.001 mf 600 V Tubular	2

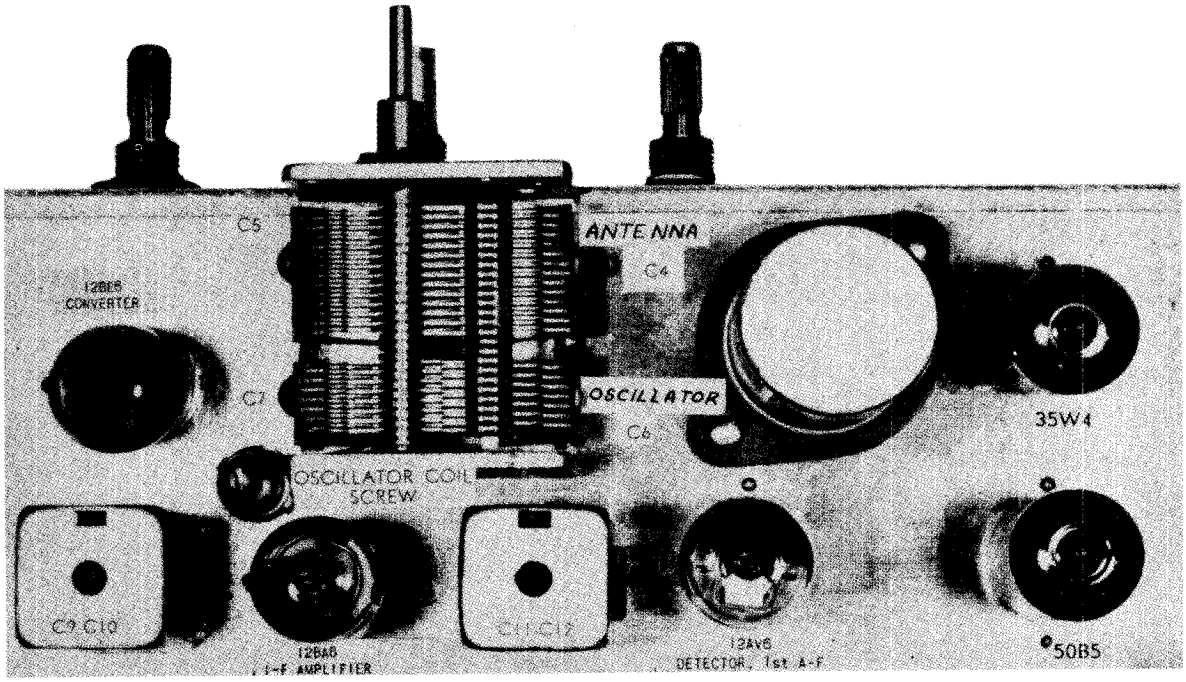
Ref. No.	Part No.	Description	Qty. Used in Set
		CAPACITORS—Cont.	
C-56	B66203	.02 mf 200 V Tubular	1
C-57	F66602	.006 mf 600 V Tubular	1
C-58	B66502	.005 mf 200 V Tubular	1
C-61	47X471	68 mmf Ceramic	1
C-62	47X492	2700 mmf Molded Mica	1
C-63	46X328	.01 mf 120 V Tubular	1
		RESISTORS	
		Ohms Watts	
R-1, R-10, R-22	B85105	1 meg. 0.5 Carbon	3
R-2, R-12, R-15	B83680	68 0.5 Carbon	3
R-3, R-11	B84563	56K 0.5 Carbon	2
R-4, R-6, R-8, R-13	B84102	1000 0.5 Carbon	4
R-5	B85104	100K 0.5 Carbon	1
R-7	B84103	10K 0.5 Carbon	1
R-9	B85225	2.2 meg. 0.5 Carbon	1
R-14	B85473	47K 0.5 Carbon	1
R-16	C84393	39K 1.0 Carbon	1
R-17	B85222	2200 0.5 Carbon	1
R-18	B84273	27K 0.5 Carbon	1
R-19	43X233	3.6 0.5 Wirewound	1
R-20, R-21	B83682	6800 0.5 Carbon	2
R-23	43X242	1400 5.0 Wirewound	1
R-25	36X372	0.5 meg. Volume Control	1
R-26	B85153	15K 0.5 Carbon	1
R-27	40X285	3 meg. Tone Control	1
R-28, R-33	B85106	10 meg. 0.5 Carbon	2
R-29, R-34	B85274	270K 0.5 Carbon	2
R-30	D83561	560 2.0 Carbon	1
R-31, R-35, R-38	B85474	470K 0.5 Carbon	3
R-32	B84822	8200 0.5 Carbon	1
R-36	B84682	6800 0.5 Carbon	1
R-37	B84562	5600 0.5 Carbon	1

Ref. No.	Part No.	Description	Qty. Used in Set
		TRANSFORMERS AND COILS	
L-2	9A2025	Interstage Coil (AM)	1
L-3	9A2024	Interstage Coil (FM)	1
L-4	9A2022	Oscillator Coil (AM)	1
L-5	35A5	Insulated Choke	1
L-6	9A1881	Filament Choke	1
L-7	9A2023	Oscillator Coil (FM)	1
L-8	35A7	Mixer Choke (FM)	1
L-9	9A2027	Antenna Coil (FM)	1
T-1	9A2043	1st I-F Trans. (FM)	1
T-2	9A2029	1st I-F Trans. (AM)	1
T-3	9A2030	2nd I-F Trans. (FM)	1
T-4	9A2042	2nd I-F Trans. (AM)	1
T-5	9A2064	Discriminator Coil	1
T-6	9A2004	Dipole Antenna	1
T-7	9A2041	"B" Range Loop Antenna	1
T-8	53X286	Power Transformer	1
T-9	51X142	Output Transformer	1
		DIAL AND DRIVE ASSEMBLY	
	58X723	Dial Glass	1
	25X1634	Dial Bracket	1
	41X88	Dial Light Reflector	2
	15X251	Pointer	1
	10X54	Drive Cord Assembly	1
	28X113	Drive Cord Spring	1
	7A103	No. 47 Pilot Light	2
	7A199	Pilot Light Socket Assembly	1
	19X192	"C" Washer (mtg. Drive Shaft)	2
	26X512	Drive Shaft	1
	6X67	Rubber Grommet	4
		MISCELLANEOUS	
	12A502	Speaker 12" P.M.	1
	3A305	Phono Socket—Single Pin Tip	1
	3A435	Tube Socket—Octal (8 prong) Molded	3
	3A436	Tube Socket—Noval (miniature)	1
	32X388	Tube Shield—Noval	1
	32X390	Tube Shield (miniature)	1
	3A439	Tube Socket (miniature)	6
	2A391	Band Change Switch	1
	13X546	Line Cord & Plug Assembly	1
	10A713	Knobs	4
	4X1049	Escutcheon	1
		TYPE W-28A176 RECORD CHANGER PARTS	
W-17X467		Motor Assembly, 60 cycles 105-125 Volts AC	1
W-49X123-5C		Pickup Arm	1
W-R A7M-1		Crystal Cartridge & Needles	1
W-R-13017		Needle, Microgroove (Red)	1
W-R-13016		Needle, Regular	1

MODELS 05GHM-934A, 15GHM-934A, 94GHM-934A



TUBE AND TRIMMER CONDENSER LAYOUT

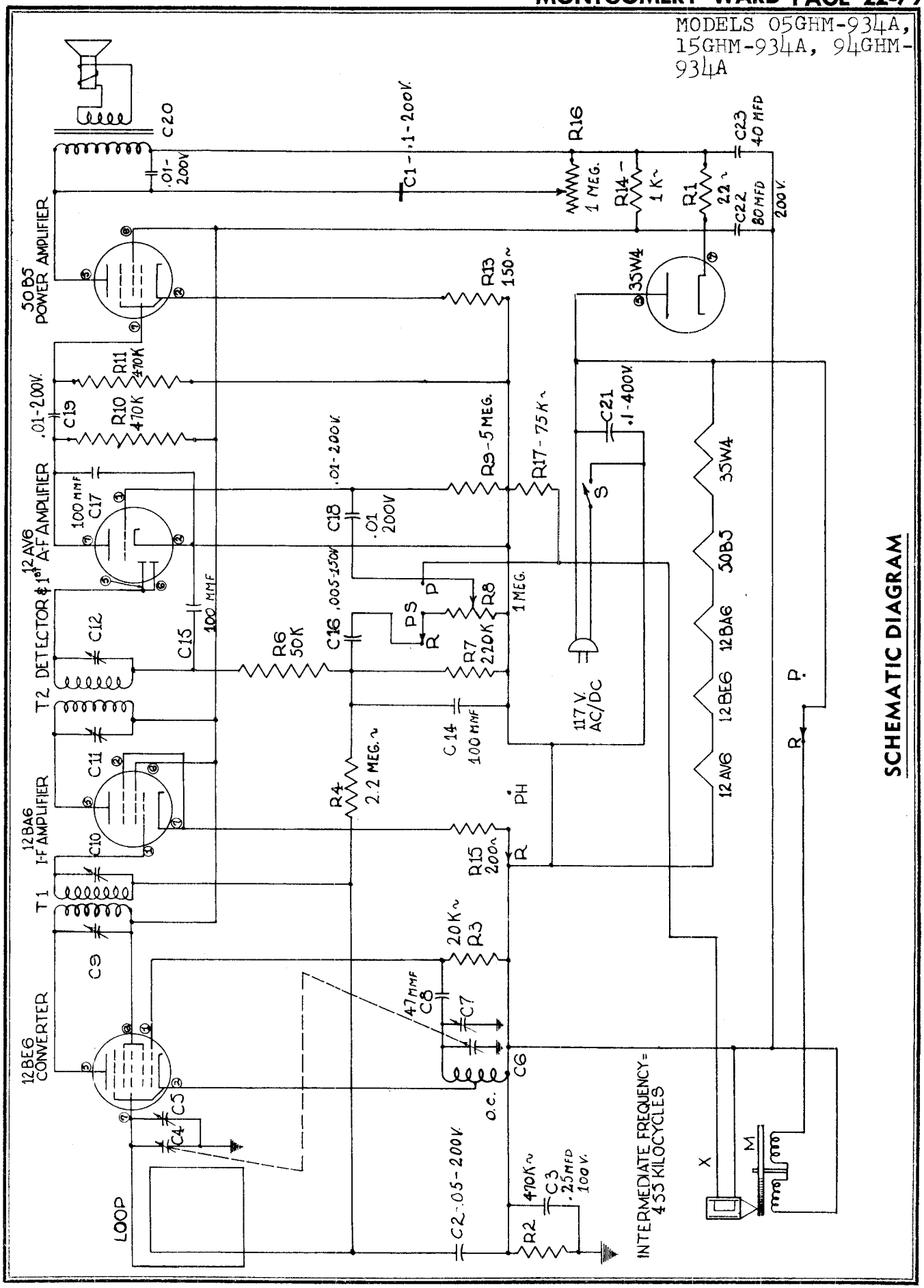


ELECTRICAL SPECIFICATIONS:

POWER SUPPLY:	105-125 volts A. C. 60 cycle
POWER OUTPUT:	1.8 watts
LOUD SPEAKER:	5" P.M. with transformer
TUBE COMPLEMENT:	1—12BE6 1—50B5
	1—12BA6 1—35W4
	1—12AV6

NOTE: C10 is located on bottom of 1st I.F. Transformer.
C12 is located on bottom of 2nd I.F. Transformer.

MODELS 05GHM-934A, 15GHM-934A, 94GHM-934A



SCHEMATIC DIAGRAM

MODELS 05GHM-934A, 15GHM-934A, 94GHM-934A

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf.

Frequency Setting	SIGNAL GENERATOR Coupling Capacitor	SIGNAL GENERATOR Connection to Radio	Ground Connection	Variable Condenser Setting	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
455 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	CLOSED	1st AND 2nd I.F. C9-C10-C11-C12
540 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	CLOSED	OSCILLATOR COIL SCREW
1640 KC	.1	CONTROL GRID OF 12 BE6	BAR TO B-BUS	WIDE OPEN	OSCILLATOR TRIMMER C7
1400 KC	.1	CONTROL GRID OF 12 BE6	TO B-BUS BAR	TO 1400 KC SIGNAL	ANTENNA TRIMMER C5

REPEAT PROCEDURE

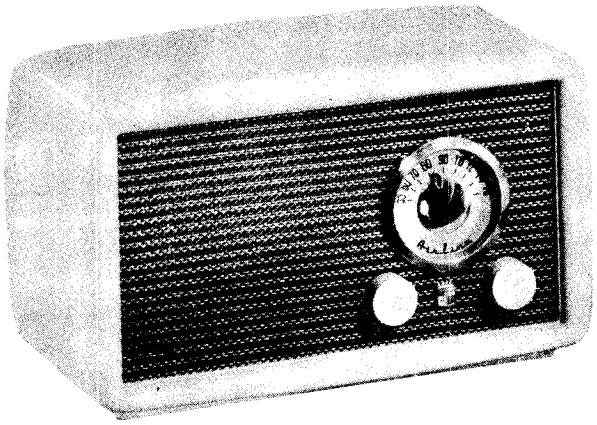
PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
		RESISTORS
R 1	RA10	22 ohm 1 watt
R 2-10-11	RA11	470K ohm ½ watt
R 3	RA12	20K " ½ watt
R 4	RA13	2.2 meg. ohm ½ watt
R 6	RA15	50K ohm ½ watt
R 7	RA16	220K " ½ watt
R 8	RA17	1 meg. volume control
R 9	RA18	5 meg. ohm ½ watt
R 13	RA19	150 ohm ½ watt
R 14	RA20	1K " ½ watt
R 15	RA21	200 " ½ watt
R 16	RA22	25K " tone control with switch
R 17	RA9	75K " ½ watt
		CONDENSERS
C 1	RA23	.1MFD-200 volts
C 2	RA24	.05-200v.
C 3	RA25	.25-100v.
C 4-5-6-7	RA26	Variable tuning cond. 2 gang
C 8		47MMF-200v.
C 9-10-11-12		I.F. trimmers
C 14-15-17	RA28	100MMF-200v.
C 16	RA29	.005-150v.
C 18-20	RA30	.01-200v.
C 21	RA31	.1-400v.
C 22-23	RA32	80/40MFD-200v. filter block

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS
X	RA33	Pickup cartridge, Electro-Voice #167T (Use 60H19)
	RA33A	Needle for #16 cartridge (Use 61H10)
X	RA34	Pickup cartridge, Electro-Voice #33-4 (Use 60H21)
	RA34A	Needle for #33-4 cartridge (Use 61H12)
X	RA35	Pickup cartridge, Electro-Voice #13 (Use 60H21)
	RA35A	Needle for #13 cartridge (Use 61H12)
	RA36	Pickup arm complete (with Electro-Voice #167T cartridge)
PS	RA37	Phono-radio switch, 3 pole D.T.
S	—	Line switch (on tone control)
	RA38T	Knob, Tone
	RA38V	Knob, Volume
	RA38PR	Knob, Phono-Radio
	RA38P	Knob, Plain
	RA39	Speaker with output transformer
M	RA40	Three speed motor (Alliance)
OC	RA41	Oscillator coil
T1	RA42	I.F. Transformer, input (450KC-4 lugs)
T2	RA43	I.F. Trnasformer, output (450KC-6 lugs)
	RA44	Dial pointer
		Dial face
	RA45	Motor speed indicator plate
	RA46	Loop antenna
	RA47	Cabinet
	RA48	Line cord, with plug
	RA49	Tube socket, 7 prong - miniature
	RA50	45 RPM record disc adapter

MODELS 94HA-1527C,
94HA-1528C

INSTALLATION



UNPACKING - Check all shipping instruction tags carefully before removing them.

POWER SUPPLY - This radio must be operated from a 105 to 125 volt DC or 105-125 volt-60 cycle AC outlet. If you are in doubt or unfamiliar with the voltage and frequency rating of your utility service, consult your local power company. Attempting to operate from other sources of power than specified above may involve costly repairs to the receiver. If the receiver does not respond after a one minute warm up period when operated from a 105-125 volt DC (Direct-Current) source, the power plug may have to be reversed at the wall outlet to obtain proper polarization.

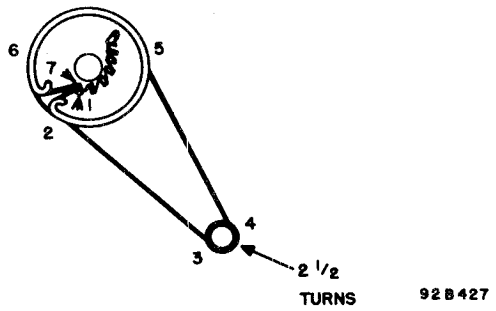
ANTENNA - The receiver is equipped with a loop type antenna eliminating the use of an external antenna. Due to the directional effect of a loop antenna, it may be necessary to rotate the receiver to obtain maximum performance from some particular station. To place the receiver in operation, simply connect the power plug to the wall receptacle and operate.

VOLUME control - This is the left hand control. It serves the function of power switch as well as volume control. To turn on the receiver, turn this control to the right past the point at which it clicks and similarly when turning off the set turn it to the left until the tell-tale click is heard and the dial light is extinguished. Turn the control clockwise to increase volume and counter-clockwise to decrease volume.

TUNING control - This is the control knob on the right. To tune in a station, turn the volume control to the right until the background noise is audible, then turn the tuning knob back and forth across the station frequency until the station is heard the clearest. Reset the volume control for the desired volume level. Never set the volume by detuning the receiver from the station. Undesired distortion results from this practice.

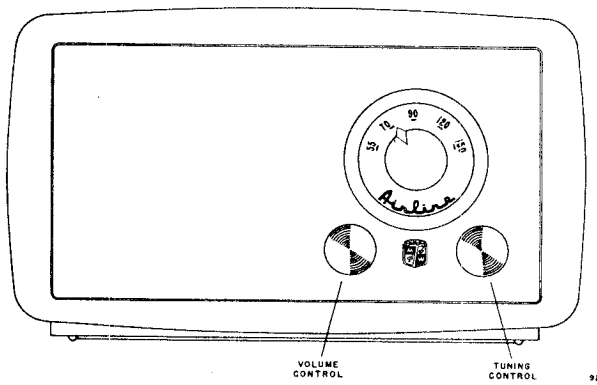
The dial is calibrated so that a zero must be added to the number appearing on the dial to obtain the station frequency in kilocycles. This will be helpful when setting the receiver dial to the station frequency listed in the radio logs of most newspapers.

DIAL CORD STRINGING INSTRUCTIONS



To restring the dial cable, pull the two control knobs and dial pointer from their shafts remove the chassis bolts and pull the chassis from the cabinet. Restring the dial drive with a 12-inch length of 30 lb. test dial cord following the stringing sequence shown in the accompanying illustration. Reinstall the receiver chassis and replace the knobs. Set the tuning condenser at maximum capacity and clip on the dial pointer so that its pointer falls on the left hand limit of the dial scale.

OPERATION



SERVICE DATA

This radio is a condenser tuned receiver using a cut plate tracking mixer section and employs four tubes in a conventional superheterodyne circuit. The loop provides for signal pickup as well as the inductive component in the tuned circuit of the mixer stage. No provision is made for the use of an external antenna.

The receiver is encased in a plastic cabinet which is supplied in two colors, Brown (62-1527) or Ivory (62-1528).

MODELS 94HA-1527C,
94HA-1528C

ELECTRICAL SPECIFICATIONS

Power Supply . . . . . .105-125 volts DC or 60 cycle AC, 25 watts

Frequency Range . . . . . .Broadcast 540-1620 KC

Intermediate Frequency. . . . . .455 KC

Antenna . . . . . .Built in loop

Power Output . . . . . .0.6 watt

Speaker . . . . . .5 inch P.M.

Voice Coil Impedance . . . . . .3 ohms

Tube and Dial Lamp Complement. 12SA7 Mixer
12SK7 I.F. Amplifier
12SQ7 Detector & Audio
50L6GT Power Amplifier
35Z5GT Rectifier
Mazda No. 47 Dial Lamp

For placement of these tubes, see the diagram showing tube layout.

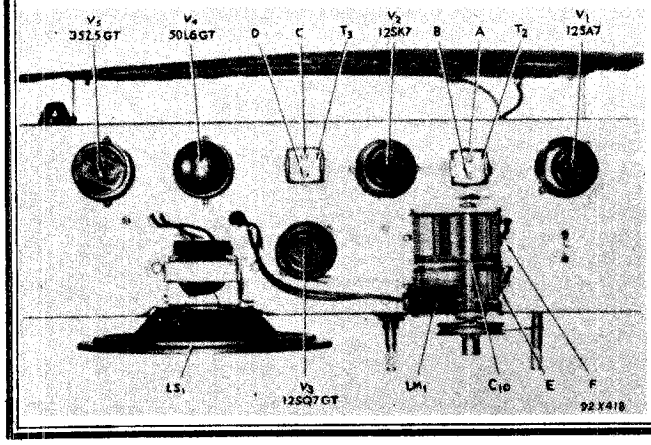
ALIGNMENT PROCEDURE

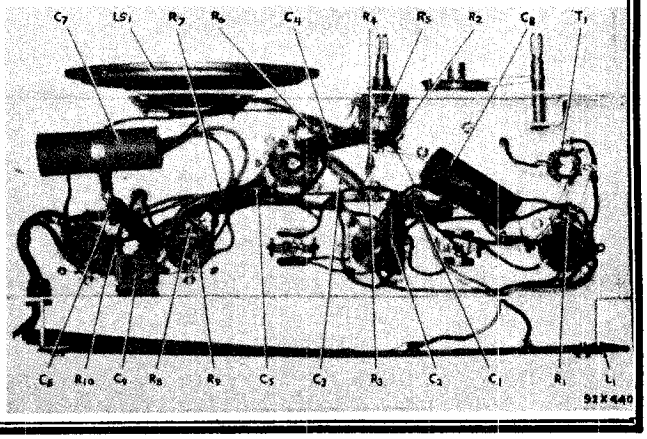
Output meter connection. . . . . Across voice coil
Generator ground . . . . . To chasis
Volume control position . . . . . Maximum

ALIGNMENT CHART

Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Tuned To	Adjust	Remarks
0.01 mfd. cap.	Connect to pin #5 of of 12SA7 through dummy ant.	455 kc	1000 kc	A,B,C,D	Adjust for max. output. IF sensitivity for 50 milliwatt output is approx. 150 microvolts.
None	Do not couple directly to loop, pickup generator signal by radiation only	1500 kc	1500 kc	E*F	Adjust for max. output.

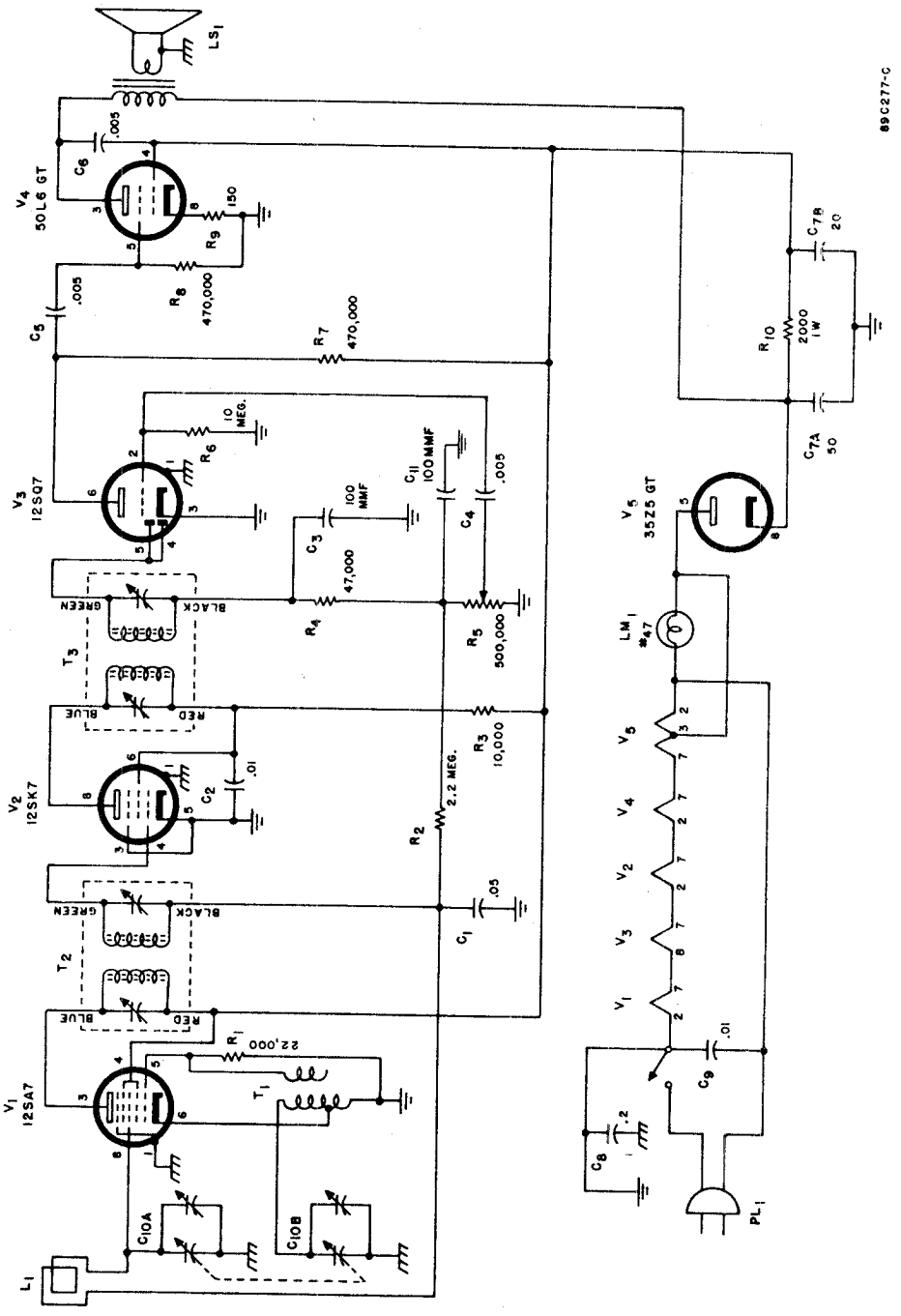
*Note - Calibration adjustment.





MODELS 94HA-1527C,
94HA-1528C

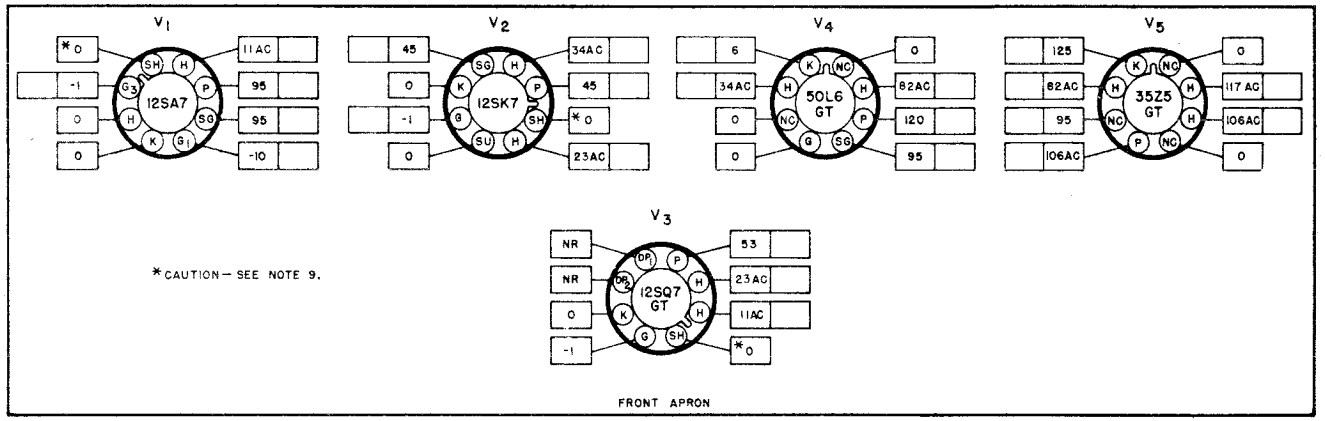
SCHEMATIC DIAGRAM



NOTE- RESISTOR VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/2 W. UNLESS OTHERWISE SPECIFIED.
CAPACITOR VALUES ARE IN MFD. UNLESS OTHERWISE SPECIFIED.
⏚ INDICATES ELECTRICAL GROUND
⏚ INDICATES CHASSIS GROUND

LAST RESISTOR SYMBOL — R-10
LAST CAPACITOR SYMBOL — C-11

TUBE SOCKET VOLTAGE CHART



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CONDENSERS
C-1	46AY503J	.05 mfd. 600 V., tubular
C-2	46AZ103J	.01 mfd. 600 V., tubular
C-3,11	CM20A101M	100 mmf. 500 V., mica
C-4,5,6	46AZ502J	.005 mfd. 600 V., tubular
C-7	45B151	50-20 mfd. 150 V., electrolytic
C-8	46AX204H	.2 mfd. 600 V., tubular
C-9	46BR103J6	.01 mfd. 600 V., molded paper
C-10	48B201	Tuning condenser
		RESISTORS
R-1	RC20AE223M	22,000 ohms $\frac{1}{2}$ watt, carbon
R-2	RC20AE225M	2.2 megohms $\frac{1}{2}$ watt, carbon
R-3	RC20AE103M	10,000 ohms $\frac{1}{2}$ watt, carbon
R-4	RC20AE473M	47,000 ohms $\frac{1}{2}$ watt, carbon
R-5	25B641	Volume control
R-6	RC20AE106M	10 megohms $\frac{1}{2}$ watt, carbon
R-7,8	RC20AE474M	470,000 ohms $\frac{1}{2}$ watt, carbon
R-9	RC20AE151M	150 ohms $\frac{1}{2}$ watt, carbon
R-10	RC30AE202M	2000 ohms 1 watt, carbon
		COILS AND TRANSFORMERS
L-1	57C119	Loop antenna
T-1	51B1058	Oscillator coil
T-2,3	50B374	Transformer IF & Det.

NOTES-

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND (NOT CHASSIS) WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE ——117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED. AC VOLTAGES SHOWN BECOME DC WHEN OPERATING FROM A DC LINE.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC"—NO CONNECTION. (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "NR"—NOT READABLE. (READING GENERALLY MEANINGLESS).
8. [ ] SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH THE CHASSIS GROUNDED.

92C428

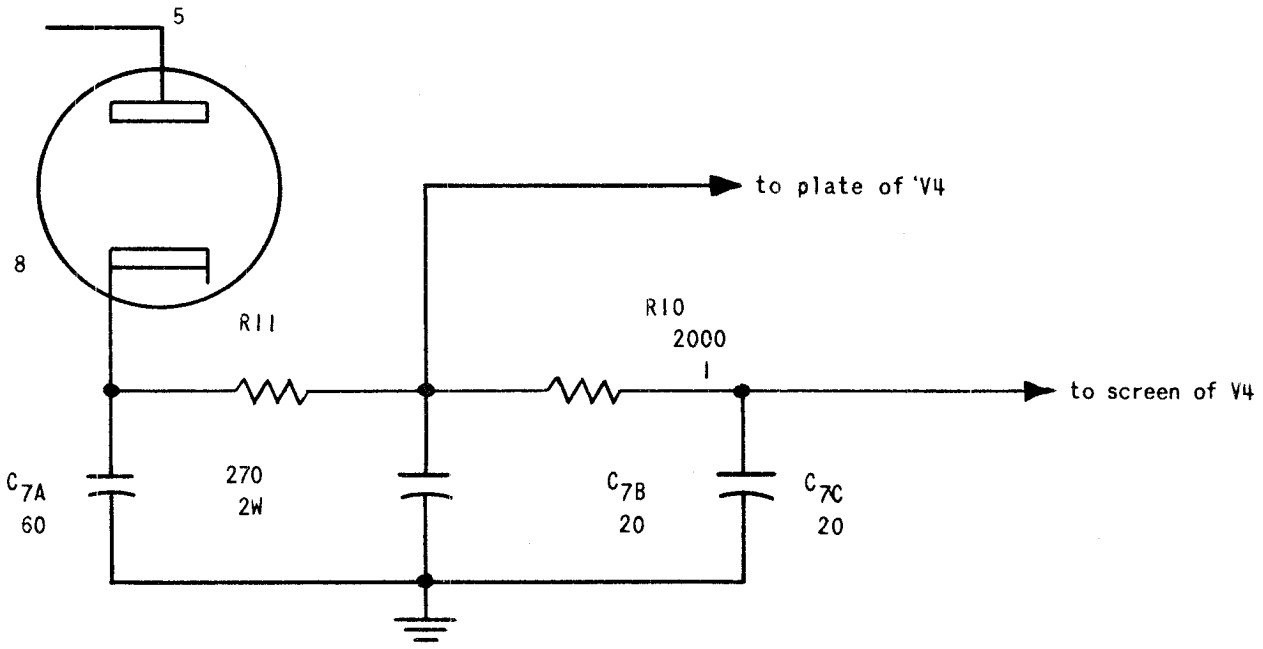
		MISCELLANEOUS	
LS-1		Speaker	85C073
		Pilot light socket & bracket	86B066
		Socket, octal	6A296
		Line cord	87B1669
		Line cord lock	76A397
		Escutcheon	7C073
		Pointer	82B150
		Dial scale	22C218
		Knob, ivory	15B068-5
		Knob, brown	15B068-6
		Cabinet, ivory finish	66E450
		Cabinet, brown finish	66E450-1

REPLACEMENT PARTS

HOW TO ORDER PARTS - Should it be necessary to write us or to order any repair parts, it is important that the complete model number which appears on the label attached to the rear of the chassis be specified. Repair parts should be ordered from your nearest Wards Retail Store, Catalog Order Office or Mail Order House.

MODELS 94HA-1527D,
94HA-1528D

SCHEMATIC



REPLACEMENT PARTS

Ref. No.	Part No.	Description
C-7	45B128	60-2C-20 mfd 175 V., electrolytic
R-11	RC40AF271K	276 ohms 2 watts, carbon

NOTE - Some sets will use condenser 45B151 with an additional single 10 mfd. condenser unit. For service replacement use condenser 45A128 wired as shown.

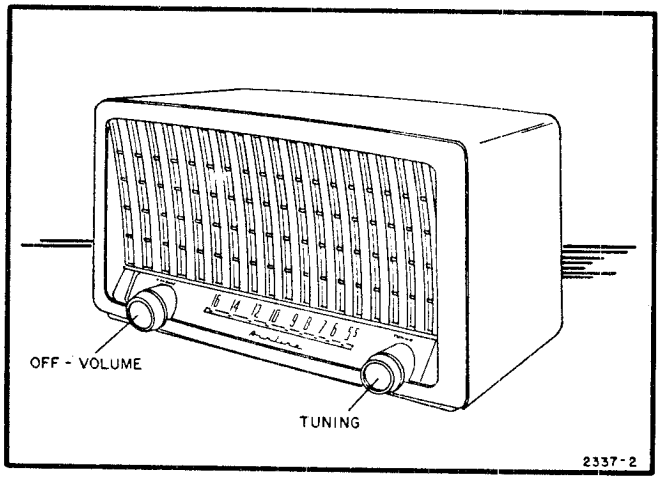
MODELS 15BR-1543B,
15BR-1544B

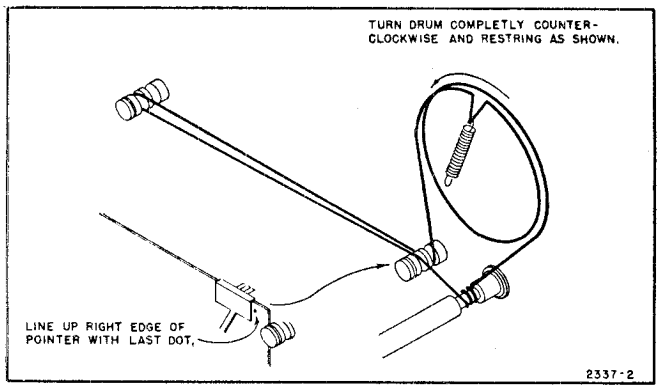
SERVICE DATA

Power Supply	115 volts, DC or 50-60 cycle AC, 24 watts.
Frequency Range	540 to 1600 Kc.
Intermediate Freq.	455 Kc.
Selectivity	At 1000 Kc., 60 Kc. at 1000 x signal
Sensitivity	150 u. v. per meter.
Power Output	0.8 watts undistorted, 1.0 watt max.
Loud Speaker	4" PM., v.c. impedance, 3.2 ohms.

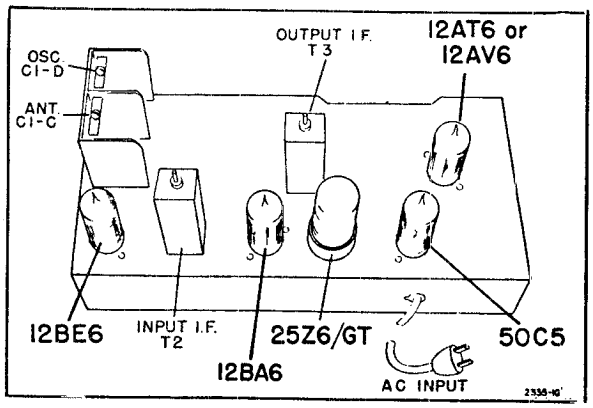
Tube Complement

12BE6, Converter
12BA6, IF Amplifier
12AV6 or 12AT6, Detector, AVC, Audio
50C5, Audio output
25Z6, Rectifier





Dial Stringing Diagram



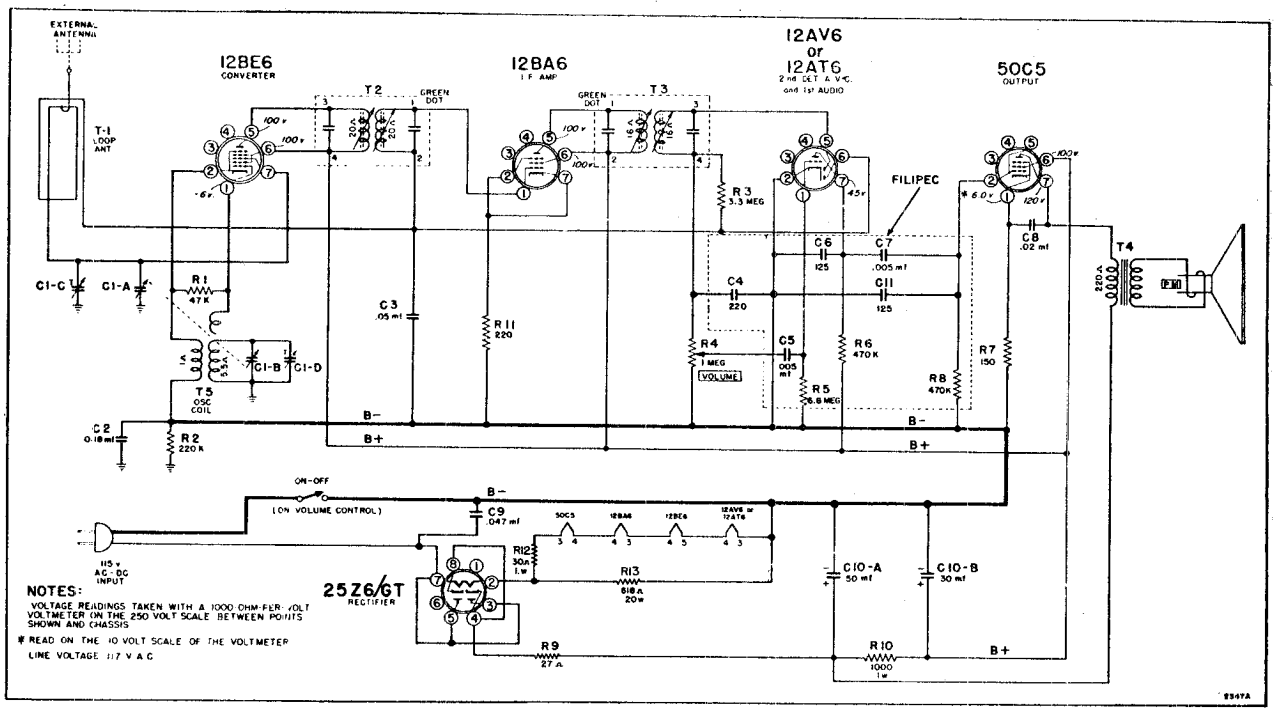
Top Chassis View

ALIGNMENT PROCEDURE

Loop must be connected and set volume to maximum.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	HEAVY BUSS LEAD ACROSS CENTER OF CHASSIS	Capacitor fully open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	65 microvolts
1620 kc.	.1 mf	12BE6, Pin 7		Capacitor fully open (plates out of mesh)	Oscillator trimmer C1-D on gang	70 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	70 microvolts
1400 kc.	———	Lay generator lead near back of cabinet		Tune in 1400 kc. signal	Antenna trimmer C-1C on gang	200 to 400 microvolts
400 cycles	.1 mf	12AT6, Pin 1		———	———	.06 volts

MODELS 15BR-1543B,
15BR-1544B



SCHEMATIC DIAGRAM

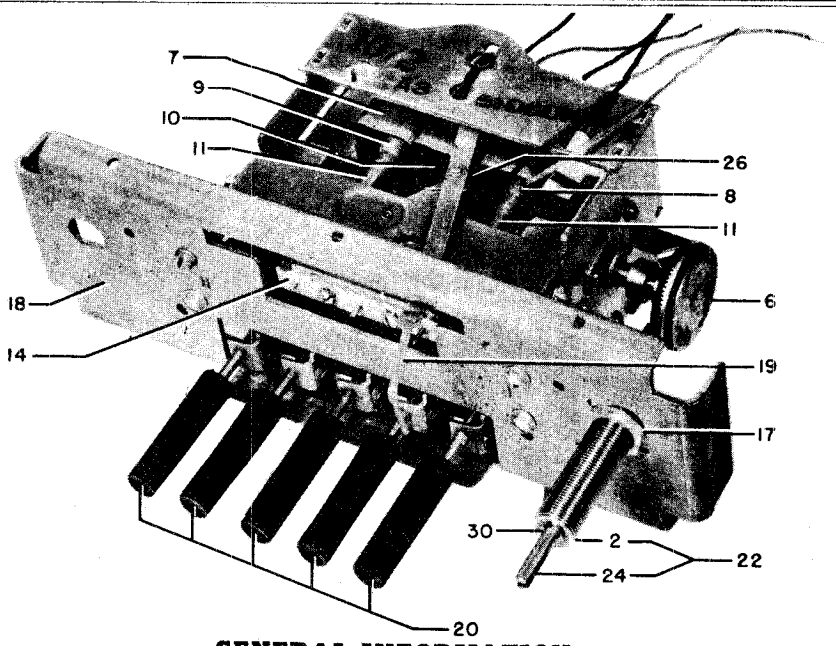
REPLACEMENT PARTS LIST

Please specify part number and chassis model number when ordering replacements.

Ref. No.	Part No.	Description
		CAPACITORS
C1A, B	8A-17377	2-gang condenser
C1C, D		Trimmers on gang
C2	8D-11111	.18 mfd x 400 volts
C3	8D-10770	.05 mfd x 200 volts
C4-5-6-7-11- and R5-6-8	201-19303	Filipec
C8	8D-10774	.02 mfd x 400 volts
C9	8J-16081	.047 mfd x 400 volts
C10A, B	8C-17391	Electrolytic condenser
		RESISTORS
R1	9B1-82	47K ohms, 1/2 watt, 10%
R2	9B1-27	220K ohms, 1/2 watt, 20%
R3	9B1-34	3.3 megohms, 1/2 watt, 20%
R4	10A-19616	Volume control and switch
R5-6-8		See Filipec
R7	9B1-52	150 ohms, 1/2 watt, 10%
R9	9B1-43	27 ohms, 1/2 watt, 10%
R10	9B2-62	1000 ohms, 1 watt, 10%
R11	9B1-54	220 ohms, 1/2 watt, 10%
R12	9C-19769	30 ohms, 1 watt, 10%
R13	9M-19602	618 ohms, 20 watts, 10%
		TRANSFORMERS AND COILS
T1	13E-19621	Loop antenna assembly
T2-3	13B-17731	IF transformer
T4	12C-19302 or	Output transformer
	12C-17595	Output transformer
T5	13D-17583	Oscillator coil
		DIAL PARTS
	3A-19617	Tuning shaft
	40A-17591	Bushing

Ref. No.	Part No.	Description
	29E-17592	Spring washer
	43D-17609	Tinnerman clip
	29C-10630	"C" washer
	53A-18547	Dial string (approx. 20")
	49A-10078	Take up spring
	2C-19619	Pointer plate
	2G-19620	Pointer
	3M-19623	String guide
	37A-19626	Dial background
	6D-19625	Dial scale
	2M-19624	Dial mounting strip
		MISCELLANEOUS
	5C-19532-9	Cabinet (Ivory)
	5C-19532-36	Cabinet (Walnut)
	5B-19790-8	Knob (Ivory)
	5B-19790-74	Knob (Walnut)
	23J-19627	Grill cloth and baffle board
	18A-19618	Speaker, 4" PM
	43D-12779	Tinnerman clip
	2H-17588 or	Tube shield
	2H-19188	Tube shield
	2M-17589 or	Tube shield base
	2M-19187	Tube shield base
	2M-17580	IF locking clip
	15C-16007	7-prong, socket
	15B-10440	Octal socket
	14M-10088-4	AC line cord and plug
	2D-15432-1	Loop mounting bracket
	23A-10344	Line cord lock
	42A10-19851	Chassis mounting bolt
	29A-3528	Steel washer
	29J-16690	Rubber washer

MODEL AT-81, Tuner



GENERAL INFORMATION

Automatic Tuner AT-81 is used in Motorola auto receiver, Model 1MF.

This is a 3-gang permeability type tuner, mechanically operated by movement of its push buttons or manual tuning control. Five pre-set tuning positions are provided. Stations can also be selected simply by turning manual control until desired station is tuned in.

TO SET THE PUSH BUTTONS

1. Turn receiver "on" and allow it to warm up for a few minutes.

2. With the tuning knob, tune in the station you desire to set up. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality. The pointer will indicate the station being set up.

3. Loosen by turning counterclockwise the automatic tuning push button you wish to use.

4. Push the automatic push button in as far as it will go and tighten by turning clockwise until moderately tight.

5. Push button now will automatically bring station selected simply by pushing button all the way in.

6. Remaining push buttons can be set up in the same manner.

SERVICE INFORMATION

CORE REPLACEMENT

When tuner is in the set, the following method of removing cores is recommended:

1. Remove knobs, dial escutcheon and background.

2. Mark core insulator and core bracket to re-mount core assembly the same as before removal.

3. Remove the two #4-40 x 3/16" core assembly mounting screws.

4. Gently pull out core and insulator assembly through holes of core mounting bracket.

5. Soften cement holding core screw to insulator and unscrew from insulator.

6. Replace core and insulator assembly into same position as before removal.

7. Realign tuner.

8. Cement core screws to insulator.

COIL REPLACEMENT

First remove tuning cores by following steps 1 through 4 of CORE REPLACEMENT. With cores out of the way, push coil out of rubber grommet and gently ease out of tuner. CAUTION: In replacing coils, be careful not to nick or damage coil by hitting sides of shields, etc. Cement coil to rubber grommet with any household rubber cement, replace cores, and realign tuner.

TUNER ALIGNMENT

The tuner cores have been correctly aligned at the factory. Field alignment is not recommended unless components have been replaced or tampered with. If found necessary to realign, construct two core alignment tools. These are made by gluing strips of rubber to two wood sticks, as shown in Figure 1. Refer to Figure 1 for proper use of tools. Alignment instructions are given in Model 1MF service manual.

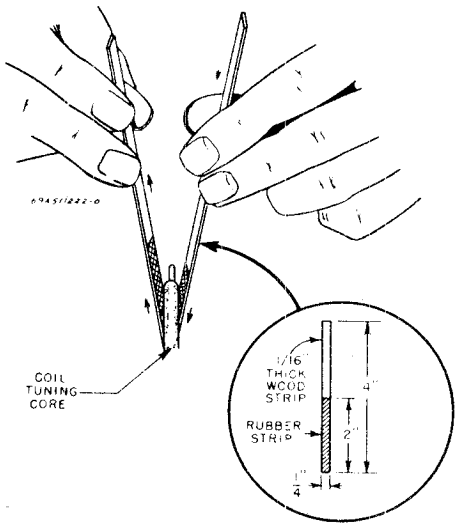
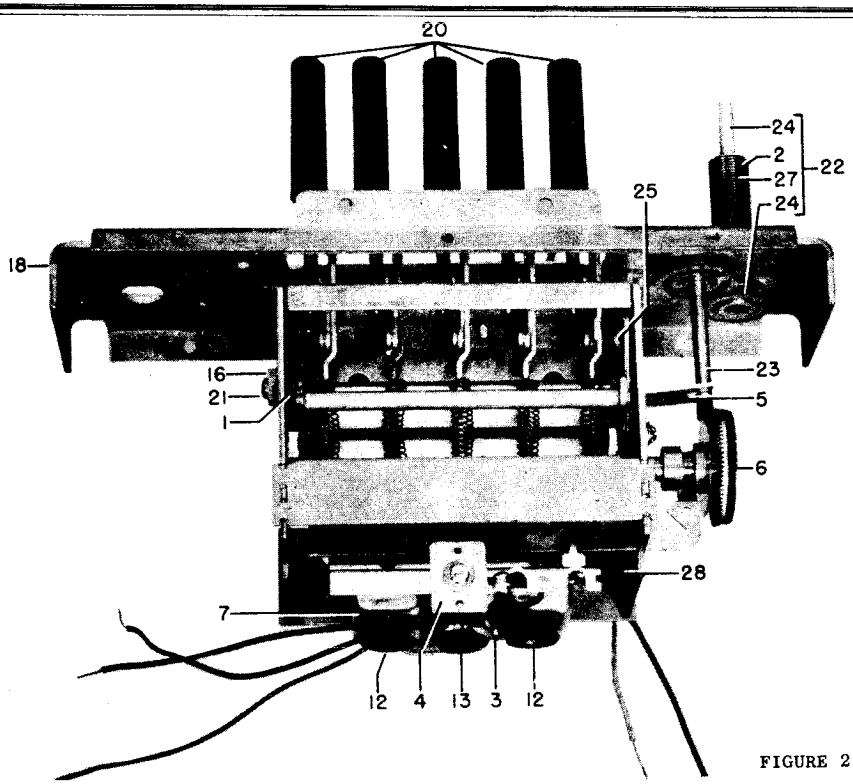


FIGURE 1. CORE ALIGNMENT DETAIL



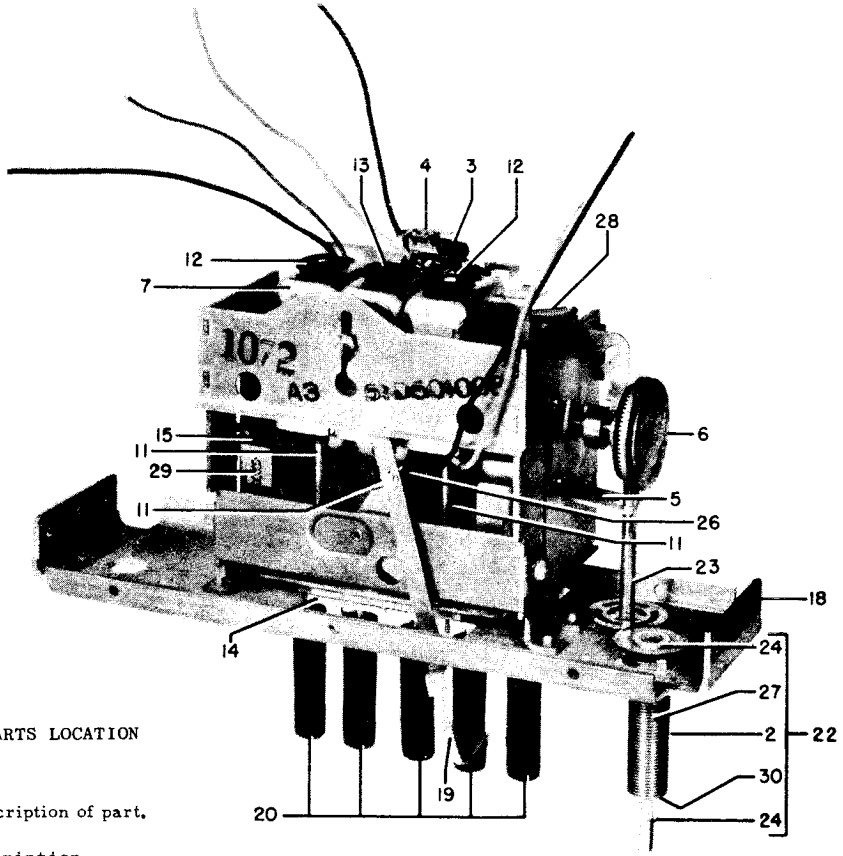


FIGURE 2. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of tuner in addition to part number and description of part.

Ref. No.	Part Number	Description
	51D501008	Tuner, Model AT-81:
1	43A4326	Ball, steel: .125" diameter (tuner drive carriage bearings).....
2	43A501147	Bushing, manual shaft.....
3	21K114068	Capacitor, compensating: 43 mmf.....
4	20A510111	Capacitor, variable: mica; 470 mmf (osc trim).....
5	43A500920	Clamp, clutch support.....
6	51A500995	Clutch Drive Assembly: consists of friction washers, hub crown gear, pinion gear etc.....
7	51X510776	Coil Assembly complete: consists of coil shield, ant, RF and osc coils, osc trim, and 43 mmf ceramic cap.....
8	24B510175	Coil antenna.....
9	24K510176	Coil, RF.....
10	24B510112	Coil, oscillator.....
11	46A510788	Core, iron (tuning cores)...
12	5A501016	Grommet, rubber (ant and RF coil mtg).....
13	5A501017	Grommet, rubber (osc coil mtg).....
14	14A510154	Insulator, core, (tuning core mtg).....
15	45A501035	Link, connecting (core brkt)
16	2S7048	Nut, hex: 10-32 x 5/16"; steel; cad pl (carriage set-screw lock).....
17	2S8397	Nut, hex: $\frac{1}{2}$-28 x 5/8"; steel cad pl (manual shaft bushing assem mtg).....
18	64C501141	Plate, front mtg.....
19	52A510159	Pointer, dial: with adj cam.
20	51B500602	Pushbutton and Screw Assembly
21	3S3859	Setscrew, 10-32 x $\frac{1}{4}$"; slotted headless; cup point machine screw (tuner drive carriage mtg).....
22	51B502838	Shaft and Bushing Assembly, manual tuning: complete....
23	51A501042	Shaft, Drive Disc and Pinion Assembly.....
24	51K502839	Shaft Assembly, manual drive: includes 2 pinch washers...
25	41B501025	Spring, compression (on split gear).....
26	41K501096	Spring, pointer anti-backlash
27	41A501027	Spring, compression (part of shaft and bushing assem)...
28	41A501047	Spring, tension (on clutch gate release).....
29	41A501037	Spring, tension (link retaining).....
30	4A501015	Washer, "C" (manual shaft retaining).....

MODEL CT1M,
Chevrolet

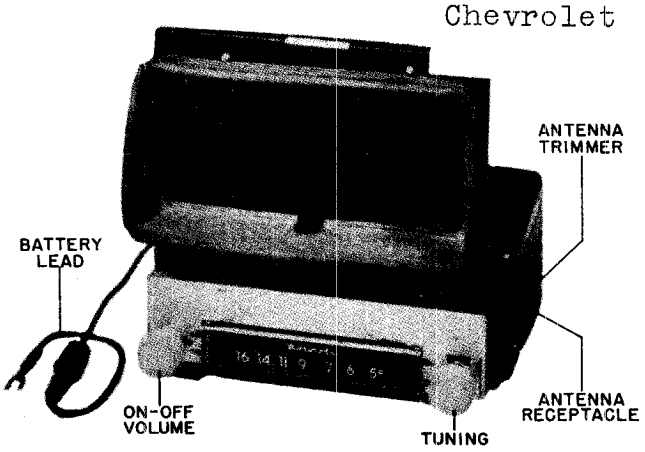
GENERAL INFORMATION

TYPE - An automotive superheterodyne receiver, designed for 1951 Chevrolet. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



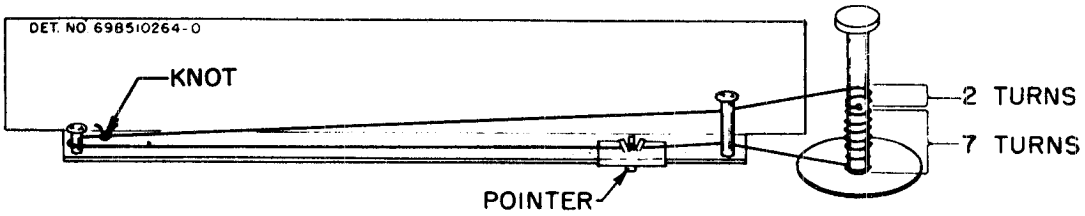


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator.
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3.)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: Keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment.

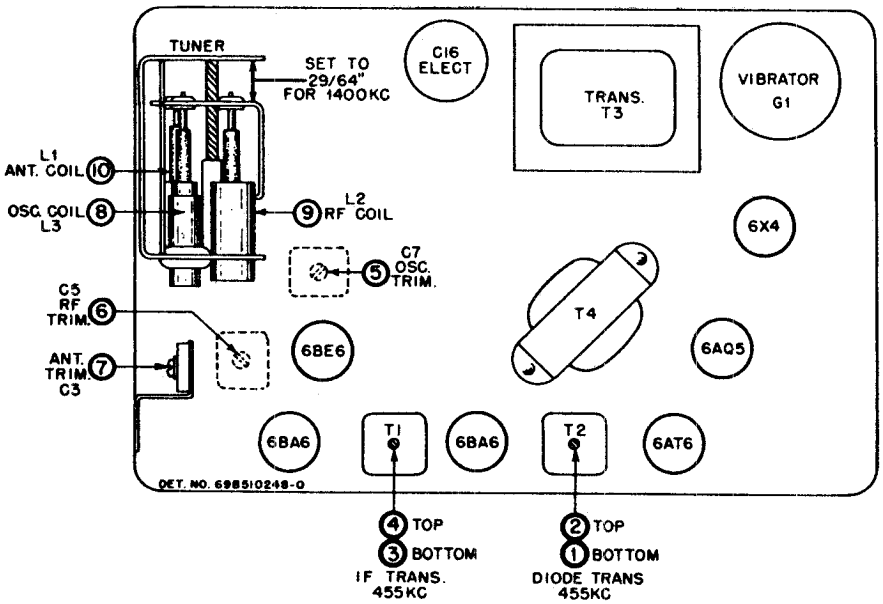


FIGURE 2. TUBE & TRIMMER LOCATIONS.

MODEL CT1M, Chevrolet

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7)	455 Kc	High frequency end of dial (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated.
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy	1605 Kc	"	5	Peak for maximum.
3.	"	"	1400 Kc	Tune for max.	6 & 7	"
TUNER ALIGNMENT						
NOTE: The tuner cores have been correctly aligned at the factory. Field alignment of the tuner is not recommended unless components have been replaced or tampered with. Construct two core alignment tools as shown in Figure 4. Refer to Figure 4 for proper use of tools, and proceed to align as follows:						
4.	See Fig. 3	Antenna receptacle through dummy	1610 Kc	High frequency end of dial; cores should project 1-1/32" from end of coil form - screw out if necessary	5, 6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	1400 Kc -per Figure 2	8, 9 & 10	"

6. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust the antenna trimmer (7) for maximum signal of a weak station or noise between stations.

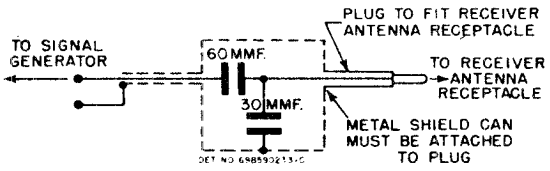


FIGURE 3. DUMMY ANTENNA DETAIL.

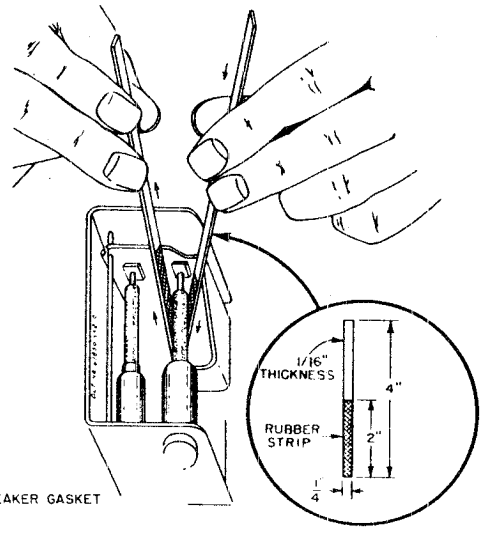


FIGURE 4. CORE ALIGNMENT DETAIL.

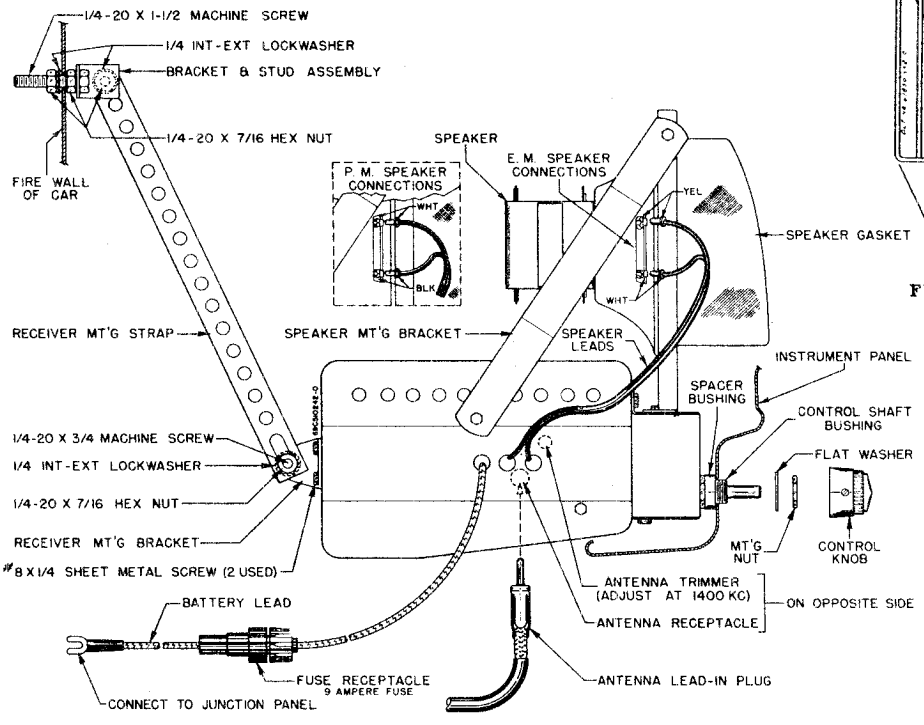


FIGURE 5. RECEIVER INSTALLATION DETAIL.

MODEL CT1M,
Chevrolet

INSTALLATION INFORMATION

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 6. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 7. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) may be installed at the shoulders so that the hood makes a good ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Elimination Powder (available in kit form - Motorola Part No. 51B591494) into tires, following instructions given on the package.

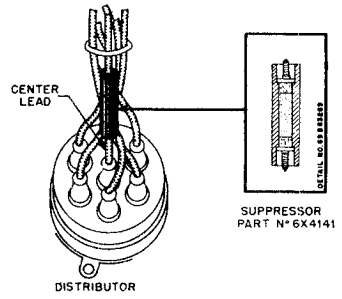


FIGURE 6. DISTRIBUTOR SUPPRESSOR INSTALLATION.

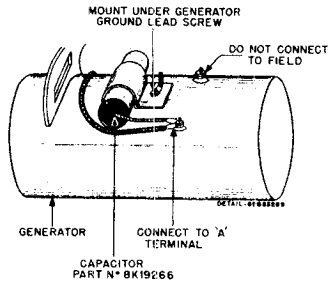


FIGURE 7. GENERATOR CAPACITOR INSTALLATION.

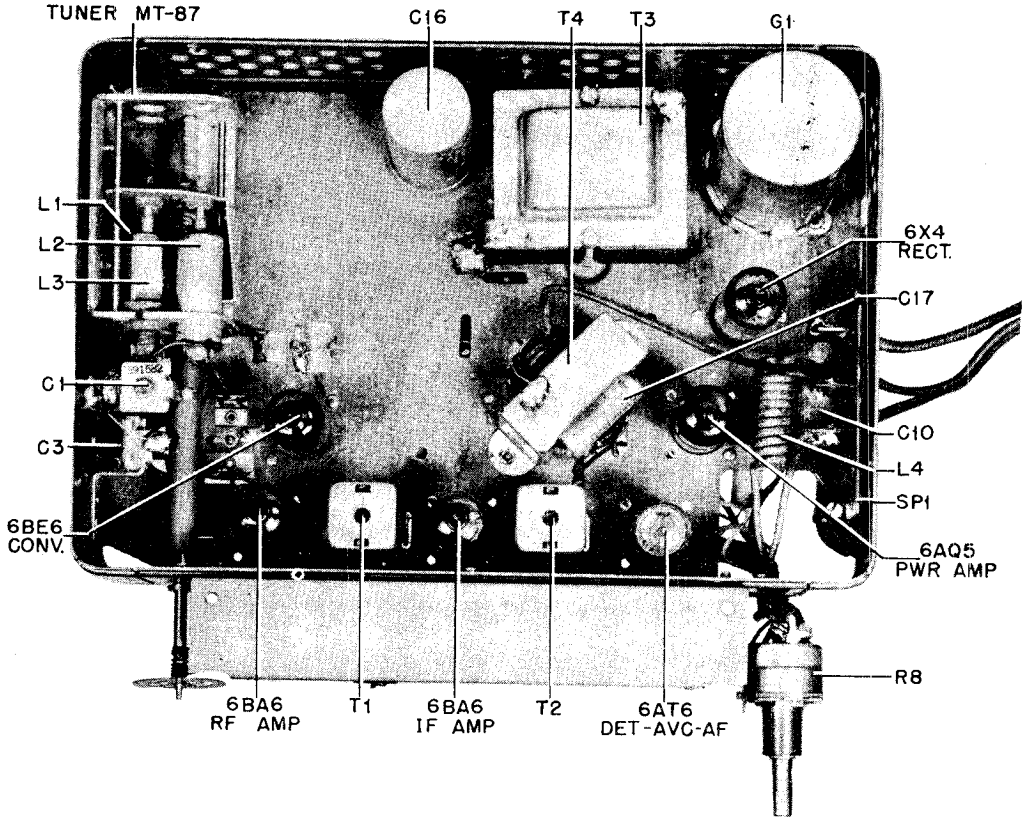


FIGURE 8. TOP VIEW OF CHASSIS.

MODEL CT1M,
Chevrolet

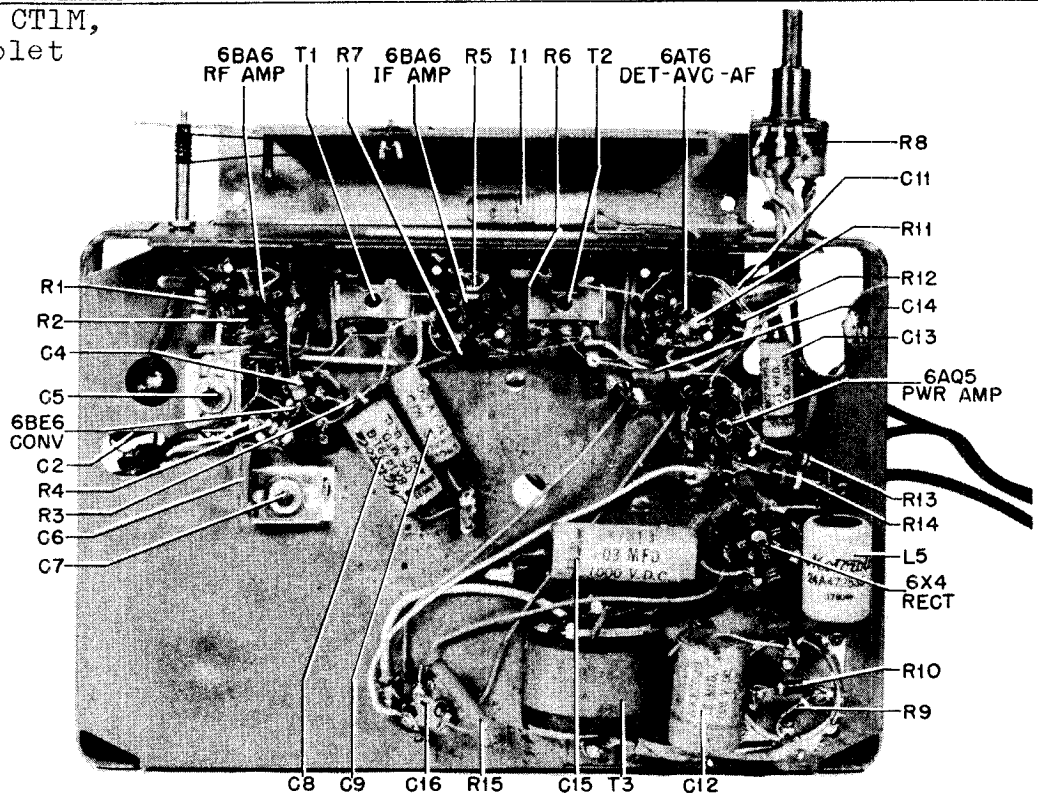


FIGURE 9. BOTTOM VIEW OF CHASSIS.

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20A502338	Trimmer, mica: 50 to 280 mmf.....
C-4	21K70720	Molded: 5 mmf 500V.....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf
C-6	21K77373	Ceramic: 47 mmf.....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf.....
C-8	8K14791	Paper: .05 mf 400V.....
C-9	8R13514	Paper: .05 mf 100V.....
C-10	8K17028	Paper: .5 mf 100V.....
C-11	8R472754	Paper: .01 mf 100V.....
C-12	8K17028	Paper: .5 mf 100V.....
C-13	8R23690	Paper: .01 mf 400V.....
C-14	21K481377	Ceramic: 500 mmf.....
C-15	8K400883	Paper: .03 mf 1000V.....
C-16	23A485677	Electrolytic: 15-10-20 mf/350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V.....
Fuse		
F-1	65K16248	Fuse: 9 amp.....
Vibrator		
G-1	48B3333	Vibrator: 4-pin; non-sync.
Dial Light		
I-1	65X10867	Bulb: 6.3V; .25A; tubular; bayonet base; #44.....
Coils		
L-1	24B502472	Antenna Coil Assembly (specify color coding on old coil when ordering).....
L-2	24B502473	RF Coil Assembly (specify color coding on old coil when ordering).....
L-3	24B502474	Oscillator Coil Assembly (specify color coding on old coil when ordering)..
L-4	24K580706	Choke, RF.....
L-5	24A472535	Choke, hash.....
Speaker		
LS-1	50B510532	Speaker, EM: 5" x 7"...
or		
LS-2	50K510064	Speaker, PM: 5" x 7"; 3.2 ohm VC.....
Resistors		
Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6R6032	470,000 20% ½W.....
R-2	6R3933	220 20% ½W.....
R-3	6R6075	100,000 20% ½W.....
R-4	6R6056	47,000 20% ½W.....
R-5	6R6010	330 20% ½W.....
R-6	6R490001	6800 10% 1W N.I.....
R-7	6R6004	1 meg 20% ½W.....

R-8	18K510011	Volume control: .5 meg; includes on-off switch....
R-9	6R5614	56 10% ½W.....
R-10	6R5614	56 10% ½W.....
R-11	6R2122	4.7 meg 20% ½W.....
R-12	6R6032	470,000 20% ½W.....
R-13	6R6414	270,000 10% ½W.....
R-14	6R6336	270 10% 1W.....
R-15	6R488312	2200 10% 1W N.I.....

Spark Plate

SP-1	1B501290	Spark Plate Assembly.....

Transformers

T-1	24B485553	
or	24K502819	IF, 455 Kc: complete.....
T-2	24K485554	Diode, 455 Kc: complete...
T-3	25C501303	Power Transformer.....
T-4	25B70171	Output Transformer.....

CHASSIS PARTS - MECHANICAL

1X510137	Bracket, dial background: includes shoulder rivets.....
7C510065	Bracket, dial mtg.....
43K510014	Bushing, manual shaft.....
1X510135	Cable Assembly, speaker (for PM spkr).....
1X510195	Cable, Assembly, speaker (for EM spkr).....
42A510012	Clip, dial scale retainer.....
42A485548	Clip, coil can mtg (T-1 & T-2)..
42A4215	Clip, vibrator grounding.....
11M8877	Cord, dial: 20 lb; black.....
58A501296	Coupling, tuning shaft: less insert springs.....
9K510086	Lead Assembly, fuse: complete with fuse.....
2S8397	Nut, hex: 1/2-28 x 5/8; cad pl (tuning shaft bushing and volume control mtg).....
1A510007	Pointer and Slider Assembly.....
9A472148	Receptacle, antenna.....
5K71246	Rivet, shoulder: .187 lg (dial cord guide).....
5A71735	Rivet, shoulder: ½" long (dial cord guide).....
34B510062	Scale, dial.....
3S7247	Screw, machine: 6-32 x 3/16; slotted locking type; stl; cad pl (tuner mtg).....
1X510142	Shaft Assembly, manual drive: includes 2 pinch-type drive washers.
1X510138	Shaft, Drive Disc, & Dial Cord Assembly.....
9K592354	Socket, dial light: includes mtg bracket.....
9A70208	Socket, tube: 4-prong (for vibrator).....
9A472534	Socket, tube: miniature; 7-prong..
9K580218	Socket, tube: miniature; 7-prong; with dummy lug.....
41A485380	Spring, insert (inside tuning shaft coupling).....
29A76280	Terminal, pin and washer: black (for PM speaker).....
29K76282	Terminal, pin and washer: white .....
29K502828	Terminal, pin and washer: yellow (for EM Speaker).....
4K501364	Washer, "C" (tuning shaft retainer)

Part Number	Description

HOUSING PARTS

15K501283	Cover, bottom.....
15K501306	Cover, top.....

MOUNTING PARTS & ACCESSORIES

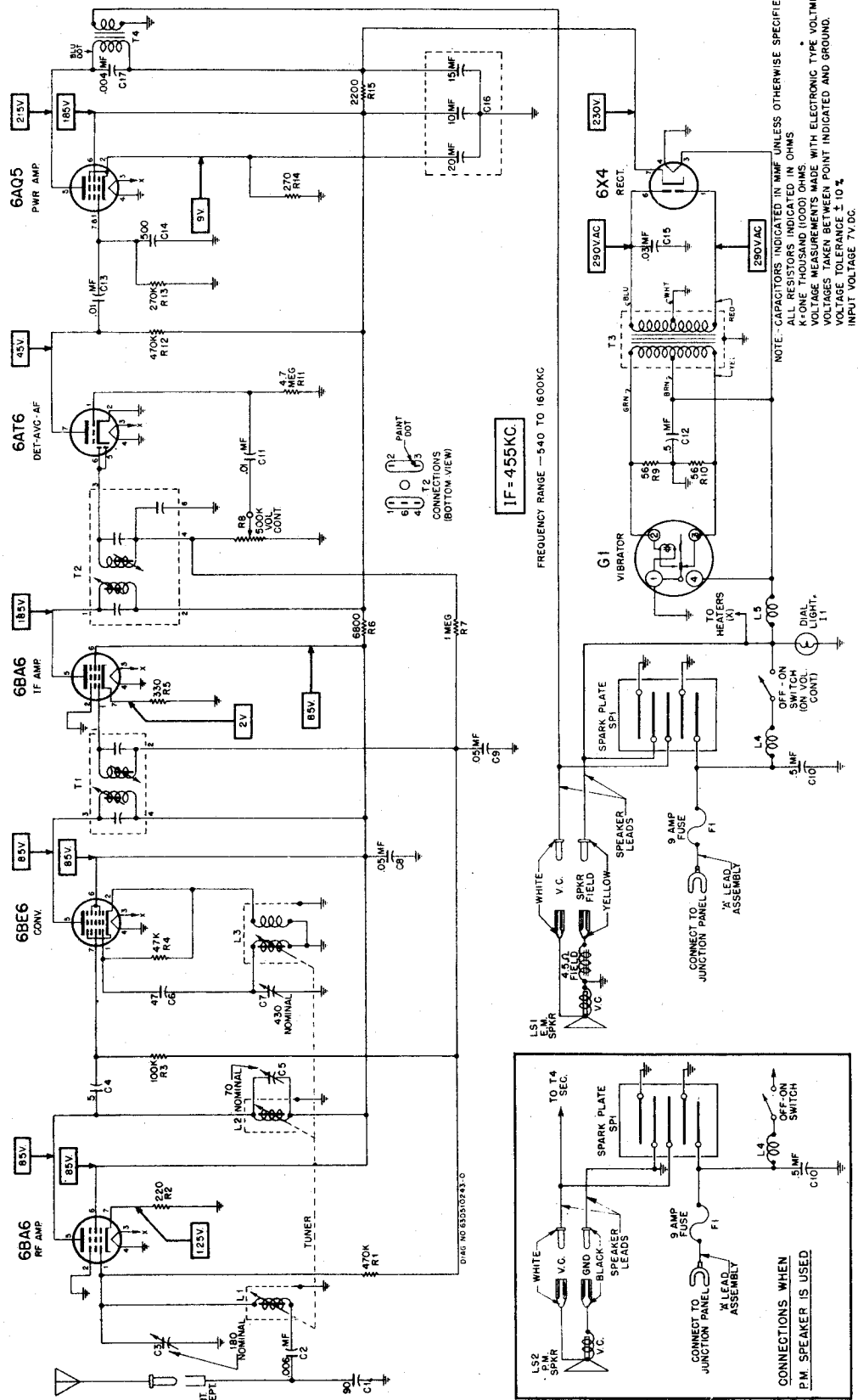
7A72256	Bracket, receiver mtg (on hsng)....
7B510058	Bracket, speaker plate mtg.....
7A484424	Bracket and Stud Assembly (receiver mtg).....
43A502927	Bushing, spacer (receiver mtg to instrument panel).....
8A4491	Capacitor, noise suppression (generator).....
32C510039	Gasket, speaker.....
36K510180	Knob, control.....
4S7688	Lockwasher, int-ext: ¼; stl; cad pl (receiver mtg).....
2S7022	Nut, hex: ¼-20 x 7/16; stl; cad pl (receiver mtg).....
2S8397	Nut, hex: ½-28 x 5/8; stl; cad pl (receiver mtg to instrument panel) .....
1X510130	Plate and Gasket Assembly, speaker.
3S488298	Screw, sheet metal: #8 x ¼ slotted hex head; stl; cad pl (mtg brkt mtg-rear).....
3S7295	Screw, machine: ¼-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap).....
3S9694	Screw, machine: ¼-20 x 1½; plain hex head; stl; cad pl (receiver mtg to firewall).....
3S7118	Setscrew (control knob).....
42A485718	Strap, receiver mtg.....
6A4141	Suppressor, noise (distributor)....
4S1758	Washer, flat: 13/16 x .515 x .040 thick; stl; nkl pl (receiver mtg to instrument panel).....

TUNER - MODEL MT-87

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.

51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft).....
42A502507	Clip, spring (manual drive shaft retainer).....
46A502505	Core, iron (L-1, 2, & 3 tuning - specify color coding on old core when ordering).....
5A502510	Grommet (L-1 & 2 mtg).....
5K502516	Grommet (L-3 mtg).....
5A501503	Grommet (L-1, 2, & 3 core mtg)..
2A502508	Nut, tension drive (on tuner carriage).....
47A502509	Shaft, manual drive.....
46A502506	Sleeve, iron (inside L-1 & 2, shields).....
4K502518	Washer, fibre (on manual drive shaft).....
4A502517	Washer, paper (inside L-1 & 2, shields).....

MODEL CT1M,
Chevrolet



NOTE:- CAPACITORS INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS
K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER
VOLTAGES TAKEN BETWEEN POINT INDICATED AND GROUND.
VOLTAGE TOLERANCE ± 10%
INPUT VOLTAGE 7V.DC.
NO SIGNAL INPUT.

FIGURE 10. SCHEMATIC DIAGRAM.

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

GENERAL INFORMATION

NOTE: This manual contains complete service information and replacement parts list for AM-FM radio chassis HS-211 and HS-230. Service data for the television chassis and the record changers will be found in their respective service manuals.

RECEIVER MODELS

Model	Radio Chassis Used	Record Changer Used	TV Chassis Used
16VF8R	HS-211	M3RC	TS-16 series
16VF8B	HS-211	M3RC	TS-16 series
19F1	HS-230	RC-36	TS-67 series
19F1B	HS-230	RC-36	TS-67 series

RADIO CHASSIS - HS-211: Radio chassis HS-211 contains 9 tubes and receives both AM and FM broadcast programs. Except for common speakers, it operates entirely independently of the television receiver.

HS-230: Similar to chassis HS-211 except for the addition of a separate phono motor power switch, connected to the AM-FM-PHONO switch control shaft.

RADIO TUNING RANGE - AM -535 to 1620 Kc
FM - 88 to 108 Mc

RADIO IF FREQUENCIES - AM IF - 455 Kc
FM IF - 10.7 Mc

RADIO ANTENNAS - Separate AM and FM loop antennas, mounted in cabinet

SPEAKERS - Dual 12" PM and 5" PM, common to both radio and television chassis.

POWER SUPPLY - 117 volts, 60 cycle alternating current only

RADIO POWER CONSUMPTION - 100 watts, including phono motor

RADIO AUDIO OUTPUT - 8 watts

RADIO CHASSIS TUBE COMPLEMENT -
6AU6 - FM-AM RF Amplifier
6BA7 - FM-AM Converter
6BA6 - FM-AM IF Amplifier
6AU6 - FM IF Amplifier
6AL5 - FM Ratio Detector
6AV6 - AM Detector & 1st Audio Amp
6V6GT - Power Amplifier
6V6GT - Power Amplifier
7Z4 - Rectifier

INSTALLATION & OPERATING INSTRUCTIONS

ANTENNAS

No outside antenna or ground is normally required for standard broadcast (AM) reception, as a loop antenna is located inside the cabinet. Antenna connections are shown in Figure 1. In locations where additional pick-up is desired, an external antenna may be connected to the clip marked "EXT BC ANT" on the loop antenna.

An FM loop antenna, mounted inside the cabinet, eliminates the need for an external FM antenna when the receiver is used in normal FM service areas such as are found in and for a few miles around metropolitan areas.

In "fringe" or weak signal areas, improved FM reception can be obtained by using an outside FM antenna. The loop connections should be removed from the terminal strip on the rear of the chassis and the outside antenna should be connected, through a 300 ohm twin transmission line, to the terminal strip, as shown in Figure 1. Orient the antenna to obtain maximum volume of the FM stations.

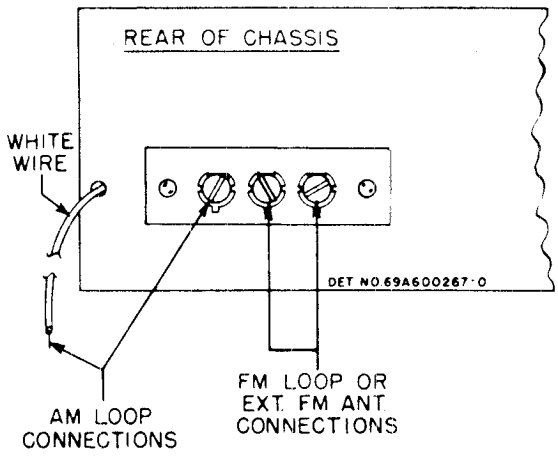


FIGURE 1. EXTERNAL ANTENNA CONNECTIONS

MODELS 16VF8B, 16VF8R,
Ch. HS-211; 19F1, 19F1B,
Ch. HS-230

SERVICE NOTE

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the four radio knobs on the front of the cabinet.
2. Remove the AC power plug from the receptacle attached to the cabinet.
3. Remove the large panel covering the rear of the cabinet.
4. Disconnect the AM and FM loop leads from the receiver.
5. Disconnect the phono power plug from the chassis.
6. Disconnect the speaker leads.
7. Remove the three chassis mounting screws.
8. Slide the chassis from the cabinet.

CONTROLS

Refer to Figure 2 for the location of the radio controls.

POWER SWITCH AND VOLUME CONTROL. The volume control and power switch for both radio and phonograph operation are combined and are operated with the extreme left-hand knob. **CAUTION:** The power switches on the AM-FM radio and on the television receiver are independent. Make sure both are turned off when the set is not in use.

TONE CONTROL. Tone is varied by adjusting the second knob from the left.

AM-FM-PHONO SWITCH. The third control from the left operates a three-position switch. The extreme counterclockwise position selects the AM (Standard Broadcast) band, the center position selects the FM (Frequency Modulation) band, and the extreme clockwise position is used for phonograph operation. **NOTE:** On the 19F1 model, rotating the control to the "PHONO" position also starts the phono motor, whereas model 16VF8 has a separate power switch on the record changer itself.

TUNING CONTROL. The extreme right-hand control selects the desired FM or AM station. The standard broadcast scale (AM) is read in kilocycles by adding one '0' to the figures. The frequency modulation scale (FM) is read in megacycles (88 to 108).

Tuning of FM stations should be done very carefully, for best sound reproduction, not necessarily for strongest volume received.

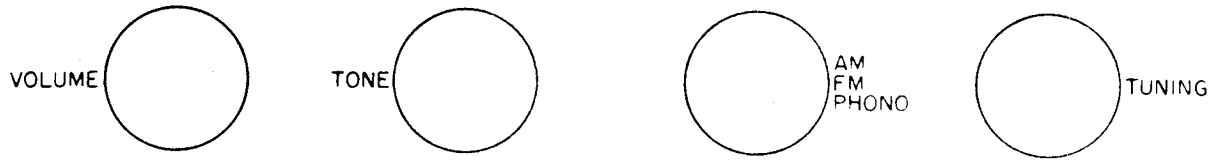


FIGURE 2. RADIO CONTROLS

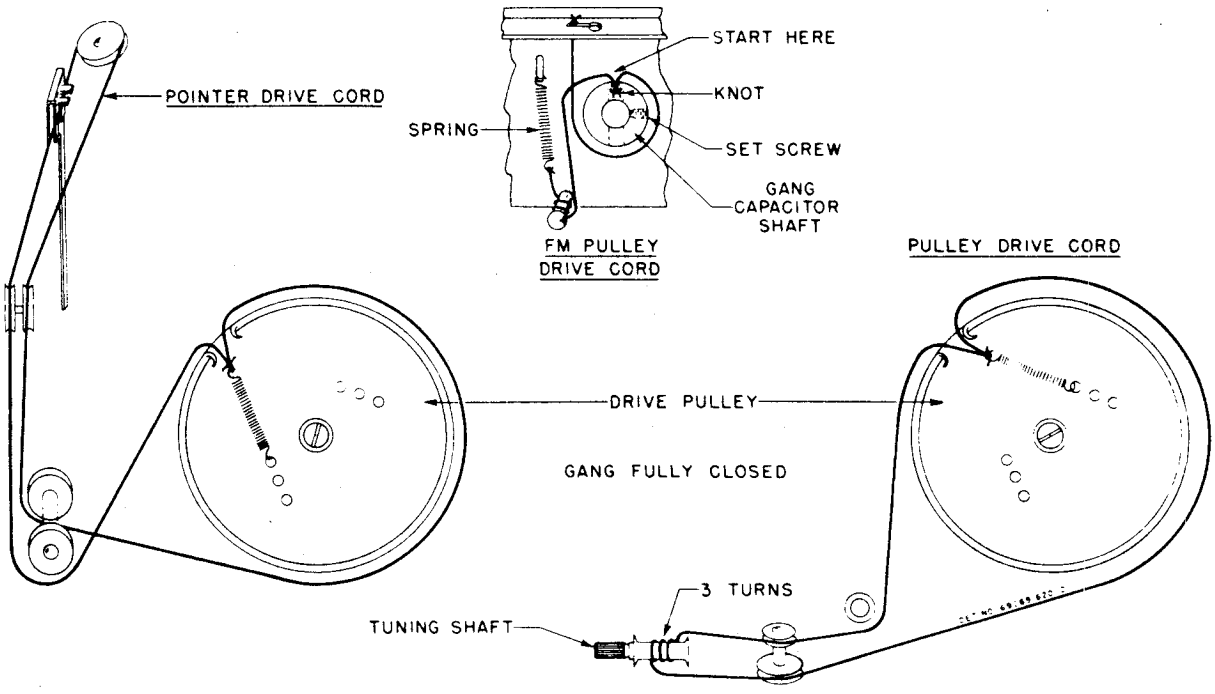


FIGURE 3. STRING DRIVE DETAIL

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

ALIGNMENT

GENERAL INFORMATION

1. Maximum performance can be obtained only if extreme care is exercised during alignment.

2. Use a small fibre screwdriver for aligning the IF transformers.

3. Refer to Figure 4 for the location of all alignment trimmers and cores.

4. As the stages are brought into alignment, reduce the signal generator output to a low value to avoid overloading the receiver.

ORDER OF ALIGNMENT AND EQUIPMENT REQUIRED

1. Broadcast Band IF & RF Alignment
   a. 455 to 1620 Kc AM Signal Generator
   b. Low range output meter

2 (A) FM Band IF & RF Alignment (Preferred Method)
   a. 10.7 to 108 Mc FM signal generator
   b. Oscilloscope

(B) FM Band IF & RF Alignment (Alternate Method)
   a. 10.7 to 108 Mc signal generator (unmod.)
   b. Low range DC electronic voltmeter.

BROADCAST BAND - IF & RF ALIGNMENT

1. With the gang fully closed, adjust the pointer to coincide with the calibration marks at the left of the "55" on the dial scale.

2. Connect the AM signal generator as in chart below, with 400 cycle, 30% modulation.

3. Connect the output meter across the speaker voice coil. Throughout alignment reduce the generator output to a level which produces less than 1.27 volts (.5 watt) across the voice coil, to avoid overloading the receiver.

4. Set the bandswitch to the AM position.

5. Turn the receiver volume control to maximum.

6. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	455 Kc	Fully opened	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	1620 Kc	Fully opened	5 (AM osc)	Adjust for maximum.
3.	.1 mf	Grid of conv. V-2 (pin 7, 6BA7)	1400 Kc	Tune in signal	6 (AM RF)	Adjust for maximum.
4.	-	-	-	-	-	Connect AM loop to chassis.
5.	-	Across radiation loop*	1400 Kc	Tune in signal	7 (AM ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

FM BAND - IF & RF ALIGNMENT (PREFERRED METHOD)

1. The following FM alignment procedure, using an FM signal generator and an oscilloscope, is to be preferred because the actual response pattern may be observed on the scope and adjusted for best symmetry and maximum amplitude.

2. Connect the vertical input terminals of the oscilloscope between the chassis and the junction of resistor R-17 (47K) and capacitor C-21 (1000 mmf).

3. Connect the FM signal generator sync voltage output terminals, through a phase shifting network, to the horizontal input terminals of the scope, as in Figure 5. (Other values of resistance and capacitance may be required, depending upon the scope). The phasing control should be adjusted to give only one trace on the scope. NOTE: If the FM generator has a built-in phase control, the phase shifting network is not necessary.

4. Set the bandswitch to the FM position.

5. Throughout alignment, reduce the generator output to keep the signal just above the noise level, to avoid overloading the receiver.

6. Proceed as shown in the following chart.

GENERATOR CONNECTION	STEP	DUMMY ANTENNA	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
	IF ALIGNMENT					
Grid of 2nd IF Amp V-4 (pin 1, 6AU6)	1.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	8 (ratio det pri)	Adjust for maximum amplitude of pattern.*
Grid of 2nd IF Amp V-4 (pin 1, 6AU6)	2.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	9 (ratio det sec)	Adjust for symmetrical curve, as shown in Figure 6.
-	3.	-	-	-	-	Repeat steps 1 & 2 for maximum amplitude and best symmetry.
Grid of 1st IF Amp V-3 (pin 1, 6BA6)	4.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	10 & 11 (2nd IF sec & pri)	Adjust for maximum amplitude of pattern.*
Grid of conv. V-2 (pin 7, 6BA7)	5.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	12 & 13 (1st IF sec & pri)	Adjust for maximum amplitude of pattern.*
Grid of conv. V-2(pin 7, 6BA7)	6.	1000 mmf	10.7 mc ±100 Kc dev.	Fully opened	10, 11 12 & 13	Readjust for maximum amplitude and best symmetry.
	RF ALIGNMENT					
FM terminal 19 on rear of chassis	7.	270 ohms	105 mc ±22½ Kc dev.	105 mc on dial	14 (osc core)	Adjust for maximum amplitude of pattern.*
-	8.	-	-	Fully closed	15 & 16 (RF & ant cores)	Turn counterclockwise until cores are at bottom of pipe, then turn two turns clockwise.
FM terminal 19 on rear of chassis	9.	270 ohms	90 mc ±22½ kc dev.	Tune in signal	17 & 18 (RF & ant tuning plugs)	Adjust for maximum amplitude of pattern.*
FM terminal 19 on rear of	10.	270 ohms	105 mc ±22½ kc dev.	Tune in signal	15 & 16 (RF & ant cores)	Adjust for maximum amplitude of pattern.*
-	11.	-	-	-	-	Repeat steps 9 & 10 until no further adjustment is necessary.

An output meter across the speaker voice coil will also indicate maximum amplitude. It should not be used in place of the scope, however, since it will not show symmetry of the curve.

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

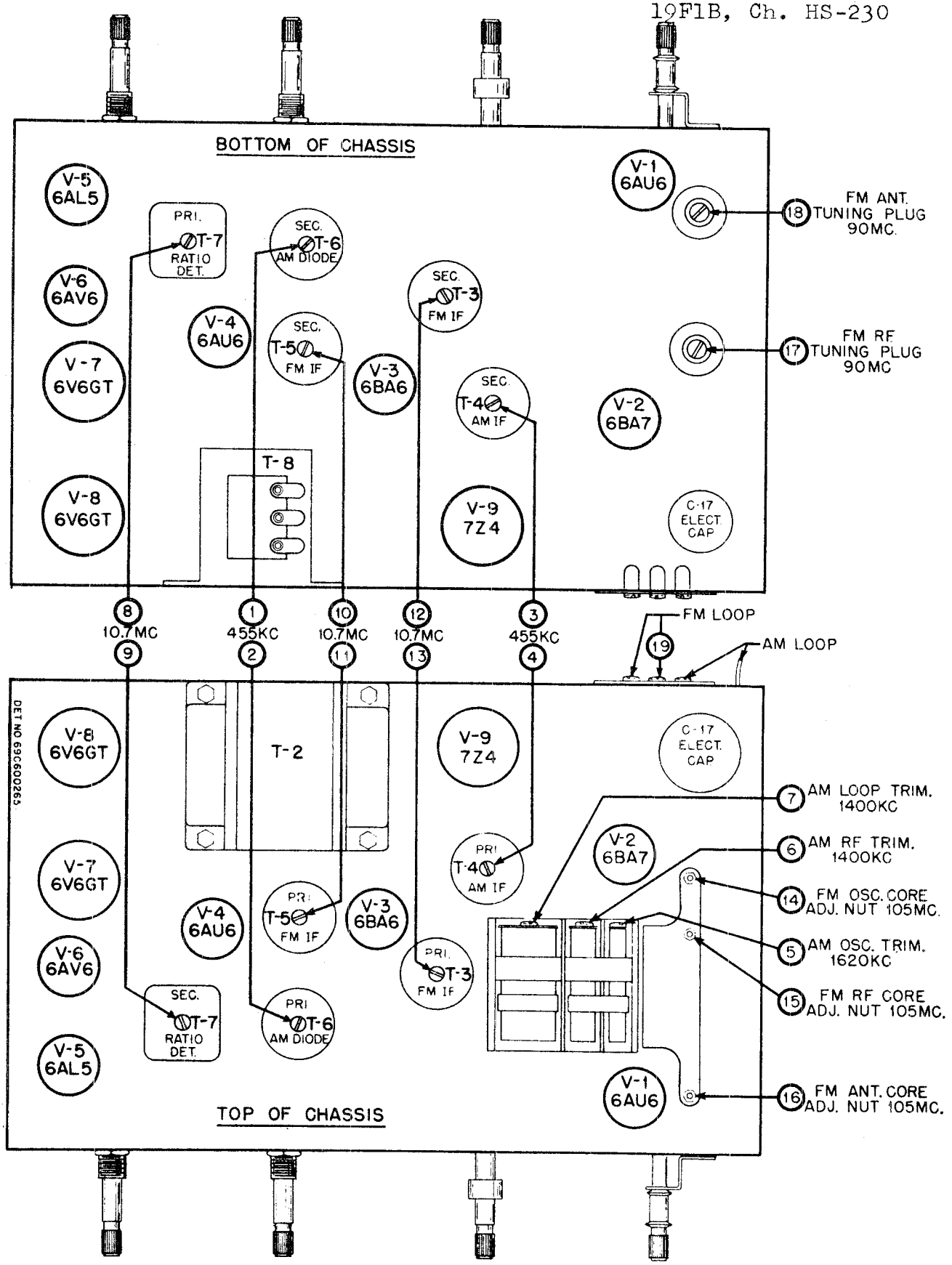


FIGURE 4. TUBE & TRIMMER LOCATIONS

MODELS 16VF8B, 16VF8R,
Ch. HS-211; 19F1,
19F1B, Ch. HS-230

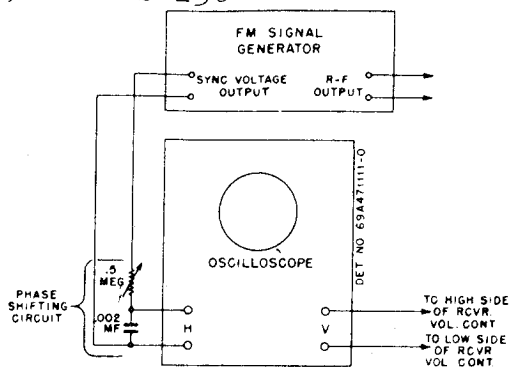


FIGURE 5.

FM SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

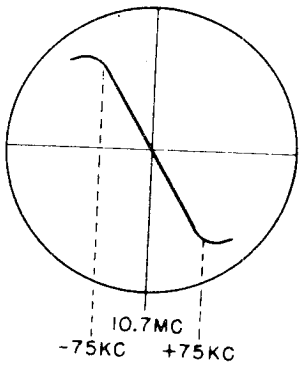


FIGURE 6.

RATIO DETECTOR WAVEFORM

FM BAND - IF & RF ALIGNMENT (ALTERNATE METHOD)

1. The following procedure for FM alignment, with an unmodulated carrier generator and a DC electronic voltmeter, is not as desirable as the preceding method; but it may be used if no FM generator is available.

2. Connect the signal generator as in chart below, with no modulation.

3. Set the bandswitch to the FM position.

4. Except in step 2 below, connect the electronic voltmeter across resistor R-21 (33K) in the ratio detector stage.

5. Throughout alignment reduce the signal generator output to a value which produces no more than a 5 volt rise above no signal voltage, to avoid overloading the receiver.

6. In step 2 below, connect two 100K ohm resistors in series across R-21. Connect the electronic voltmeter between the volume control side of resistor R-17 (47K) and the junction of the two 100K resistors, with the low side of the meter at the 100K resistors.

7. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of conv. V-2 (pin 7, 6BA7)	10.7 mc	Fully opened	8, 10, 11, 12 & 13 (IF cores)	Adjust for maximum.
2	1000 mmf	Grid of conv. V-2 (pin 7, 6BA7)	10.7 mc	Fully opened	9 (ratio det sec)	Adjust for zero. (Connect meter as in step 6 above)
RF ALIGNMENT						
3.	270 ohms	FM terminal 19 on rear of chassis	105 mc	105 mc on dial	14 (osc core)	Adjust for maximum.
4.	-	-	-	Fully closed	15 & 16 (RF & ant cores)	Turn counterclockwise until cores are at bottom of pipe, then turn two turns clockwise.
5.	270 ohms	FM terminal 19 on rear of chassis	90 mc	Tune in signal	17 & 18 (RF & ant tuning plugs)	Adjust for maximum.
6.	270 ohms	FM terminal 19 on rear of chassis	105 mc	Tune in signal	15 & 16 (RF & ant cores)	Adjust for maximum.
7.	-	-	-	-	-	Repeat steps 5 & 6 until no further adjustment is necessary.

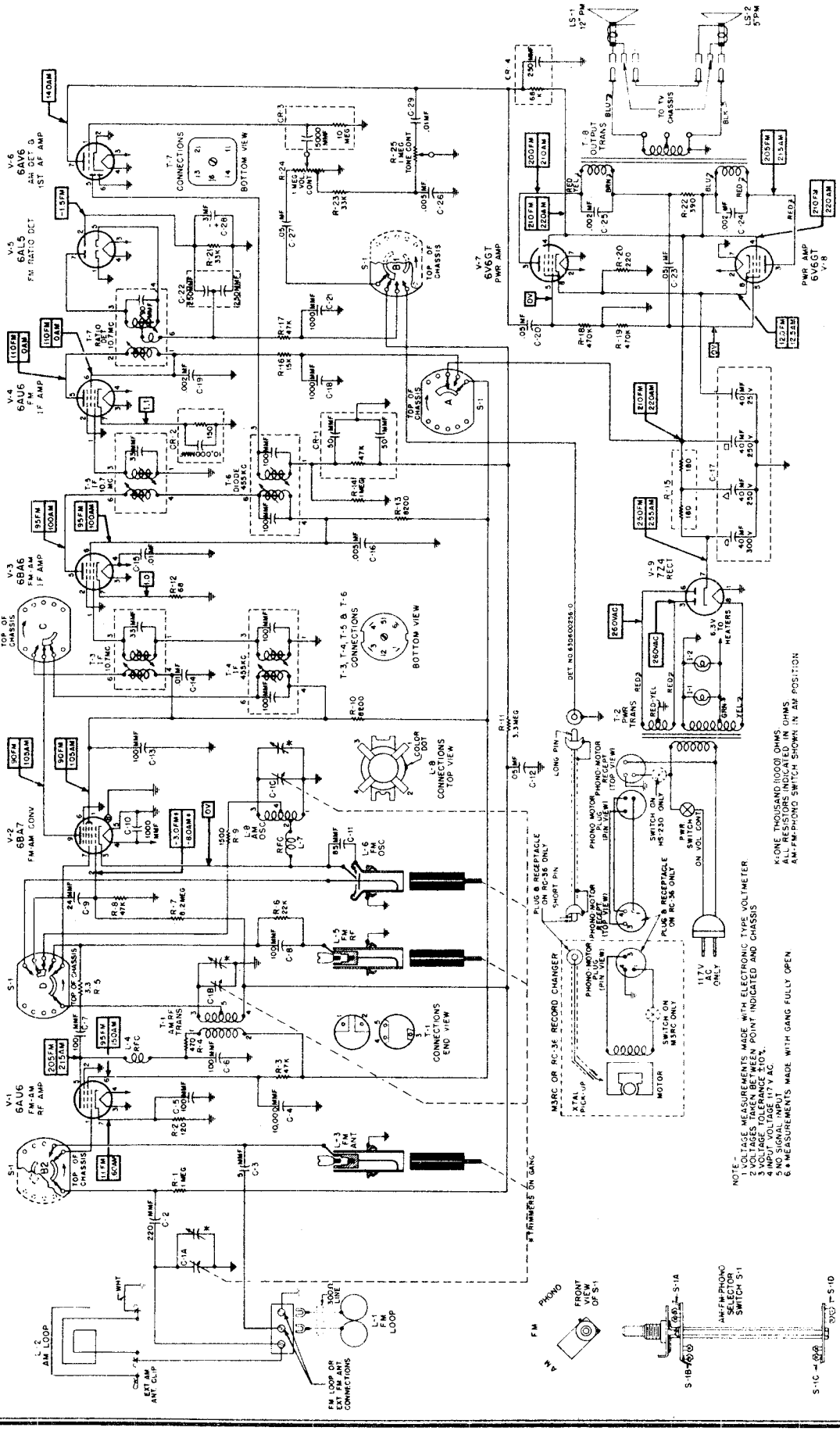


FIGURE 7. SCHEMATIC DIAGRAM

RECORD CHANGER: For Model RC-36,
See Pgs. RCD.CH.21-1 through
RCD.CH.21-15,16.

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
SPEAKERS		
LS-1	50C791631	Speaker: 12" PM; 3.2 ohm VC
LS-2	50C790701 or 50C791430	Speaker: 5" PM; 3.2 ohm VC..
RESISTORS		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-1	6R6004	1 meg 20% ½W .....
R-2	6R5551	120 10% ½W .....
R-3	6R6048	47,000 10% ½W .....
R-4	6R3949	470 20% ½W .....
R-5	6R490131	3.3 10% ½W .....
R-6	6R6028	22,000 20% ½W .....
R-7	6R5585	8.2 meg 10% ½W .....
R-8	6R6048	47,000 10% ½W .....
R-9	6R6038	1500 10% ½W .....
R-10	6R5725	8200 10% 2W .....
R-11	6R6497	3.3 meg 10% ½W .....
R-12	6R2039	68 10% ½W .....
R-13	6R5725	8200 10% 2W .....
R-14	6R6046	1 meg 10% ½W .....
R-15	17A690973	Wirewound: 360 10% 3W; center tapped .....
R-16	6R6431	15,000 10% 1W .....
R-17	6R6056	47,000 20% ½W .....
R-18	6R6032	470,000 20% ½W .....
R-19	6R6032	470,000 20% ½W .....
R-20	6R6389	220 10% 1W.....
R-21	6R6410	33,000 10% ½W .....
R-22	6R5598	390 10% 1W .....
R-23	6R6012	33,000 20% ½W .....
R-24	18K691192	Volume Control: 1 meg; tapped at 300,000 ohms; includes on-off switch .....
R-25	18K77399	Tone Control: 1 meg .....
SWITCHES		
S-1	40B690977	Band Switch: AM-FM-PHONO.....
S-2	-	On-off Switch (on volume control)
S-3	40A691922	Phono-Radio-Switch; SPST (HS-234)
TRANSFORMERS		
T-1	24B690899	AM RF Transformer .....
T-2	25B691035	Power Transformer .....
T-3	24B690540	1st FM IF Transformer (orange dot): 10.7 mc; complete with capacitor and cores; less shield
T-4	24B482863	AM IF Transformer (brown dot): 455 Kc: complete with capacitors and cores; less shield....
T-5	24B690541	2nd FM IF Transformer (yellow dot): 10.7 mc; complete with capacitor and cores; less shield
T-6	24B482865	AM Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield....
T-7	24B690542	Ratio Detector Transformer: 10.7 mc: complete with capacitors, cores and shield.....
T-8	25B690898	Audio Output Transformer.....

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B690978	Variable, 3 gang .....
C-2	21K77375	Ceramic: 220 mmf 500V .....
C-3	21K70720	Ceramic: 5 mmf 500V .....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V .....
C-5	21B77286	Ceramic: 100 mmf 500V .....
C-6	21B77286	Ceramic: 100 mmf 500V .....
C-7	21B77286	Ceramic: 100 mmf 500V .....
C-8	21R6554	Mica: 100 mmf 10% 500V .....
C-9	21K28816	Ceramic: 24 mmf 500V .....
C-10	21K478410	Ceramic: 1000 mmf 500V .....
C-11	21K691203	Ceramic: 85 mmf 500V .....
C-12	8R9821	Paper: .05 mf 200V .....
C-13	21B77286	Ceramic: 100 mmf 500V .....
C-14	8R9809	Paper: .01 mf 400V .....
C-15	8R9809	Paper: .01 mf 400V .....
C-16	8R9813	Paper: .005 mf 600V .....
C-17	23B690975	Electrolytic: 40 mf/300V, 40-40 mf/250V, 40 mf/25V..... ....
C-18	21K478410	Ceramic: 1000 mmf 500V .....
C-19	8R9824	Paper: .002 mf 400V .....
C-20	8K470606	Paper: .05 mf 400V .....
C-21	21K478410	Ceramic: 1000 mmf 500V .....
C-22	21B484337	Ceramic: dual; 250-250 mmf/450V.
C-23	8K470606	Paper: .05 mf 400V .....
C-24	8R9824	Paper: .002 mf 400V .....
C-25	8R9824	Paper: .002 mf 400V .....
C-26	8R9813	Paper: .005 mf 600V .....
C-27	8R9821	Paper: .05 mf 200V .....
C-28	23K690543	Electrolytic: 3 mf 50V .....
C-29	8R9809	Paper: .01 mf 400V .....
CAPACITOR-RESISTOR		
CR-1	21K690980	Capacitor-Resistor: 50 mmf-50 mmf 47,000 ohms .....
CR-2	21K680007	Capacitor-Resistor: 10,000 mmf 150 ohms .....
CR-3	21K691125	Capacitor-Resistor: 5000 mmf 10 meg .....
CR-4	21K690979	Capacitor-Resistor: 250 mmf 68,000 ohms .....
DIAL LIGHT		
I-1, I-2	65X11854	Bulb, dial light: #47; 6-8V; .15 amp; clear; bayonet base .....
COILS		
L-1	24K690985	FM Loop antenna: with lead.....
L-2	24C690896	AM Loop antenna .....
L-3	24C690584	Inductor and Capacitor Assembly: FM antenna: less tuning core...
L-4	24A484025	RF choke .....
L-5	24C690584	Inductor and Capacitor Assembly: FM RF; less tuning core .....
L-6	24K690996	Inductor and Capacitor Assembly: FM oscillator; less tuning core
L-7	24K780128	RF choke: insulated .....
L-8	24B690976	AM oscillator coil .....

MODELS 16VF8B, 16VF8R, Ch. HS-211; 19F1, 19F1B, Ch. HS-230

PART NUMBER	DESCRIPTION
CHASSIS PARTS - MECHANICAL	
1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet and single anti-backlash clip .....
1X691127	Bracket & Pullies Assembly: includes two pullies and shoulder rivet (cord guides on chassis front) .....
7C690567	Bracket, tuner mtg (gang mtg).....
7A77337	Bracket, tuning shaft .....
43K890398	Bushing, line cord retainer (use with 43A890397) .....
43A890397	Bushing, line cord strain relief (use with 43K890398) .....
42A690560	Clip, anti-backlash: double (on tuner mounting brkt) .....
42K690561	Clip, anti-backlash: single (on core mtg brkt) .....
42B482867	Clip, spring: blued finish (holds IF transformer) .....
11M488137	Cord, dial (core drive) .....
11M8944	Cord, dial (pointer drive).....
30K21859	Cord, line: with plug: 9 ft long .....
46B692164	Core, iron and screw: green dot (FM osc tuning core) .....
46K692165	Core, iron and screw (FM RF and ant tuning core) .....
34C690897	Dial scale: glass .....
1X691136	Dial Scale and Plate Assembly: complete with cord pulleys .....
5S7866	Eyelet: .125 x .091; brass; nkl pl (core drive cord retainer).....
1X600081	Link Assembly, bandswitch actuating: complete with bushings; less setscrews
4S9751	Lockwasher, int-ext: #8; cad pl (pointer drive pulley mtg).....
2S7019	Nut, hex: 4-40 x 1/4; cad pl (FM tuning core mtg) .....
2S7051	Nut, hex palnut: 3/8-32 x 9/16; cad pl (bandswitch, tone and volume control mtg) .....
52B481704	Pointer, dial .....
49A21741	Pulley, cord: 3/8" groove (on chassis front) .....
49A73807	Pulley, cord: 1/2" groove (on chassis side and on dial plate) .....
49A26433	Pulley, cord: 21/32" groove (on chassis front) .....
49A690562	Pulley, core drive: brass .....
1K691145	Pulley, pointer drive: 3-1/2" diameter
9K592170	Receptacle, phono pick-up: 1 prong....
9A27674	Receptacle, phono power: 3-prong.....
5S8497	Rivet: .088 x 1/8 stl; nkl pl (single anti-backlash clip mtg) .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (min and midget tube socket mtg)....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (loctal tube socket, terminal strip, output transformer mtg).....
5S7701	Rivet: .122 x 3/16 stl; nkl pl (power receptacle, ant term strip, and tuning shaft bracket mtg).....
5S7700	Rivet: .122 x 1/4; stl; nkl pl (octal tube socket mtg).....
5K13896	Rivet, shoulder (tuning core cord guide and pulley mtg on front of chassis) .....
5K71246	Rivet, shoulder (pulley mtg on side of chassis and on left side of dial plate) .....
5K481770	Rivet, shoulder (for double pullies on dial plate) .....
3S7462	Screw, machine: 6-32 x 3/16 plain hex head; cad pl (electrostatic shield mtg) .....
3S7326	Screw, machine: 8-32 x 3/16 plain locking hex head; cad pl (gang mtg) .....
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; cad pl (pointer drive pulley mtg) .....
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (tuner brkt mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (dial plate assembly mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; cad pl (power trans mtg) .....
3S7103	Setscrew: 8-32 x 1/8 Allen head; cad pl (core drive pulley mtg).....
3S7113	Setscrew: 8-32 x 1/4 slab head; cad pl (bandswitch link assembly mtg).
47A690893	Shaft, bandswitch actuating (HS-211)..
1X691134	Shaft, tuning: complete with pulley...
26K485936	Shield, coil: for IF transformers.....
26A470013	Shield, dial light .....
26K690984	Shield, electrostatic (gang shield)...
26K690981	Shield, tube: spring type .....
26A692080	Shield, tube (for V-9) .....
9K471935	Socket, dial light: includes brkt.....
9A72519	Socket, tube: loctal .....
9A690129	Socket, tube: midget; 7 prong (for V-1)
9K484167	Socket, tube: miniature; 7 prong .....
9A485495	Socket, tube: noval; 9-prong .....
9A76209	Socket, tube: octal .....
41A690598	Spring, coil: 7 turns; cosmoline dipped (FM RF & ant core mtg) .....
41K691840	Spring, coil: 8 turns; copper plated (FM osc core mtg) .....
41A14244	Spring, tension (core & pointer drive cord) .....
41K692081	Spring, tube shield retaining (for V-9 shield) .....
37K21114	Strip, channel: rubber; 1" long (dial scale mtg) .....
31K37504	Strip, terminal: 1 insulated lug; #1 mtg; 3/8" spacing .....
31K51251	Strip, terminal: 1 insulated lug, #1 gnd; 3/8" spacing .....
31K471565	Strip, terminal: 3 insulated lugs, #4 gnd; 3/8" spacing .....
31A690974	Strip, terminal: 7 insulated lugs, #4 & 9 gnd; 3/8" spacing .....
31K471498	Strip, terminal: 3-screw (antenna input) .....
29K5412	Terminal, plain pin (on speaker leads) .....
4A70015	Washer, 'C' (tuning shaft retainer) .....
CABINET PARTS	
39K17396	Contact, pin terminal (in molded phono motor receptacle)(19F1)..
13C791478	Escutcheon, radio dial: brass...
5A71081	Eyelet (radio chassis mtg).....

CHASSIS HS-211,
HS-230, HS-230A

PART NUMBER	DESCRIPTION
5A71092	Grommet, rubber (radio chassis mtg)
14K791482	Insulator, fibre (clamps phono and antenna leads) .....
36B790569	Knob, control: no dot; beige plastic (radio controls) .....
36K791630	Knob, control: with dot; beige plastic (radio controls) .....
1X792530	Lead and Plugs Assembly, phono pick-up (shielded lead with two phono pick-up plugs)(19F1) .....
64D791510	Panel, cabinet back: fibre (covers radio and phono compartments)(16VF8)
64K792522	Panel, cabinet back: fibre (covers radio and phono compartments)(19F1)..
28K71775	Plug, phono pick-up (short plug on phono lead)(19F1) .....
28K22183	Plug, phono pick-up (long plug on phono lead)(19F1) .....
28K30736	Plug, phono motor: 3-pin; includes shell (on phono motor lead).....
9K470402	Receptacle, phono motor: 5-prong; molded; includes contacts (19F1) ....
9A600040	Receptacle, phono motor: 3-prong; includes shell (19F1) .....
3S7536	Screw, sheet metal: #6 x 3/8 PKA slotted acorn head; antique copper finish (cabinet back panel mtg).
3S7534	Screw, sheet metal: #8 x 1-3/8 PKA plain hex head; cad pl (radio chassis mtg) .....
15K74443	Shell, plug (on 28K30736 phono motor plug) .....
15A690616	Shell, receptacle (on 9A600040 phono motor receptacle)(19F1) .....
4S490513	Washer, flat: 3/4 x 7/32 x .042 stl; cad pl (radio chassis mtg)...

GENERAL INFORMATION

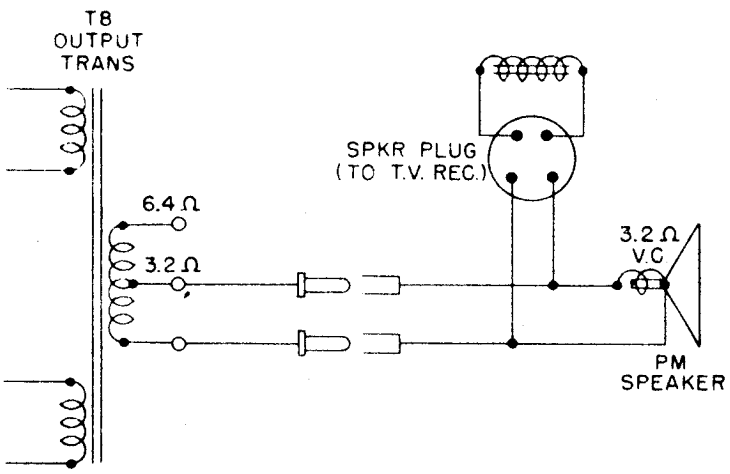
AM-FM radio chassis HS-230A is the same as chassis HS-230 except that the output transformer secondary winding is connected for use with one speaker instead of dual speakers.

SERVICE NOTE

The following service note applies only to television-radio combinations, where both chassis use the same speaker:

One side of the output transformer secondary winding is grounded in some HS-230A chassis. If the leads to the speaker are not correctly polarized, a 60 cycle hum may be induced into the speaker from the power line because of coupling between the radio and TV chassis. This AC hum will be noticed even with both the radio and the TV power switches turned off.

To eliminate the hum, reverse the leads from the radio at the receptacles on the speaker.



REVISED SPEAKER CIRCUIT IN CHASSIS HS-230A

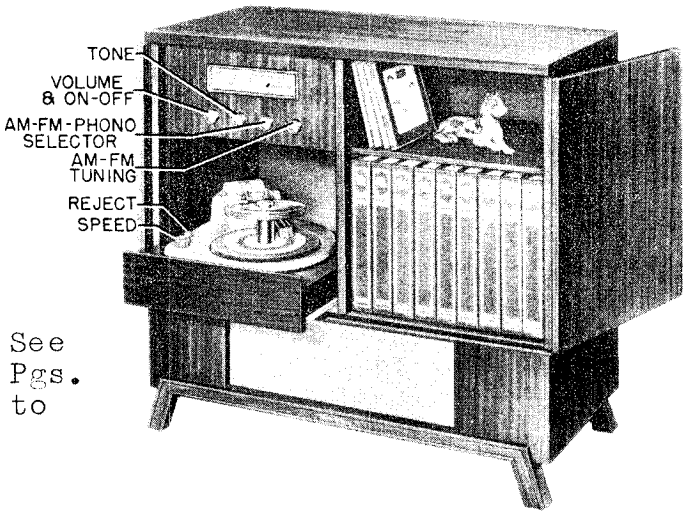
MODEL 91FM21,
Ch. HS-230A

GENERAL INFORMATION

TYPE - AM-FM Radio-Phonograph Combination

CHASSIS - HS-230A. Refer to HS-230 & HS-230A Service Manual for service information.

PHONOGRAPH - Model RC-37, three-speed; 33, 45 & 78 RPM. Refer to RC-37 Service Manual for record changer service information.



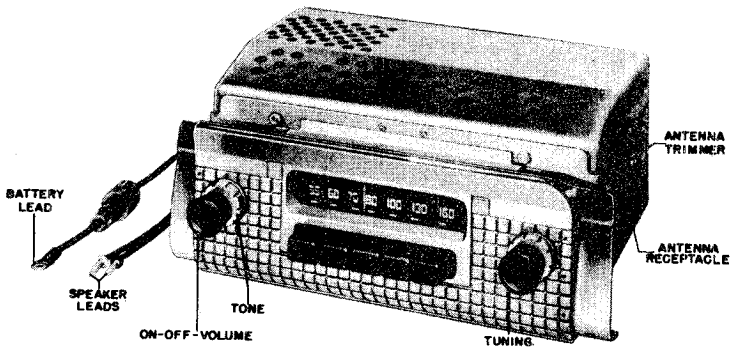
RECORD CHANGER: See Model RC-37, on Pgs. RCD.CH.21-17,18 to RCD.CH.21-29.

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part. For chassis & record changer replacement parts, refer to their respective service manuals.

Part Number	Description
CABINET PARTS	
16F610008	Cabinet, console: red-brn mahogany; complete, less escutcheon, loop antennas, and speaker.....
55B72307	Catch, bullet: statuary bronze finish (door latch on cabinet)...
13K700763	Cloth, grille: 22-5/8 x 7-5/8; mahogany & gold.....
15D610006	Cover, cabinet back.....
13B72750	Escutcheon, dial.....
5A71081	Eyelet, chassis mtg: plain; 9/32" long.....
5A600963	Eyelet, chassis mtg: pierced; 1/8" long.....
5A71092	Grommet, chassis mtg.....
55K790566	Handle, door: brass plated.....
55K791499RH	Hinge, stop: statuary bronze finish (upper right & lower left).....
55K791499LH	Hinge, stop: statuary bronze finish (upper left & lower right).....
36C701150	Knob, control.....
1X601844	Lead Assembly, phono motor: complete
1X601843	Lead & Plug Assembly: phono pick-up (includes shielded lead and plugs)
62K70581	Logotype: "Motorola"; gold finish.
24C690896	Loop Antenna, AM.....
24C482890	Loop Antenna, FM; with lead.....
55C790564	Plate, door: brass plated.....
28K22183	Plug, phono pick-up.....
28A27573	Plug, phono motor: 3-pin.....
9A600040	Receptacle, phono motor: 3-prong..
3K791011	Screw, machine: 8-32 x 1-1/4; oven head cross slot (door pull mtg)
3S7526	Screw, sheet metal: #8 x 1-1/8; plain hex head (chassis mtg)..
15A690616	Shell, receptacle: with insulator (phono motor receptacle).....
15K74442	Shell, receptacle: with insulator (phono motor plug).....
50C610000	Speaker, PM: 6" x 9" oval.....
55K72308	Strike, bullet: statuary bronze finish; with 1/2" nail (door latch on door).....
55K601672	Track & Channel, record changer drawer.....
4S490513	Washer, flat: 3/4 x 7/32 x .042 cad pl (chassis mtg).....

MODEL KR1,
Ch. 1A



TYPICAL RECEIVER USING CHASSIS 1A.
MODEL KR1 ILLUSTRATED

GENERAL INFORMATION

TYPE - Automotive type universal radio chassis. In addition to Model KR1, this chassis will be used on subsequent models. Separate service manuals covering these models will be issued as required.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT -

6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Diode, detector, AVC & 1st AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3V DC

POWER OUTPUT - 3.5 watts (max)

TUNER - Model AT-86 or AT-90. See AT-86 or AT-90 Service Manual for Replacement Parts.

OPERATING INSTRUCTIONS

TO TURN RADIO "ON"

The On-Off switch is combined with the volume control. Turn the knob clockwise until a "click" indicates the receiver is "on". Wait a few seconds for the tubes to heat up, before tuning-in a station.

STATION SELECTOR

Turn the volume "up" until stations can be heard; then turn the station selector knob until the desired station is received. After station is tuned in properly, adjust the volume control to the desired level.

SET AUTOMATIC TUNING

The receiver has 5 buttons for automatic station selection. To set the push buttons on automatic tuning, proceed as follows:

1. Turn volume up until stations can be heard.

2. Pull out button to unlock tuner and with the station selector, tune to the station desired.

3. Push button in to lock tuner. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining four buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

TO TURN THE RADIO "OFF"

Turn the volume knob counterclockwise until a "click" indicates that the receiver is "off".

ALIGNMENT

EQUIPMENT REQUIRED:

1. A special tool for adjusting the tuner cores. Use alignment tool, Motorola Part No. 66A76278.

2. A small screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 2.

PROCEDURE:

1. To expose the alignment adjustments, remove the top and bottom covers. If the tuner cores require adjustment, remove the escutcheon and dial scale bracket assembly.

2. Connect a PM speaker (3.2 ohm VC) to "VC" and "GND" terminals of the receiver.

3. Connect an output meter across the speaker voice coil.

4. Connect 6.3 volts to the receiver "A" lead terminal and chassis.

5. Turn the receiver "on" and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt = 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

7. Antenna Trimmer Adjustment. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

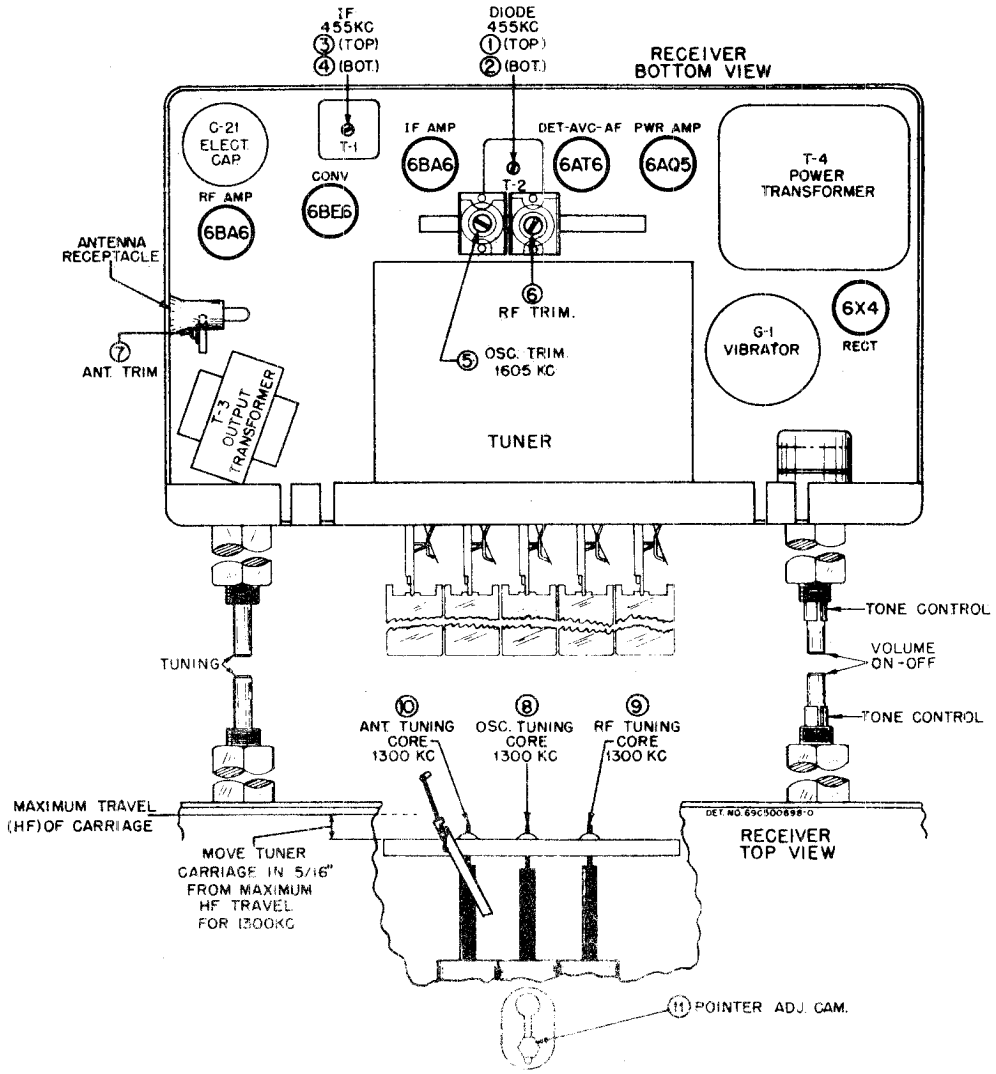


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODEL KR1,
Ch. 1A

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side -6BE6 grid (pin #7) Low side-chassis	455 kc	Extreme high frequency end of travel	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
NOTE: If the tuner is tracking properly over its entire range, the tuner cores 8, 9, & 10 will not require adjustment- proceed as follows:						
2.	Dummy- see Fig. 1	Ant. receptacle thru dummy antenna	1605 kc	Extreme high frequency end of travel	5	Peak for maximum.
3.	"	"	1300 kc	With tuning knob, tune to maximum signal	6 & 7	Peak for maximum in order indicated.
4.	-	-	-	-	-	Repeat steps 2 & 3.
NOTE: If the tuner coils or cores have been replaced or tampered with, or the tuner does not cover the required range, the tuner cores 8, 9, & 10 require adjustment - proceed as follows:						
5.	Dummy- see Fig. 1	Ant receptacle thru dummy antenna	1605 kc	Extreme high frequency end of travel	5, 6, & 7	Remove escutcheon and dial scale bracket. Peak for maximum in order indicated.
6.	"	"	1300 kc	With tuning knob, move carriage "in" 5/16" from position in step 5.	8, 9, & 10	Peak for maximum in order indicated.
7.	"	"	1605 kc	With tuning knob, tune for maximum signal at high frequency end.	5, 6, & 7	Peak for maximum in order indicated.
8.	"	"	1300 kc	With tuning knob, tune to maximum signal	8, 9, & 10	Peak for maximum in order indicated.
9.	-	-	-	-	-	Repeat step 7.

POINTER ADJUSTMENT

10. Tune receiver to 1300 kc and adjust pointer by means of eccentric cam (11) on the tie plate to the 1300 kc calibration mark on dial scale.

11. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 kc. Car antenna should be fully extended.

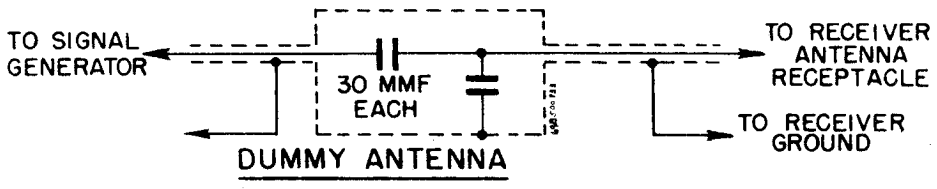


FIGURE 2. DUMMY ANTENNA DETAIL

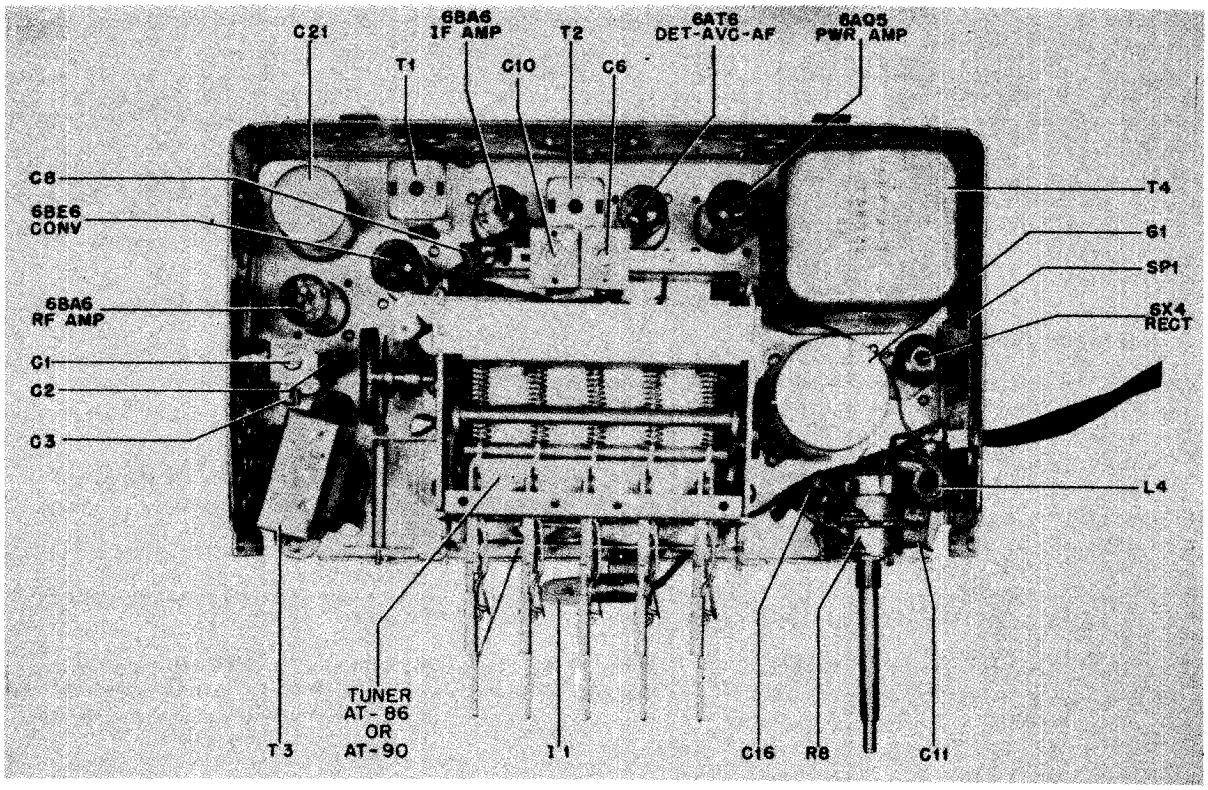


FIGURE 3. TOP VIEW OF CHASSIS

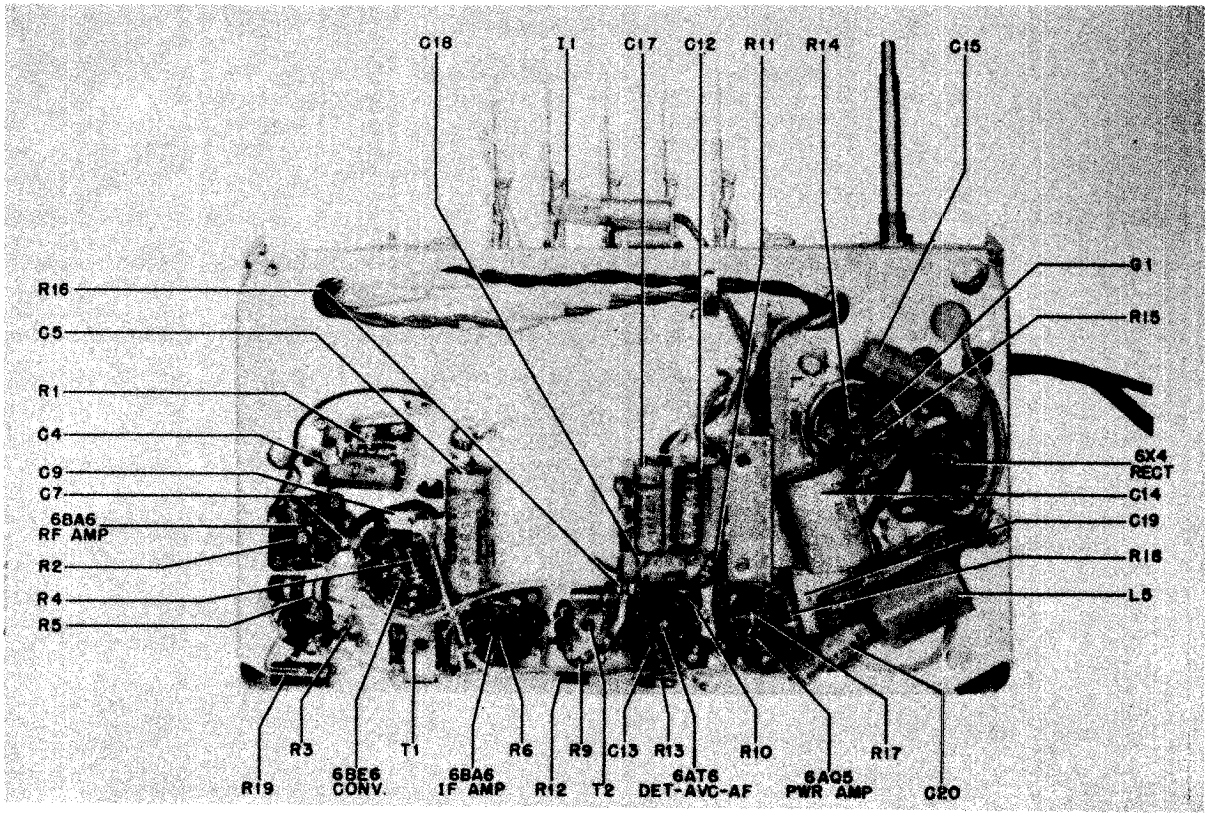


FIGURE 4. BOTTOM VIEW OF CHASSIS

MODEL KR1,
Ch. 1A

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref No.	Part Number	Description
CHASSIS 1A ELECTRICAL PARTS		
Capacitors		
C-1	21A591682	Mica, metal: 90 mmf 500V...
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A501419	Mica, variable: 50 to 280 mmf; includes bracket .....
C-4	8R13514	Paper: .05 mf 100V .....
C-5	8R13166	Paper: .1 mf 400V .....
C-6	-	Variable, mica: RF trimmer (See AT-86 or AT-90 Service Manuals) .....
C-7	21K70720	Molded, miniature: 5 mmf 500V
C-8	-	Ceramic: temperature compensating (See AT-86 or AT-90 Tuner Service Manuals).....
C-9	21R6513	Mica: 50 mmf 500V .....
C-10	-	Variable, mica: osc trimmer (See AT-86 or AT-90 Tuner Service Manuals) .....
C-11	8K17028	Paper: .5 mf 100V .....
C-12	8R472754	Paper: .01 mf 100V .....
C-13	21K70720	Molded, miniature: 5 mmf 500V
C-14	8K17028	Paper: .5 mf 100V .....
C-15	8R490449	Paper: .02 mf 1000V .....
C-16	8R51209	Paper: .02 mf 100V .....
C-17	8K71910	Paper: .006 mf 400V .....
C-18	8R23690	Paper: .01 mf 400V .....
C-19	21R6590	Mica: 500 mmf 500V .....
C-20	8K71909	Paper: .004 mf 400V .....
C-21	23A485677	Electrolytic: 15-10 mf/350V; 20 mf/25V .....
Fuse		
F-1	65K16248	9 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin ..
Pilot Light		
I-1	65X10867	Bulb: 6.3V .25A .....
Coils		
L-1	-	Antenna coil (See AT-86 or AT-90 Tuner Service Manuals)
L-2	-	RF coil (See Tuner AT-86 or AT-90 Tuner Service Manuals)
L-3	-	Oscillator coil (See AT-86 or AT-90 Tuner Service Manuals)
L-4	24K592269	Choke, hash .....
L-5	24A472535	Choke, hash .....
Resistors		
	Note:	All resistors are carbon insulated type, unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W.....
R-2	6R3992	150 20% 1/2W .....
R-3	6R6075	100,000 20% 1/2W ....
R-4	6R6012	33,000 20% 1/2W .....
R-5	6R476012	3900 10% 2W .....
R-6	6R6010	330 20% 1/2W .....
R-7	6R6394	12,000 10% 1/2W .....
R-8A,B	18B501206	Volume-On-Off-Tone Control (R-8A 250,000 ohms; R-8B 1 meg) .....
R-9	6R6056	47,000 20% 1/2W .....
R-10	6R2122	4.7 meg 20% 1/2W .....
R-11	6R5577	2700 10% 1/2W .....
R-12	6R6004	1 meg 20% 1/2W .....
R-13	6R6004	1 meg 20% 1/2W .....
R-14	6R5614	56 10% 1/2W .....
R-15	6R5614	56 10% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....
R-17	6R6015	220,000 20% 1/2W .....
R-18	6R6336	270 10% 1W .....
R-19	6R476130	2200 20% 2W .....
Spark Plate		
SP-1	1A501207	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF Transformer, 455 kc: complete with padding capacitor and tuning cores .....
T-2	24B485555	Diode Transformer, 455 kc: complete with padding capacitor and tuning cores .....
T-3	24B500727	Output Transformer .....
T-4	25B472533	Power Transformer .....
Tuner - Model AT-86		
	51D501442	Tuner, Model AT-86: complete with pinion shaft (See AT-86 Tuner Service Manual for breakdown) .....
OR		
Tuner - Model AT-90		
	51D502000	Tuner, Model AT-90: complete with pinion shaft (See AT-90 Tuner Service Manual for breakdown) .....
CHASSIS 1A MECHANICAL PARTS		
	7B501472	Bracket, shield (near vib socket)
	42A485548	Clip, coil can mtg .....
	42B500725	Clip, bottom cover retainer ...
	42A4215	Clip, vibrator grounding .....
	1X500714	Cover Assembly, bottom: includes clips and grounding wiper .....
	5C500663	Cover, top .....
	1X501612	Lead Assembly, speaker cable ...
	9A472148	Receptacle, antenna .....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
	5S7706	Rivet: .122 x 1/8; stl; nkl pl (cover retainer clip and terminal strip mtg) .....
	5S7701	Rivet: .122 x 3/16 stl; nkl pl (vibrator clip & spark plate mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer & capacitor mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (pwr trans, housing, & shield bracket mtg) .....
	9A500709	Socket, pilot light: includes brkt.
	9A70208	Socket, tube: 4-prong (for vibrator)
	9A472534	Socket, tube: 7-prong .....
	9K580218	Socket, tube: 7-prong; with one dummy lug .....
	31K490142	Strip, terminal: 2 insulated lugs, #1 mtg .....
	31K490143	Strip, terminal: 2 insulated lugs, #2 mtg .....
	31A500705	Strip, terminal: 3 insulated lugs, #2 mtg .....
	29A76280	Terminal, speaker cable: black.
	29K76282	Terminal, speaker cable: white..
	39K470032	Wiper, grounding (bottom cover).
RECEIVER KR1 - MOUNTING PARTS, ACCESSORIES		
	7B501170	Bracket, dial background .....
	7C501187	Bracket, dial mtg .....
	7D501138	Bracket, radio mtg .....
	43A501167	Bushing, tuning and volume control mtg .....
	1X501247	Button, push .....
	8A4491	Capacitor, noise suppression .....
	42A591931	Clip, dial glass retaining .....
	32B501170	Gasket, speaker .....
	36K592304	Knob, dummy: notched disc; chrome pl
	36B473538	Knob, tone control: notched disc; chrome pl .....
	36K501199	Knob, tuning and volume control: includes setscrew .....
	4S7658	Lockwasher: #10 int; stl; cad pl (speaker mtg) .....
	4S7668	Lockwasher: 3/8 ext; stl; cad pl (tuning and volume control mtg) .....
	4S7653	Lockwasher: 5/16 int-ext; stl; cad pl (receiver mtg) .....

4S7690	Lockwasher: 5/16 ext; stl; cad pl (receiver mtg)	34B501134	Scale, dial	3S7104	Setscrew: 8-32 x 3/16; slotted headless; stl; cad pl (control knob retainer) .....
2S7003	Nut, hex: 8-32 x 5/16; stl; cad pl (speaker mtg)	3S400346	Screw, machine: 5/16-18 x 2-1/2; plain hex head; stl; cad pl (receiver mtg brkt mtg)	51D501253	Shaft and Bushing Assembly, manual drive (complete) .....
2S2869	Nut, hex: 7/16-28 x 9/16; pol nkl (overlay mtg)	3S7487	Screw, sheet metal: 8-32 x 5/16; plain hex head; stl; cad pl (front plate to tuner mtg)	51A501042	Shaft and Drive Disc Assembly, pinion (complete) .....
2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg)	3S7454	Screw, sheet metal:#8 x 1/4; PKZ; plain hex head; stl; cad pl (dial background bracket mtg, dial brkt mtg, receiver mtg brkt mtg, front plate mtg)	50B501989	Speaker, PM: 6" x 6"; 3.2 ohm VC
13D501171	Overlay, instrument panel: chrome pl			41A77592	Spring, compression (behind control knob) .....
64C501135	Plate, front cover			6A4141	Suppressor, distributor .....
1X501249	Plate and Gasket Assembly, spkr....			4A501015	Washer, "C" (tuning shaft bushing retainer) .....
1X501245	Pointer and Sleeve Assembly			4S400351	Washer, flat: 1/8 x .328 x .067 thick; stl; cad pl (recvr mtg)
1X501252	Receptacle, fuse and lead: complete				
9K580650	Receptacle, fuse				

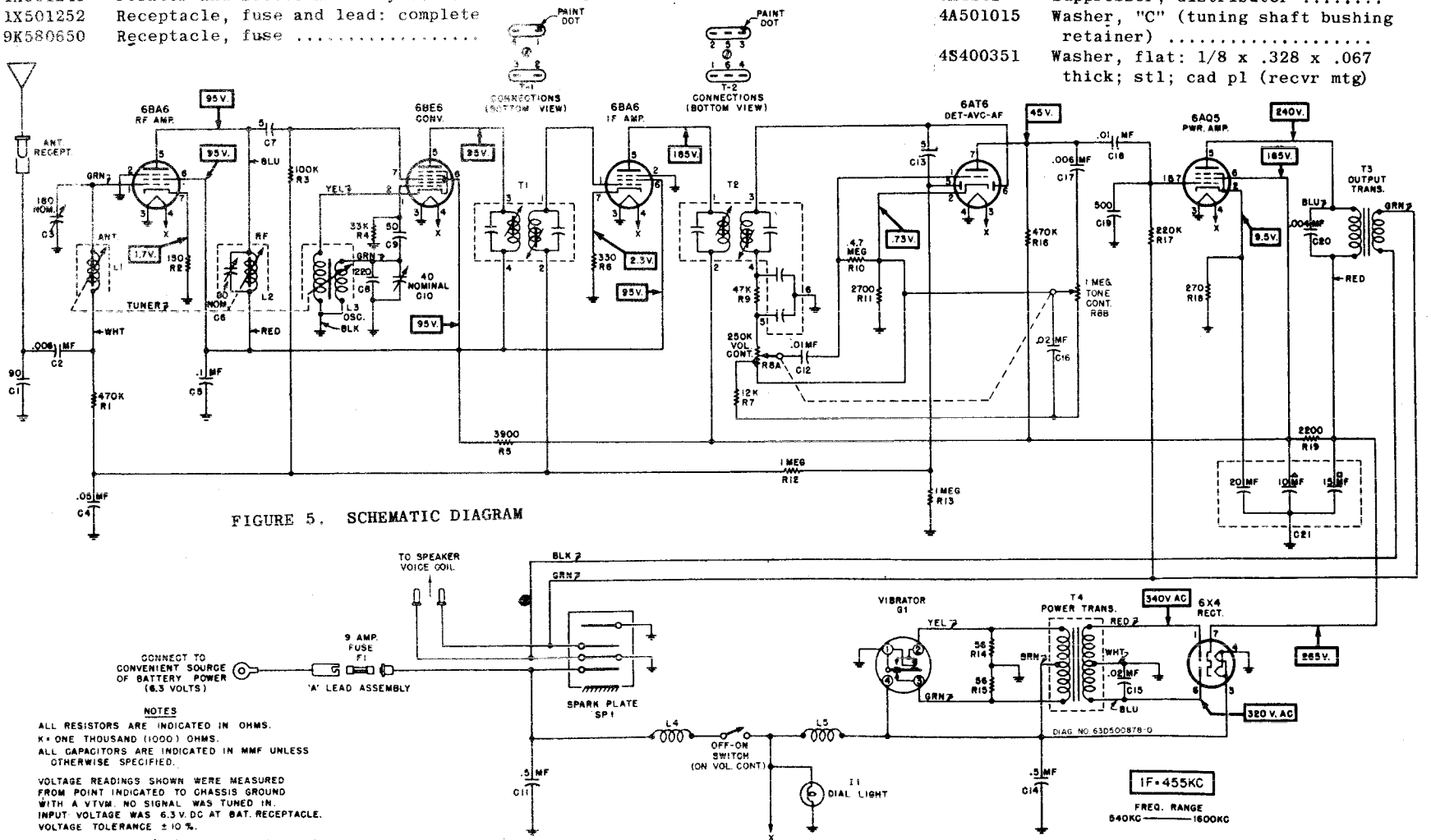


FIGURE 5. SCHEMATIC DIAGRAM

NOTES

ALL RESISTORS ARE INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.
ALL CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

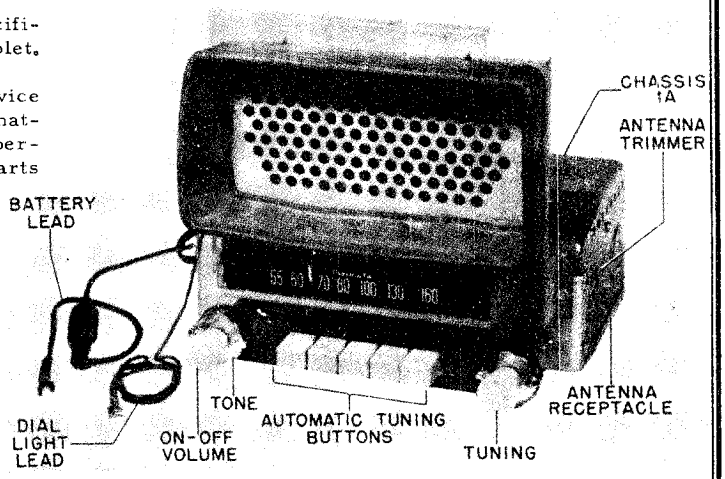
VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS GROUND WITH A VTVM. NO SIGNAL WAS TUNED IN. INPUT VOLTAGE WAS 6.3 V. DC AT BAT. RECEPTACLE. VOLTAGE TOLERANCE ± 10 %.

MODEL CT1, Ch. 1A,
Chevrolet

GENERAL INFORMATION

TYPE - Automotive type superheterodyne receiver specifically designed for installation in the 1951 Chevrolet.

CHASSIS USED - Chassis 1A. Refer to Chassis 1A Service Manual, Part No. 54P501584 for schematic, alignment, push button set-up, operating instructions, and replacement parts list.



INSTALLATION INFORMATION

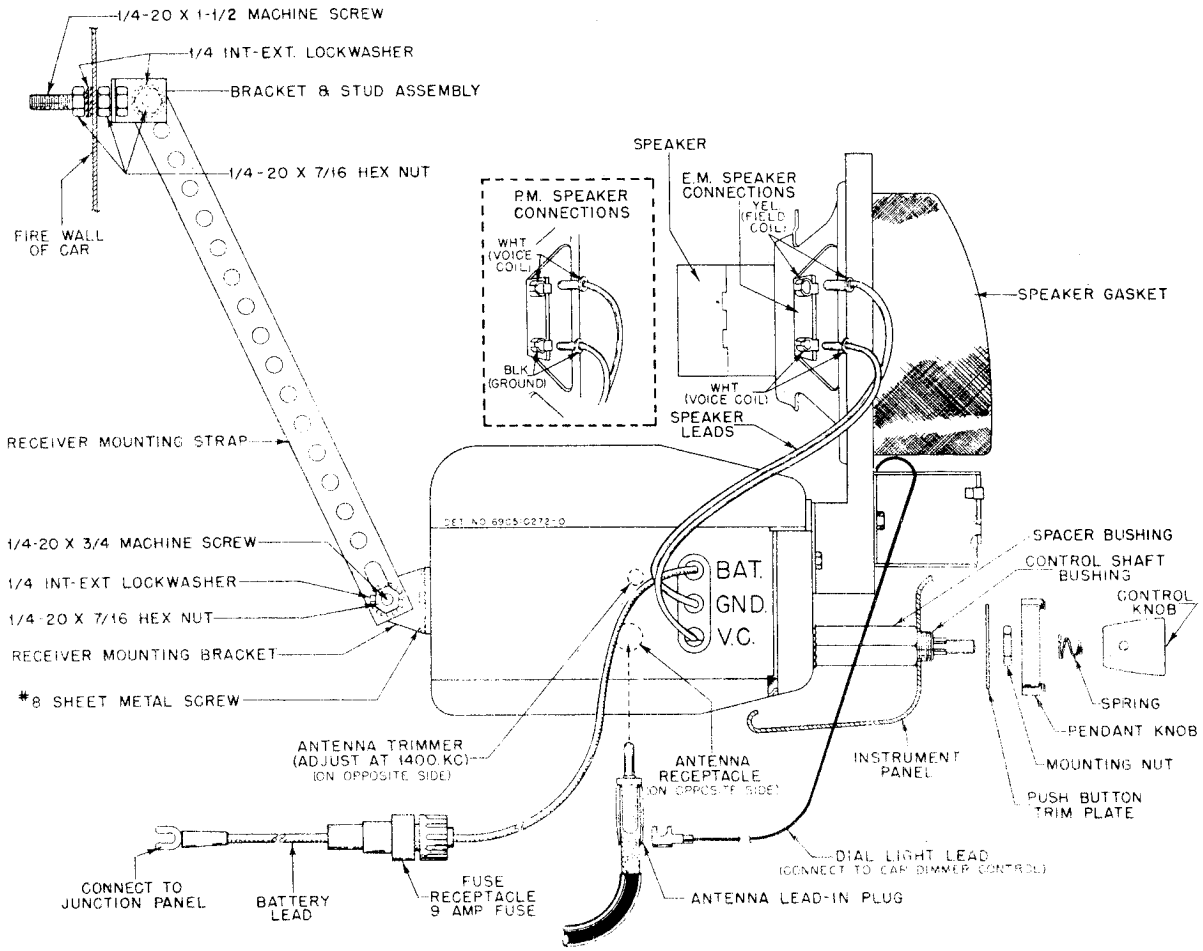


FIGURE 1. RECEIVER INSTALLATION DETAIL

INSTALLATION INFORMATION CONTD.-INTERFERENCE ELIMINATION

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 2. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 3. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) may be installed at the shoulders so that the hood makes a good ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Elimination Powder (available in kit form -Motorola Part No. 51B591494) into tires, following instructions given on the package.

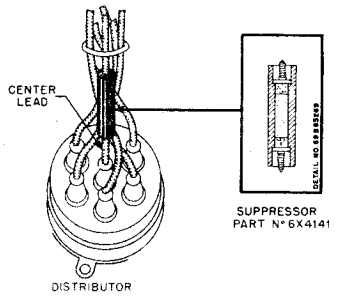


FIGURE 2. DISTRIBUTOR SUPPRESSOR INSTALLATION

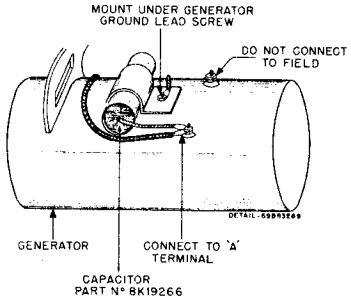


FIGURE 3. GENERATOR CAPACITOR INSTALLATION

REPLACEMENT PARTS LIST

For Chassis replacement parts, refer to Chassis 1A Service Manual.

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Part Number	Description
7B510025	Bracket, dial background
7C510040	Bracket, dial scale mtg
7A472857	Bracket, receiver mtg (on rear of set)
7A484424	Bracket and Stud Assembly, receiver mtg
43K510047	Bushing, tuning shaft and volume control mtg
1X510098	Button, push: complete
8A4491	Capacitor, noise suppression
42A500196	Clip, dial scale mtg
32C510039	Gasket, speaker
36K592302	Knob, dummy: chrome pl (behind tuning knob)
36K473550	Knob, tone: chrome pl
36K510051	Knob, tuning and volume: includes setscrew
9K510086	Lead Assembly fuse: complete with fuse
4S7668	Lockwasher, ext: 3/8; stl; cad pl (tuning and volume control mtg)
4S7688	Lockwasher, int-ext: ¼; stl; cad pl (receiver mtg)
2S2878	Nut, hex: ¼-20 x 7/16; stl; cad pl (receiver mtg)
1X510555	Plate, front: includes wiper (tuner mtg - for AT-90)
64B510022	Plate, push button trim
1X510092	Pointer
34B510021	Scale, dial
3S2956	Screw, machine: ¼-20 x 3/4 plain hex head; stl; cad pl (receiver mtg)
3S9694	Screw, machine: ¼-20 x 1½ plain hex head; stl; cad pl (receiver mtg)
3S488298	Screw, sheet metal: #8 x ¼ slotted hex head; stl; cad pl (mtg brkt - rear)
3S8176	Screw, sheetmetal: #10 x 3/8; cad pl (speaker mtg)
3S7104	Setscrew: 8-32 x 3/16; headless: stl; cad pl (knobs)
51B502001	Shaft Assembly, manual drive: complete
51A502012	Shaft and Drive Disc Assembly: with pinion on one end (for AT-90)
1X510096	Shield and Crystal Assembly, light.
9A510075	Socket, pilot light: with bracket.
41A77592	Spring, compression (behind control knobs)
50B510063 or 50B510577	Speaker, PM: 5 x 7; 3.2 ohm VC Speaker, EM: 5 x 7; 3.2 ohm VC
1X511064	Speaker Plate & Gasket Assembly: less speaker
42A485718	Strap, receiver mtg
6A4141	Suppressor, distributor
42A510531	Wiper, spring (on front plate)

MODEL NH1C, 1951
Nash Rambler

GENERAL INFORMATION

TYPE - Specifically designed for installation in the 1951 Nash (Rambler Series cars only).

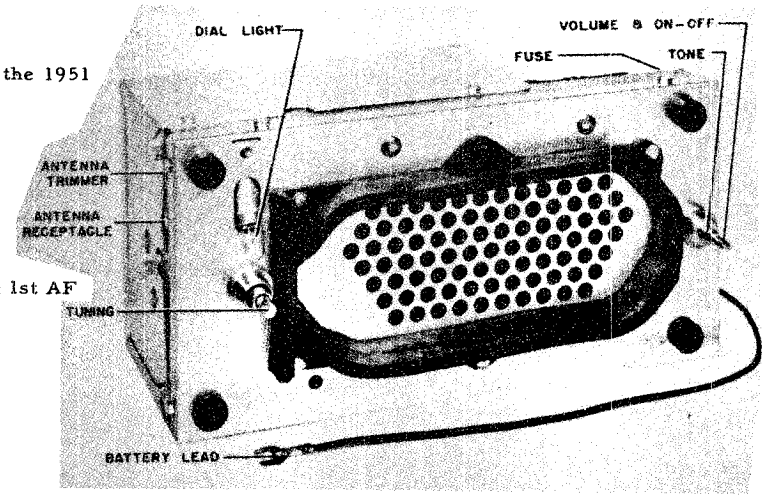
TUNING RANGE - 540 to 1600 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 6BE6 - Converter
6BA6 - IF Amplifier
6AV6 - Detector, AVC & 1st AF Amplifier
6AS5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 5.0 amps at 6.3V DC

POWER OUTPUT-2 watts (maximum)



OPERATING INSTRUCTION

VOLUME CONTROL & ON-OFF SWITCH. The volume control and on-off switch are combined and are operated with the inner right-hand knob. Turn radio on by turning knob to the right until a "click" is heard. Continued rotation to the right will increase volume. To turn radio off, turn knob fully to left until "click" is heard.

TONE CONTROL. The outer right-hand knob operates the tone control.

TUNING. Tune stations with the left-hand knob. Always tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality.

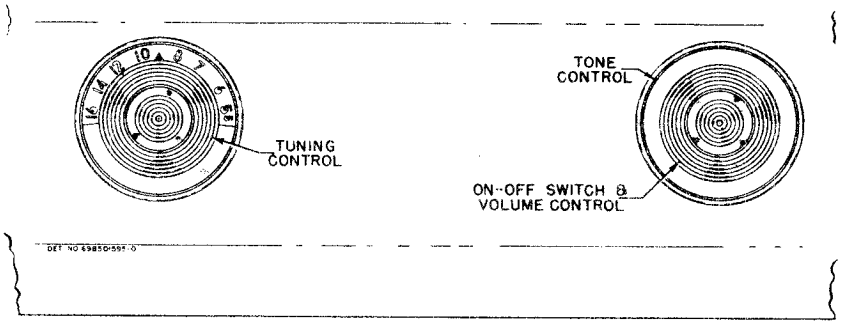


FIGURE 1. OPERATING CONTROLS

SERVICE NOTES

TO REPLACE TUBES. To replace tubes, it will be necessary to remove radio from car. Proceed as follows:

1. Disconnect "A" lead from car terminal located behind instrument panel.
2. Remove antenna plug from antenna receptacle located on left side of radio.
3. Pull off control knobs and pointer.
4. Remove two nuts, two washers and dial scale assembly.
5. Remove radio from behind instrument panel.
6. Remove large cover from radio to expose tubes.

RADIO NOISE SUPPRESSION. A capacitor installed on the car generator, a capacitor on the ignition coil, and a suppressor in the car's ignition system distributor circuit, eliminate motor noise from these sources.

TO REPLACE VIBRATOR OR FUSE. The plug-in type vibrator and radio fuse are accessible from the rear of the instrument panel. Should those require replacement, it is only necessary to pull out old vibrator or fuse and plug in a new one.

MODEL NH1C, 1951
Nash Rambler

ALIGNMENT

EQUIPMENT REQUIRED

1. A small screwdriver for IF and RF alignment.
2. An accurately calibrated 400 cycle, AM modulated signal generator.
3. A low range output meter.
4. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 2.

PROCEDURE

1. All adjustments are accessible without removing the covers, through holes provided.

2. Connect an output meter across the voice coil.

3. Connect a 6 volt storage battery to chassis and BATT terminal of receiver; turn receiver on and allow it to warm up for a few minutes.

4. For greatest accuracy, keep output of receiver at approximately 1/2 watt (1/2 watt = 1.25 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side -6BE6 grid (pin #7) Lo side-chassis	455 Kc	High freq. end	1, 2 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
2.	Special-see Figure 2	Ant receptacle through special dummy	1605 Kc	Gang open	5	Peak for maximum.
3.	"	"	1400 Kc	Tune in signal	6	Peak for maximum.
4.	"	"	600 Kc	"	7	Peak antenna padder for maximum while rocking gang.

5. Repeat steps 3 & 4 until maximum output is obtained. The last adjustment should be trimmer (6).

6. With set installed in car, peak antenna trimmer (6) for maximum noise or volume of a weak station. Car antenna should be fully extended.

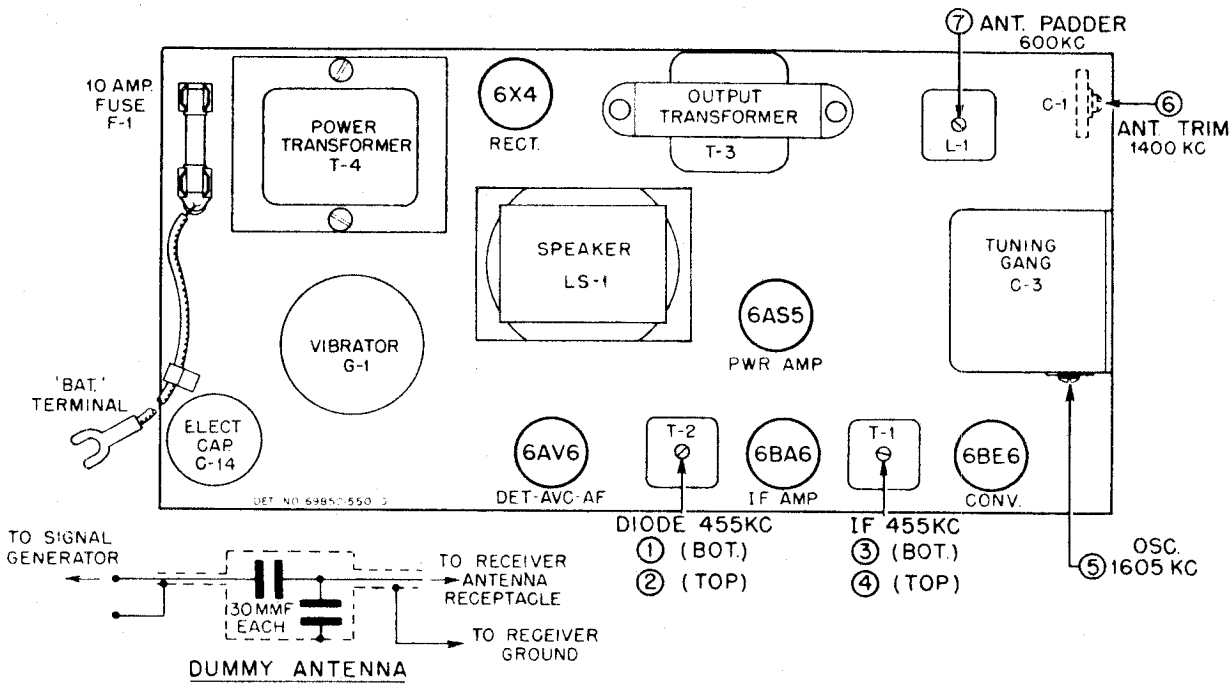


FIGURE 2. TUBE & TRIMMER LOCATION AND DUMMY

MODEL NH1C, 1951
Nash Rambler

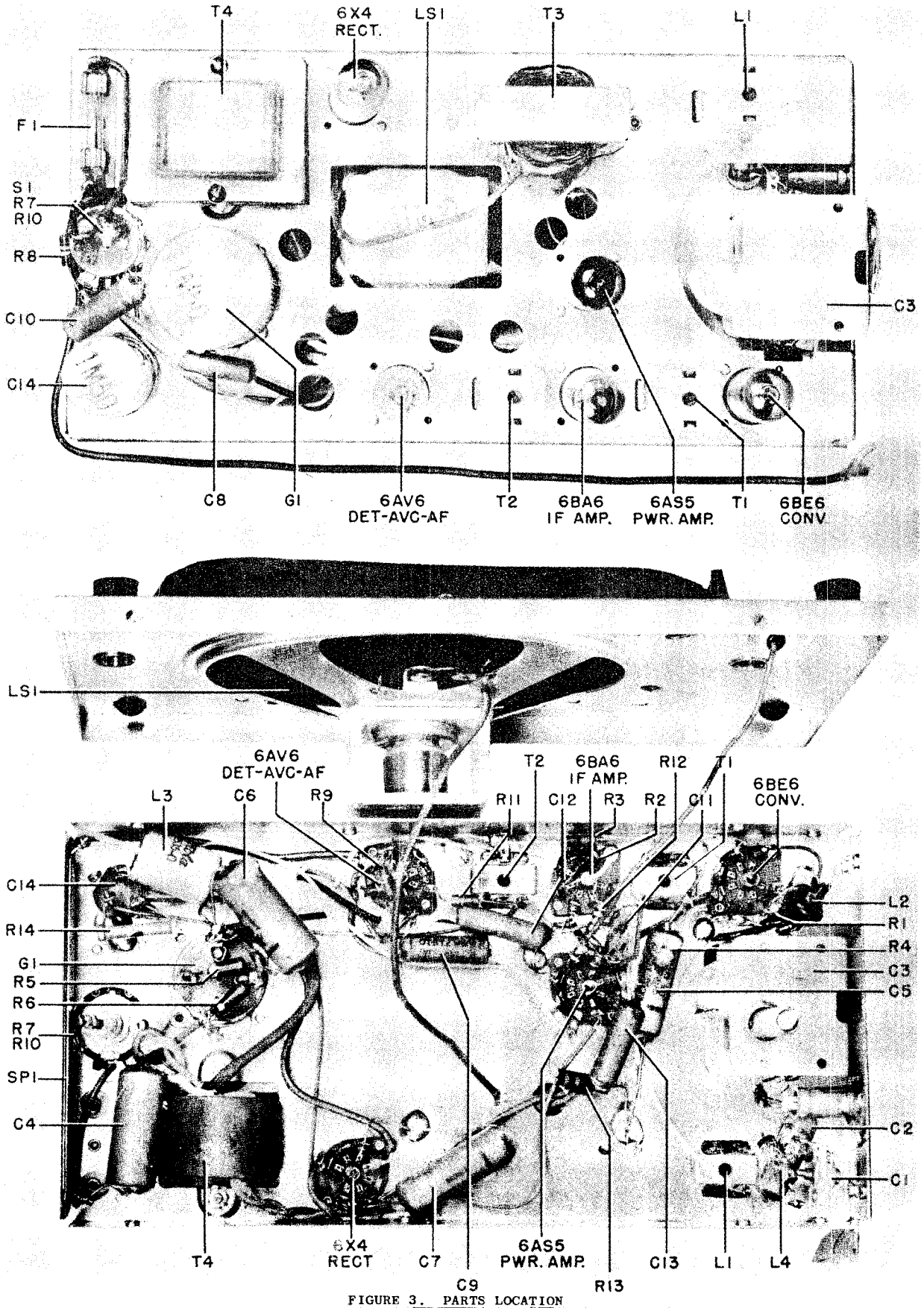


FIGURE 3. PARTS LOCATION

MODEL NH1C, 1951
Nash Rambler

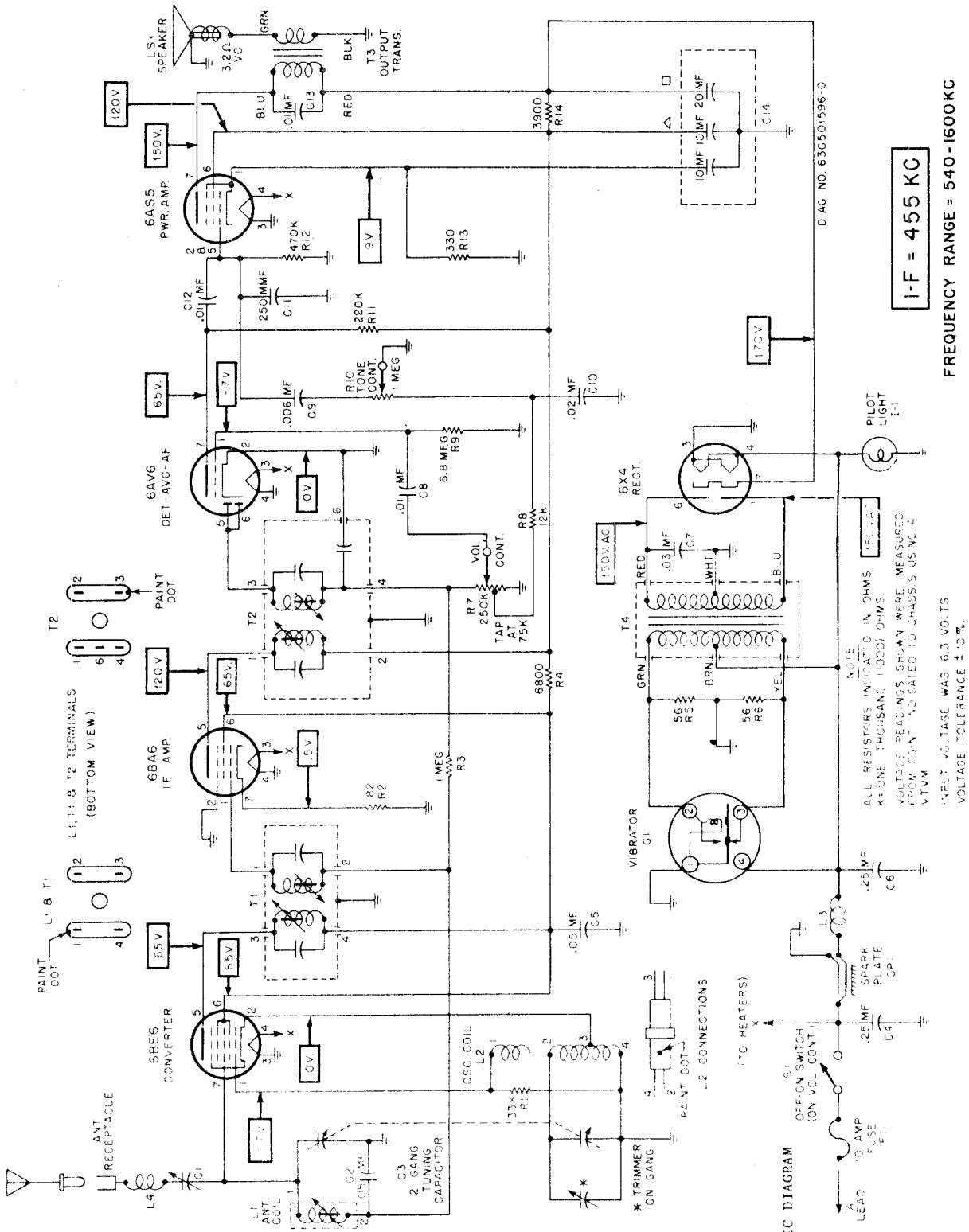
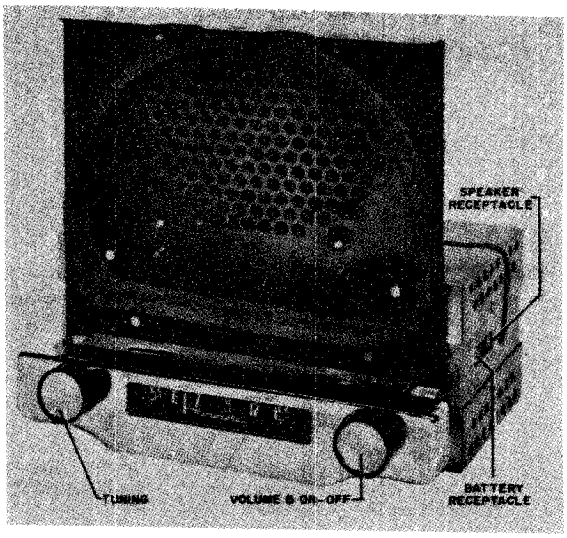


FIGURE 4. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	20K481527	Trimmer, variable mica: 70 mmf; includes mounting brkt
C-2	8R13514	Paper: .05 mf 100V
C-3	19B501790	Variable, 2-gang
C-4	8R4283	Paper: .25 mf 100V
C-5	8R23146	Paper: .05 mf 200V
C-6	8R4283	Paper: .25 mf 100V
C-7	8R592154	Paper: .03 mf 600V
C-8	8R472754	Paper: .01 mf 100V
C-9	8K71910	Paper: .006 mf 400V
C-10	8R51209	Paper: .02 mf 100V
C-11	21R6543	Mica: 250 mmf 500V
C-12	8R23053	Paper: .01 mf 200V
C-13	8R23690	Paper: .01 mf 400V
C-14	23A500059	Electrolytic: 10 mf 10 mf 250V; 10 mf 25V
Fuse		
F-1	65A10266	Fuse: 10 amp
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin full wave
Bulb		
I-1	65X10867	Bulb: 6-8V; .25 amp; round; bayonet base; clear
Coils		
L-1	24B591628	Antenna coil
L-2	24A591629	Oscillator coil
L-3	24A472535	Choke, hash
L-4	24K592197	Choke, antenna spark
Speaker		
LS-1	50C501823	Speaker, PM: 4" x 6"; 3.2 ohm VC
Resistors		
		Note: All resistors are carbon, insulated type unless otherwise specified.
R-1	6R6012	33,000 20% 1/2W
R-2	6R2035	82 10% 1/2W
R-3	6R6004	1 meg 20% 1/2W
R-4	6R6428	6800 10% 1/2W
R-5	6R5614	56 10% 1/2W
R-6	6R5614	56 10% 1/2W
R-7	18B501837	Volume Control: 250,000 ohms tapped at 25,000 ohms; includes on-off and tone control
R-8	6R6394	12,000 10% 1/2W
R-9	6R3987	6.8 meg 20% 1/2W
R-10		Tone Control: 1 meg (part of volume control R-7)
R-11	6R6015	220,000 20% 1/2W
R-12	6R6032	470,000 20% 1/2W
R-13	6R6254	330 10% 1W
R-14	6R488313	3900 10% 1W N.I.
Switch		
S-1		Switch: part of volume control R-7
Spark Plate		
SP-1	1A591512	Spark Plate Assembly
Transformers		
T-1	24K591556	IF, 455 Kc: complete
T-2	24K591555	Diode, 455 Kc: complete
T-3	25B502142	Output Transformer
T-4	25C591533	Power Transformer
CHASSIS PARTS - MECHANICAL		
	1X591534	"A" Lead Assembly
	42A591508	Clamp, cable: cad pl (for "A" lead)
	42A485548	Clip, coil can mtg (for T-1, T-2, & antenna coil)
	42A4215	Clip, vibrator grounding
	4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg)
	4S7655	Lockwasher, int: 3/8; cad pl (volume control mtg)
	2S1376	Nut, hex: 3/8-32 x 1/2; stl; cad pl (volume control mtg)
	2S7005	Nut, hex: 6-32 x 1/4; cad pl (power transformer mtg)
	9A472148	Receptacle, antenna contact
	5S7771	Rivet: .088 x 3/16 stl; pol nkl (tube socket mtg)
	5S7707	Rivet: .122 x 5/32; stl; pol nkl (capacitor brkt mtg and spark plate mtg)
	5S7701	Rivet: .122 x 3/16; stl; pol nkl (vibrator and output trans mtg)
	5S7703	Rivet: .122 x7/32; stl; pol nkl (fuse strip mtg)
	3S7350	Screw, machine: 6-32 x 1/4; slotted hex head; locking type; cad pl (gang mtg)
	3S7506	Screw, sheet metal: #6 x 1/4; PKZ; plain hex head; cad pl ("A" lead cable clamp mtg)
	9A70208	Socket, tube: 4-prong (for vibrator)
	9A472534	Socket, tube: miniature; 7-prong
	9K580218	Socket, tube: miniature; 8-prong (for power amplifier tube 6AS5)
	31A591516	Strip, fuse mtg
HOUSING PARTS & ACCESSORIES		
	35K591519	Bumper, grommet type: rubber; large (on front cover)
	35K591518	Bumper, grommet type: rubber; small (on front cover)
	8A500108	Capacitor, noise suppression (ignition coil)
	8A500109	Capacitor, noise suppression (generator)
	15D501838	Cover, rear
	1X502097	Cover Assembly, front: includes speaker, bushings and pilot light socket
	32B501848	Gasket, speaker: rubber
	36B502202	Knob, tone control
	36B502200	Knob, tuning control
	36K502201	Knob, volume control
	2A502084	Nut, hex: 9/16-24 x 11/16 stl; cad pl (receiver mtg to instrument panel)
	52A502203	Pointer, dial
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (pilot light socket mtg)
	5S490641	Rivet: .187 x 3/16; stl; nkl pl (spkr mtg)
	34C502204	Scale, dial: includes frame
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (front & back cover mtg)
	9A502284	Socket, pilot light
	6A4141	Suppressor, noise
	4S400868	Washer, flat: 3/4 x 19/32 x .042 thick; stl; cad pl (receiver mtg to instrument panel)
M-470C ANTENNA		
	1B592409	Antenna Lead-In Assembly
	1B592622	Antenna Tube Assembly
	15A592617	Cap, antenna trim
	42K500171	Clip, speed
	14B592618	Insulator, antenna mtg tube
	2S2884	Nut, hex: 5/16-32 x 1/2 x 3/16; brass; cad pl
	4S490837	Washer, flat: 1-1/16 O.D. x .317 I.D x .032 thick; stl; cad pl
	4A592619	Washer, gasket
	4K592453	Washer, rubber



**TYPICAL RECEIVER USING CHASSIS 1B.
MODEL SR1B ILLUSTRATED**

GENERAL INFORMATION

TYPE - Automotive type universal, manually tuned, radio chassis. In addition to Model SR1B, this chassis will be used on subsequent models. Supplements covering these models will be issued as required. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AV6 - Det-AVC & AF Amp
6AS5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 5 amps at 6.3V DC

POWER OUTPUT - 2 watts

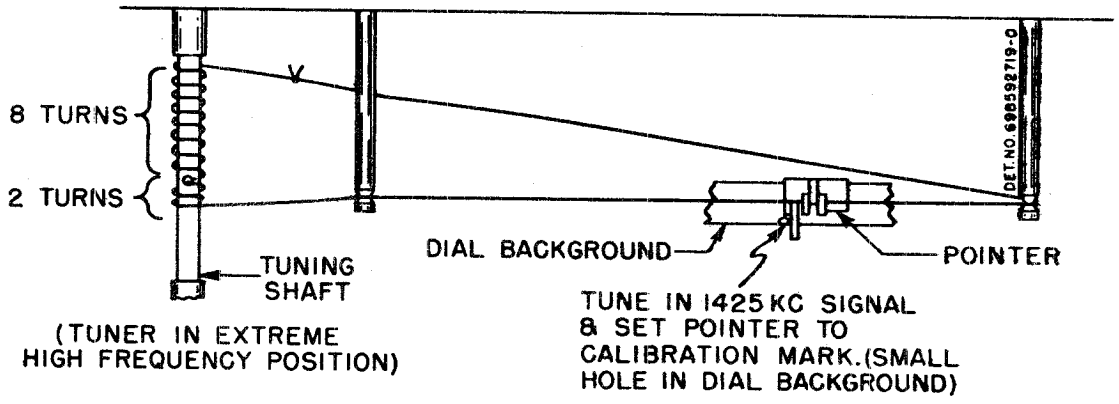


FIGURE 1. STRING DRIVE DETAIL FOR MODEL SR1B

ALIGNMENT

Remove receiver top and bottom housing covers, escutcheon and speaker plate to expose all alignment adjustments.

Connect a 6 volt storage battery to BAT terminal and chassis of receiver.

Connect a 3.2 ohm PM speaker to VC terminal and chassis of receiver.

Connect a low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part No. 66A76278, is required for adjusting the tuner cores. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move the tuner carriage and result in inaccurate alignment.

MODEL SR1B,
Ch. 1B

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High freq end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 2	Antenna receptacle through dummy	1610 Kc	High freq end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc-per Figure 2	8, 9, & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

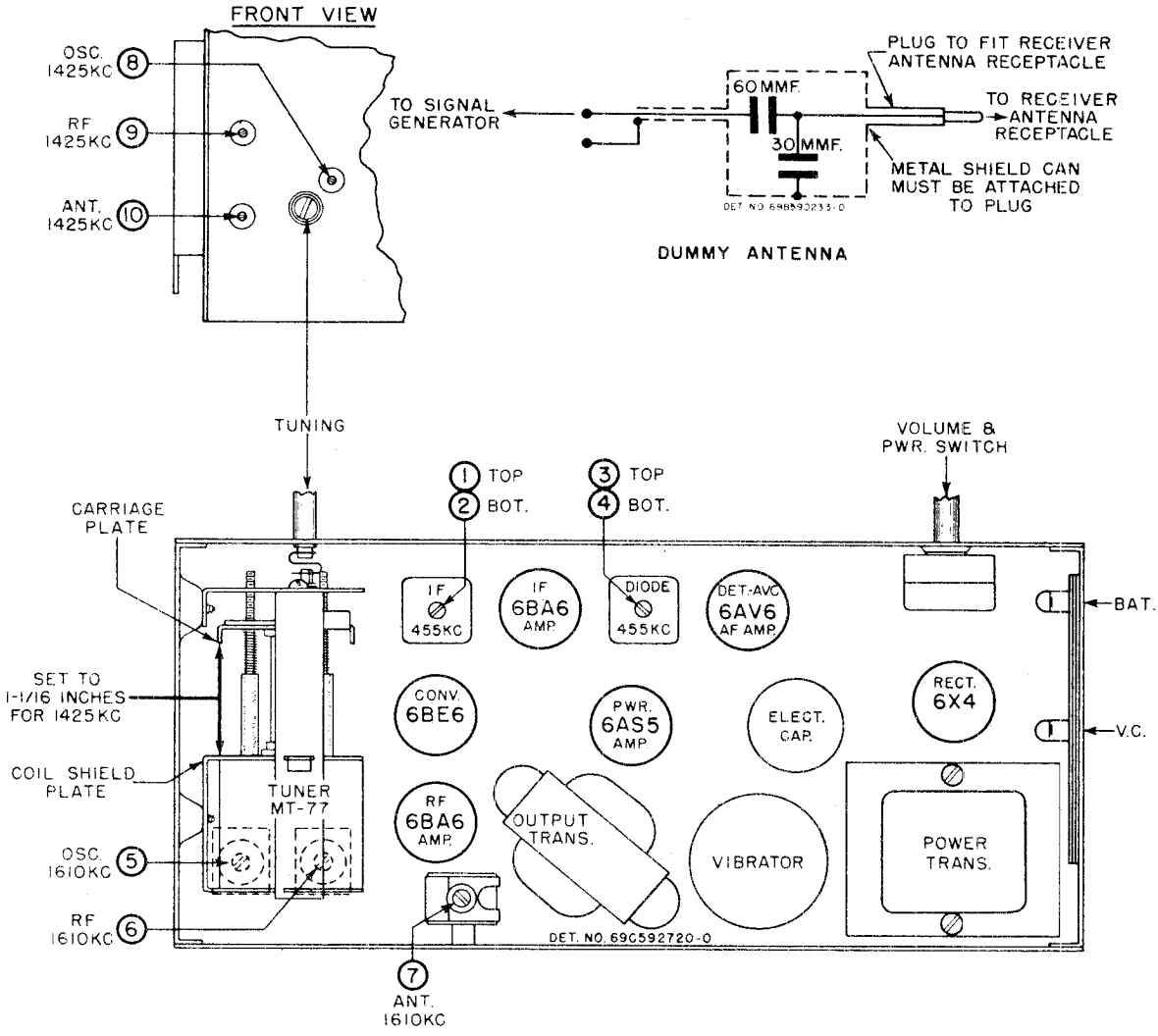


FIGURE 2. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL

MODEL SR1B,
Ch. 1B

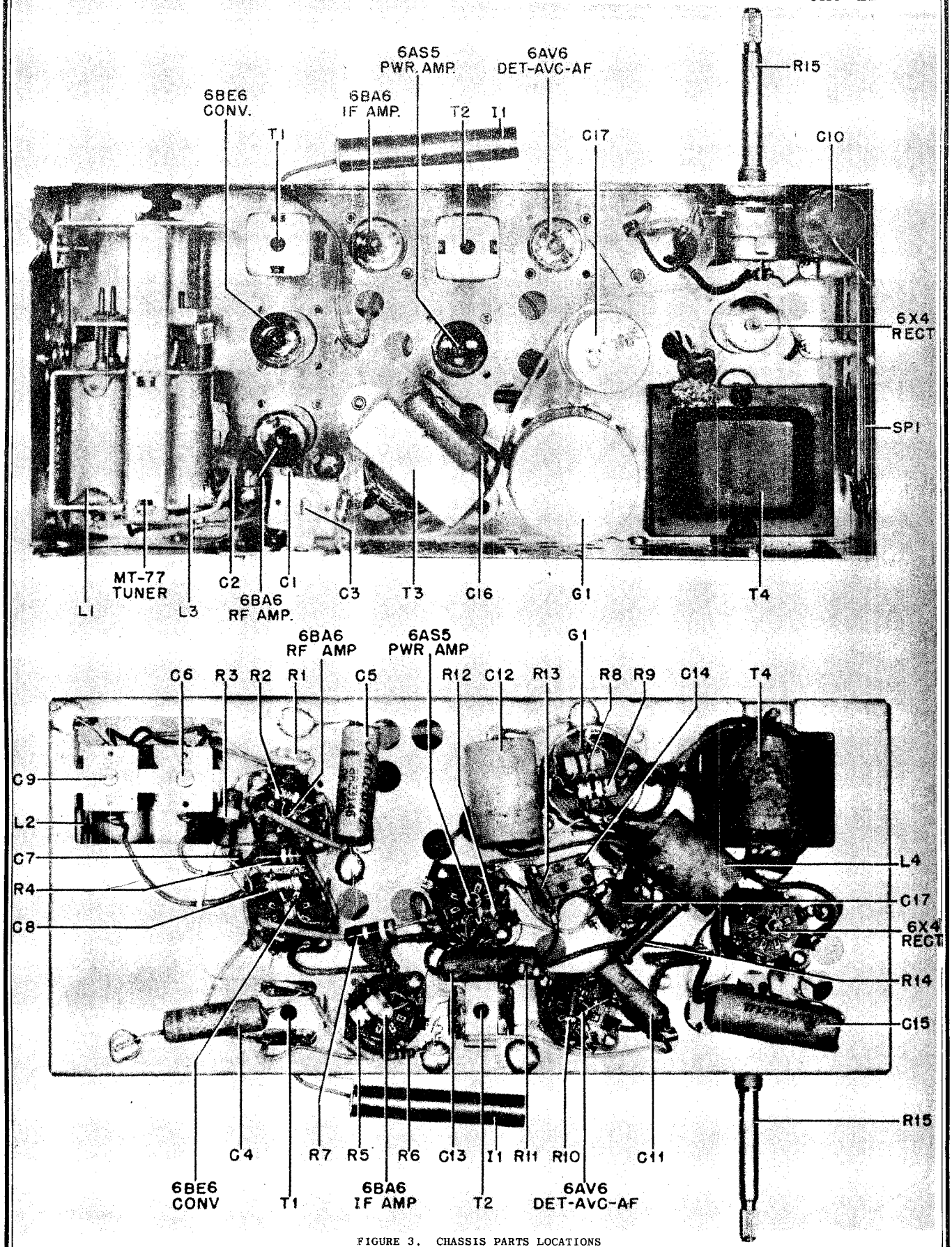


FIGURE 3. CHASSIS PARTS LOCATIONS

REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description
CHASSIS 1B ELECTRICAL PARTS		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20K591969	Trimmer, variable: 180 mmf nominal .....
C-4	8K13514	Paper: .05 mf 100V .....
C-5	8R23146	Paper: .05 mf 200V .....
C-6	20A481526	Trimmer, variable: 70 mmf nominal .....
C-7	21K70720	Molded: 5 mmf 500V .....
C-8	21K592375	Molded: 47 mmf 500V .....
C-9	20A591977	Trimmer, variable: 540 mmf nominal .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8K472754	Paper: .01 mf 100V .....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8R23690	Paper: .01 mf 400V .....
C-14	21R6543	Mica: 250 mmf 20% 500V..
C-15	8K592154	Paper: .03 mf 600V .....
C-16	8R23690	Paper: .01 mf 400V .....
C-17	23A500059	Electrolytic: 10-20/250V; 10/25V .....
Fuse		
F-1	65K16248	Fuse: 9 amp .....
Pilot Light		
I-1	65X10867	Bulb: 6.3V; .25 amp; tubular bayonet base; clear; #44...
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin ..
Coils		
L-1,2	24B71881	RF & Antenna Coil (specify color of paint dots on old coil when ordering).....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24A472535	Choke, hash .....
Resistors		
Note: All resistors are insulated carbon type unless otherwise specified.		
R-1	6R6032	470,000 20% 1/2W ....
R-2	6R6090	470 10% 1/2W .....
R-3	6R6075	100,000 20% 1/2W ....
R-4	6R6056	47,000 20% 1/2W .....
R-5	6R5554	390 10% 1/2W .....
R-6	6R6004	1 meg 20% 1/2W .....
R-7	6R5618	3900 10% 1W .....
R-8	6R5614	56 10% 1/2W .....
R-9	6R5614	56 10% 1/2W .....
R-10	6R2122	4.7 meg 20% 1/2W ....
R-11	6R6015	220,000 20% 1/2W ....
R-12	6R6032	470,000 20% 1/2W ....
R-13	6R6336	270 10% 1W .....
R-14	6R6006	2200 20% 1W .....
R-15	18A591978	Volume Control: 500,000 ohms; includes SPST switch .....
Spark Plate		
SP-1	1B592173	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete.
T-2	24B485554	Diode, 455 Kc: comple
T-3	25B70171	Output Transformer ..
T-4	25C591533	Power Transformer ..
CHASSIS 1B MECHANICAL PARTS		
	42A485548	Clip, coil can mtg .....
	42A591959	Clip, spring (tuner drive).....
	42A4215	Clip, vibrator grounding .....
	15K592073	Cover, housing (top & bottom).....
	1X473150	Light Shield & Plug Assembly .....
	4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
	4S7691	Lockwasher, int: 3/8"; cad pl (vol control mtg) .....
	2S7005	Nut, hex: 6-32 x 1/4; cad pl (pwr trans mtg) .....
	2S1376	Nut, hex: 3/8-32 x 1/2; cad pl (vol control mtg) .....
	64A591992	Plate, rear cover .....
	9A472148	Receptacle, antenna contact.....
	5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light brkt mtg) .....
	5S7707	Rivet .122 x 5/32; stl; nkl pl (terminal strip, output trans, and capacitor bracket mtg) .....
	5S7771	Rivet: .088 x 3/16;stl; nkl pl (tube socket mtg) .....
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator socket mtg).....
	5S7700	Rivet: .122 x 1/4; stl; nkl pl (spark plate mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ; plain hex head; (tuner mtg, rear cover mtg) .....
	3S8140	Screw, sheet metal: #8 x 3/16; PKZ; plain hex head (tuner mtg)..
	9A591971	Socket, pilot light & brkt .....
	9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
	9A472534	Socket, tube: miniature; 7-prong...
	9K580218	Socket, tube: miniature; 8-prong...
	31C490140	Strip, terminal: 1 insulated lug, #1 mtg .....
TUNER PARTS - MECHANICAL		
Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.		
	1X592120	Model MT-77 Manual Tuner: complete.
	1X592099	Base, Sleeve, Shields & Channels Assembly .....
	1X78034	Carriage Plate, Slug Insulator & Center Guide Rod Assembly .....
	42A70184	Clip, core adjustment .....
	46B591654	Core, iron & screw .....
	14A70876	Insulator, coil sleeve .....
	14B78007	Insulator, slug: bakelite .....
	2A77596	Nut, floating: without ear (on manual lead screw) .....
	2A78005	Nut, floating: with ear (on manual lead screw) .....
	64K592064	Plate, tuner front .....
	5S7770	Rivet: .088 x 5/32; stl; pol nkl (slug insulator mtg) .....
	47A78002	Rod, carriage guide .....
	3S7352	Screw, machine: 8-32 x 2"; slotted round head; stl; cad pl (front plate mtg) .....
	3A591998	Screw, manual lead (tuning shaft).
	43A70881	Sleeve, coil: iron .....
	41A77595	Spring, coil slug .....
	41A77592	Spring, compression (on manual lead screw) .....
	4A21577	Washer, "C" spring (manual lead screw mtg) .....
	4A70873	Washer, coil spacer .....
	4A74571	Washer, fishpaper .....
	4A70956	Washer, slug insulator .....
MODEL SR1B MOUNTING PARTS, ACCESSORIES, ETC.		
	3A592058	Bolt, radio mounting .....
	7C592046	Bracket, escutcheon mtg (mounts escutcheon to speaker plate).....
	8A4491	Capacitor, noise suppression (generator capacitor) .....
	42A591931	Clip, dial scale retaining .....
	11M8877	Cord, dial: 20 lb; nylon;black.
	61A473514	Crystal, transparent green (for dial light) .....
	13C592066	Escutcheon, dial: chrome plated.
	32C591967	Gasket, speaker: rubber .....
	36K591949	Knob, control: tuning & volume.....
	9B473111	Lead Assembly, fuse .....
	1K592062	Pointer & Slider Assembly .....
	34B592149	Scale, dial: glass .....
	3S7462	Screw, machine: 6-32 x 3/16 slotted hex head; cad pl (escutcheon mtg) .....

3S7454	Screw, sheet metal: #8 x 1/4; PKZ; plain hex head; cad pl (cover, escutcheon bracket & spkr brkt to chassis mtg)	47A592070	Shaft, tuning	1X500090	Speaker Plate & Gasket Assembly: less spkr, pointer, tuning shaft & escutcheon mtg brkt.....
3S7468	Screw, sheet metal: #10 x 3/8 PKZ; plain hex head; cad pl (speaker mtg)	50B592106 or 50B592479	Speaker, PM: 5 x 7"; 3.2 ohm voice coil	6A4141	Suppressor, distributor .....
				29K5407	Terminal, insulated pin: white (spkr lead) .....
				4B592098	Washer, "C" (tuning shaft retainer) .....

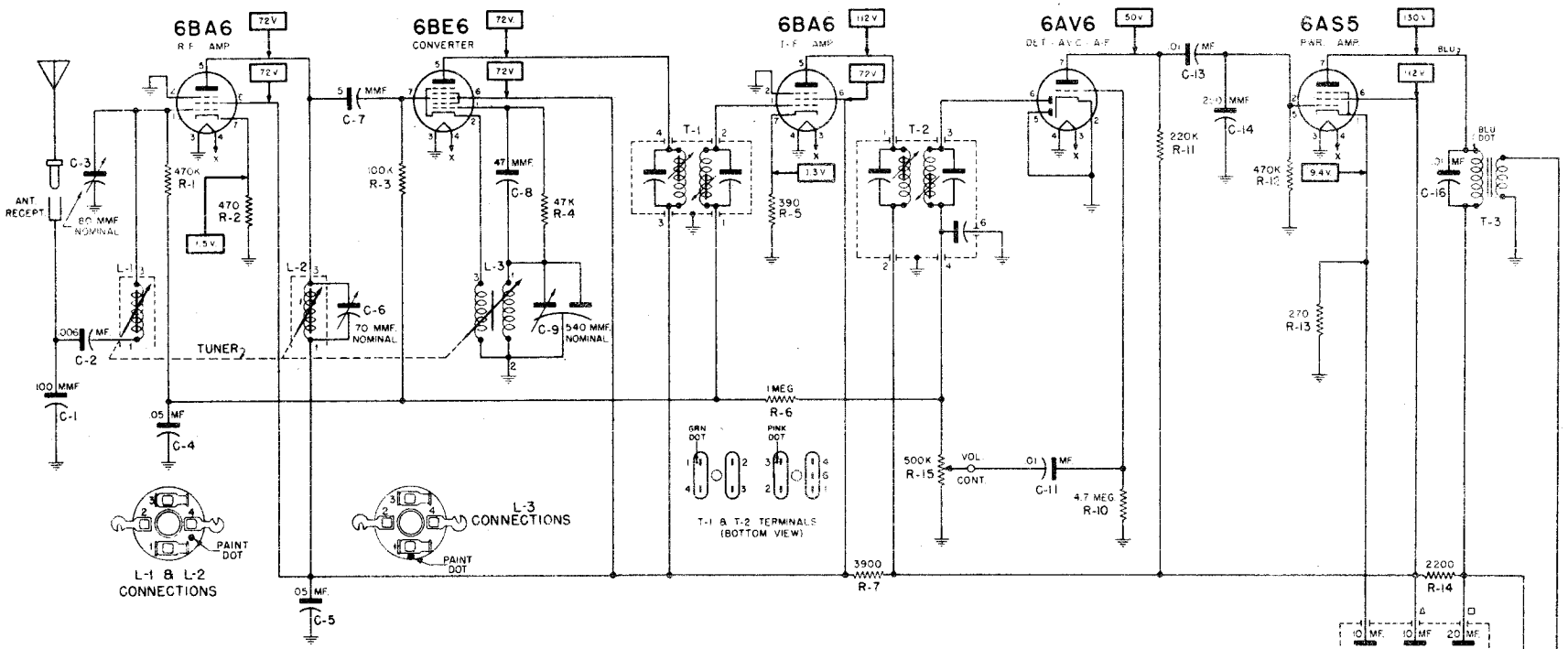


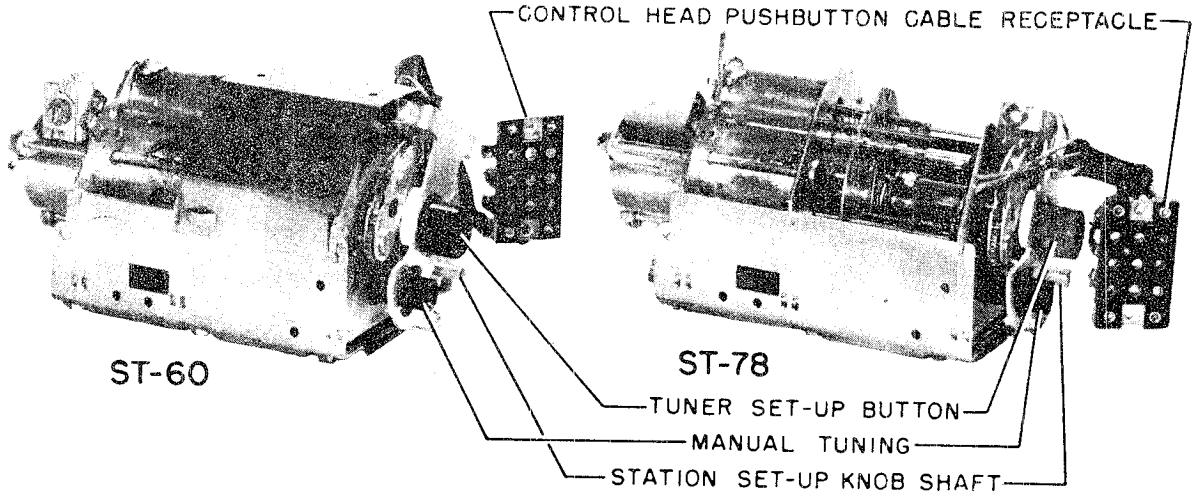
FIGURE 4. SCHEMATIC DIAGRAM

NOTES

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS WITH A VTVM. NO SIGNAL WAS TUNED IN. INPUT VOLTAGE WAS 6.3 V. DC AT BAT. RECEPTACLE. VOLTAGE TOLERANCE ± 10 %.

ALL RESISTORS INDICATED IN OHMS. K = ONE THOUSAND (1000) OHMS.

MODELS ST-60,
ST-78, Tuners



GENERAL

Solenoid Tuners ST-60 and ST-78 are used in Motorola electric push-button standard auto receivers.

Fundamentally ST-60 and ST-78 tuners are the same. The two tuners differ in push-button switch lead lengths, oscillator coil, sleeve and shield, tuning cores, antenna trimmer and cover over ST-60 carriage. These tuners are similiar to the original Motorola ST-54 solenoid tuner.

This is a 3 gang permeability type tuner operated by a solenoid. Five pre-set and one manual tuning positions are provided. The frequency range is 535 to 1600 kc. The pre-set positions can be set to any frequency within this range.

The tuner is designed to operate satisfactorily with 4.5 to 7.3 volts input. Before attempting any service work on a tuner that operates too slowly or one that doesn't operate at all, check the battery voltage directly at the receiver spark plate. Normally, this voltage is 6.3 volts. At the moment any push-button is pressed, the voltage at the spark plate should not drop to less than 4.5 volts. If the voltage is less than 4.5, it is an indication of poor wiring between the car battery and receiver or a defective car battery.

This tuner depends on "dash-pot" action between the plunger and the solenoid for proper operation. When the fit between the plunger and solenoid is too tight, the air can't get out fast enough. The result is a slow or sluggish operating tuner. All ST-60 and ST-78 tuners have an adjustable air release in the solenoid end plate. See Figures 1 & 3.

The tuner solenoid coil must be in a horizontal or near horizontal position or the tuner will not operate properly. If it is operated with the coil in a vertical position, the solenoid and carriage return spring may not be strong enough to operate the tuner.

TO SET UP AUTOMATIC TUNER

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above.)
g. Turn automatic tuner set-up knob until previously noted program is heard. NOTE: Check the setting of the automatic button just set up by pressing the "M" button and manually tune in the station. There should be no difference in volume or clarify when the station is tuned in either manually or automatically. If a difference is noted, reset the automatic tuner push button more accurately by repeating above procedure. Also make sure the push button is set to same station that was selected manually and not to a weak distant station carrying the same network program.
h. Repeat steps c, d, e, f and g for balance of buttons.

THEORY OF OPERATION

NOTE: Throughout these paragraphs, it is suggested that constant reference be made to Figure 1.

When any push-button is pressed, current flows through the solenoid coil, causing the plunger to pull into the coil. Near the end of the plunger travel, through a ratchet mechanism inside the plunger, the selector switch shaft is rotated 60°, moving the selector switch and stop plate to their new position.

An instant later, the solenoid switch is opened breaking solenoid current and the carriage return spring then pulls the plunger out, closing the solenoid switch again. If the selector switch is now resting at the position selected by the push-button (cut away section of selector switch resting in front of contact selected by push-button), the solenoid plunger will continue to be pulled out until the stop plate is resting on the selected lead screw stop. In the event the selector switch is not resting in the position selected by the push-button when the solenoid plunger is on its return trip, the moment the plunger moves out far enough to actuate the solenoid switch, current will again flow through solenoid causing the plunger to be pulled in again. The plungers inward motion again rotates the stop plate and selector switch

through another 60°. This last operation is repeated automatically until the selector switch comes to rest at the position selected by the push-button, at which time the solenoid circuit is opened and the plunger moves out until the stop plate is resting on the selected lead screw stop. The stops are adjusted to the desired positions during the station setting up procedure, through the set-up gear train assembly.

Refer to Figure 2 for mechanics behind station setting-up mechanism detail.

When the button on which a station is to be set up is first pressed, the tuner operates and the stop plate comes to rest against the selected lead screw stop. The pressure of the stop plate against the lead screw stop moves the lead screw forward until its shoulder rests against the tuner end plate. The square end of the lead screw does not engage in the square hole of the set-up gear until the set-up button is pushed in and the station set-up knob is turned. A latch on one end of the detent lever engages the gear lever, holding the set-up gear train in contact with the selected lead screw. Now the selected lead screw stop can be moved on its lead screw by turning the station set-up knob. None of the other lead screws turn because the stop plate is not resting against them. After the button is set up, pressing any other button will unlatch the gear lever and disengage the lead screw from the set-up gear. See Figure 2.

Since the coil tuning iron cores are attached to the carriage plate and move in unison with the plunger, the point at which they are brought to a stop (by means of the lead screw stop) determines the frequency to which the coils are tuned.

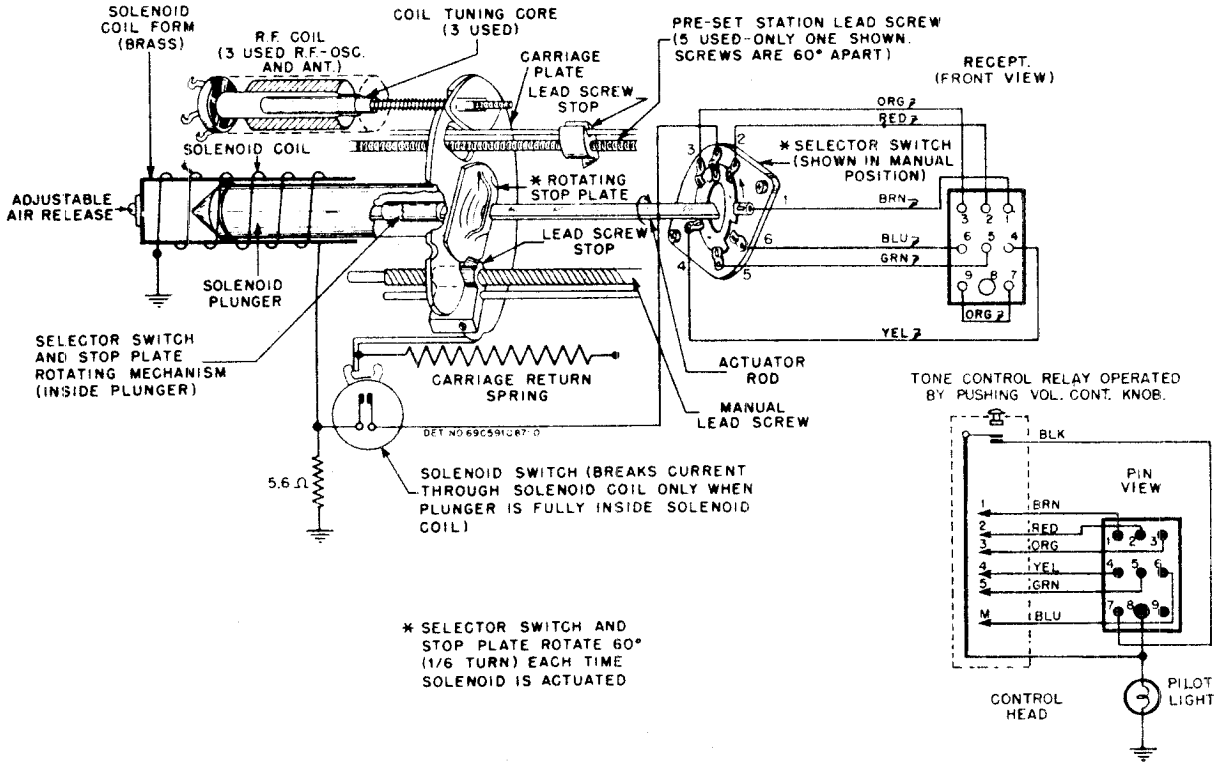
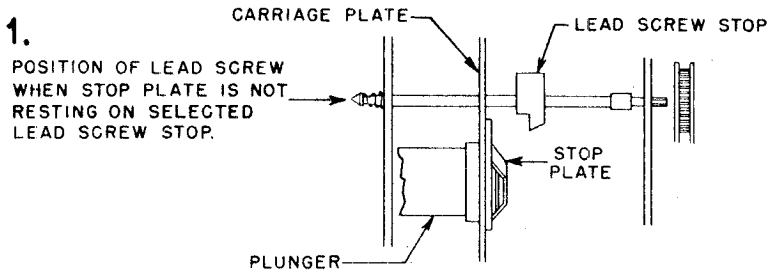


FIGURE 1. TUNER FUNCTIONAL DETAIL



MODELS ST-60,
ST-78, Tuners

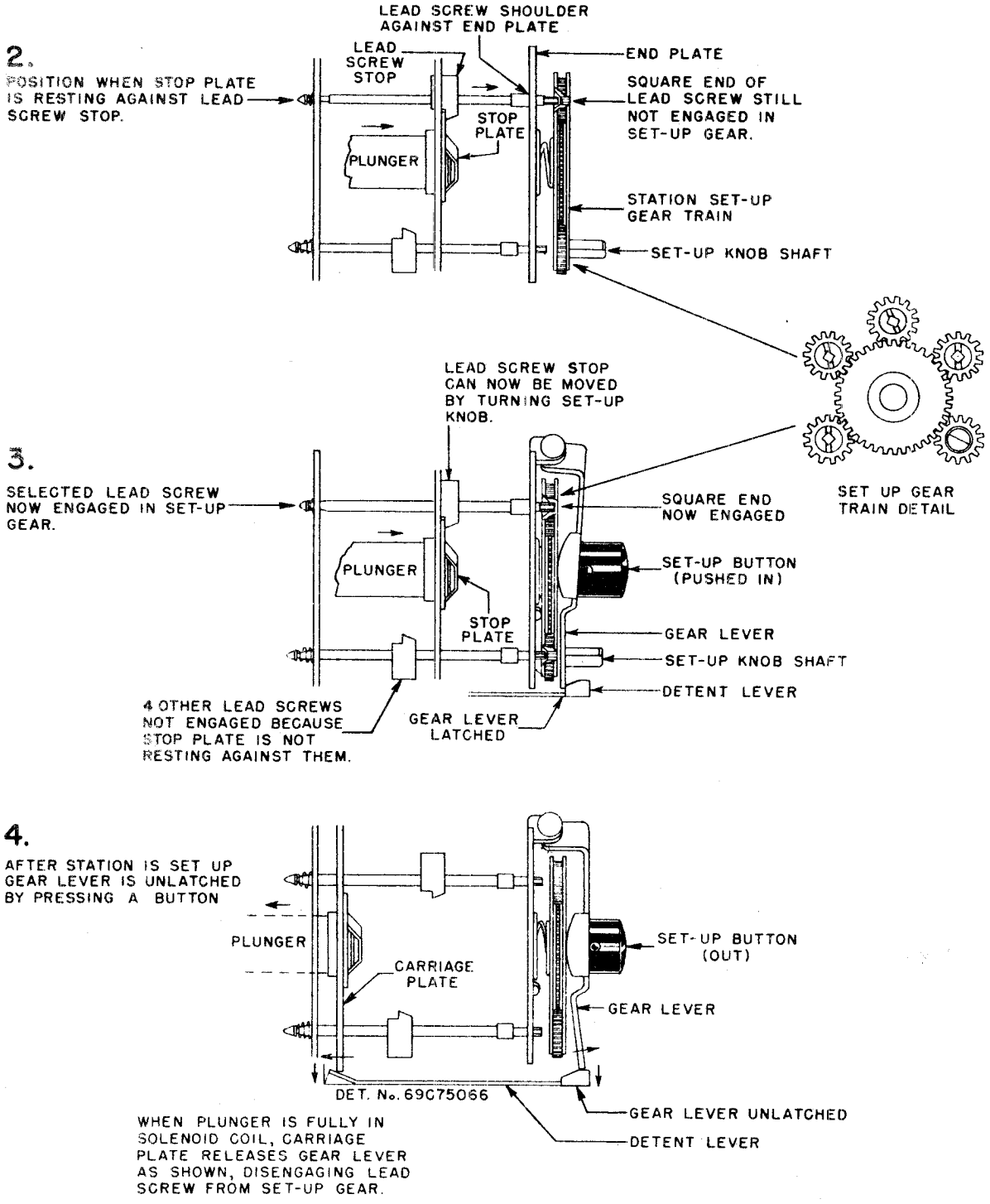


FIGURE 2. STATION SET-UP MECHANISM

TO REMOVE TUNER FROM CHASSIS

Should it become necessary to remove the solenoid tuner from the receiver chassis, proceed as follows:

1. Remove the covers from the set, completely exposing the chassis.

2. Mark all leads connecting tuner to receiver.

3. Disconnect all leads connecting tuner to receiver. The control head connecting receptacle is to be removed by unscrewing the two self-tapping screws. Do not unsolder leads from the tuner selector switch.

4. The tuner is held to the chassis by self-tapping screws driven into the sides of the tuner. Do not remove any other screws.

ADJUSTMENTS

AIR RELEASE ADJUSTMENT

The speed at which the tuner operates is governed by dash-pot action of the solenoid plunger within the closed solenoid coil form. The rate at which air is allowed to enter or escape determines the speed of the plunger.

An adjustable air release is provided on all ST-60 and ST-78 tuners. See Fig. 3. To adjust, loosen the screw and move the eccentric washer which covers the air release hole to expose or cover more of the air release hole as required.

1. If tuner operates too slowly, open the air release hole. Open it only far enough to secure reliable operation. Too little "dash-pot" action (air release open too much) may cause the plunger to hammer and sometimes even to make the tuner operate continuously due to the selector switch rotor being turned so rapidly as to overshoot its contacts.

2. If the tuner operates too rapidly increase dash-pot action by closing the air release hole slightly. Close it only enough to eliminate hammering.

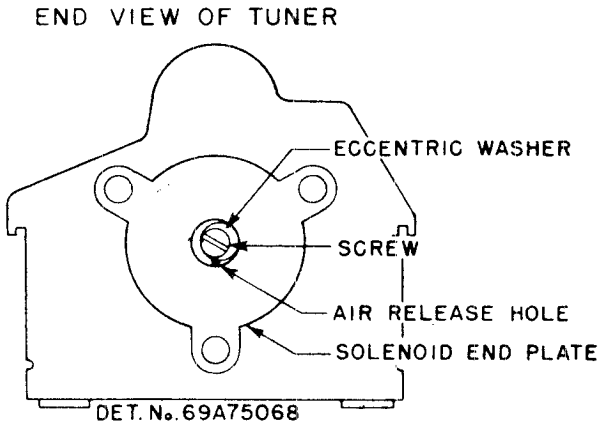


FIGURE 3. AIR RELEASE ADJUSTMENT

PLUNGER RATCHET ADJUSTMENT

The plunger ratchet mechanism is shown in Figure 4. This mechanism rotates the actuator rod which, in turn, rotates the carriage stop plate and the selector switch 60° for each inward motion of the plunger.

If this adjustment is incorrect, tuner may operate continuously once current is applied.

Correct ratchet adjustment is indicated when 1/64" to 1/32" clearance is observed between selector switch contacts and the selector switch rotor as shown in Figure 5. Slowly work the plunger by hand and observe clearance at each contact position. If the average clearance is not 1/64" to 1/32", correction can be made by loosening ratchet adjustment setscrew and turning actuator rod by hand until correct clearance is observed.

Before ratchet adjustment setscrew is finally tightened, push fixed ratchet 1/32" back into plunger. This increases spring tension against rotating ratchet, thus insuring more positive operation.

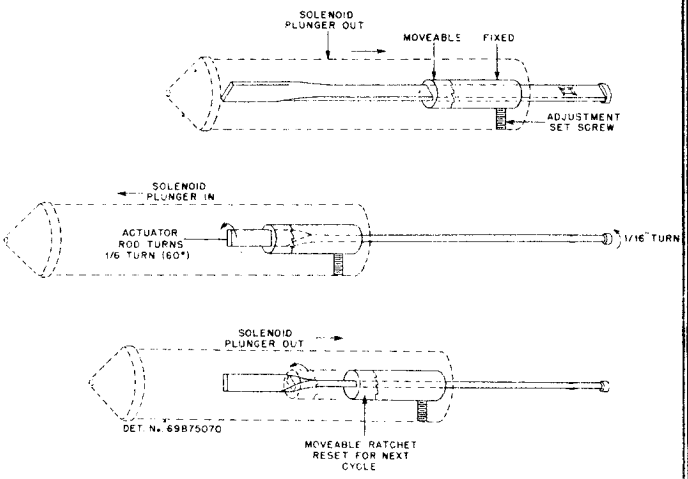


FIGURE 4. PLUNGER RATCHET MECHANISM

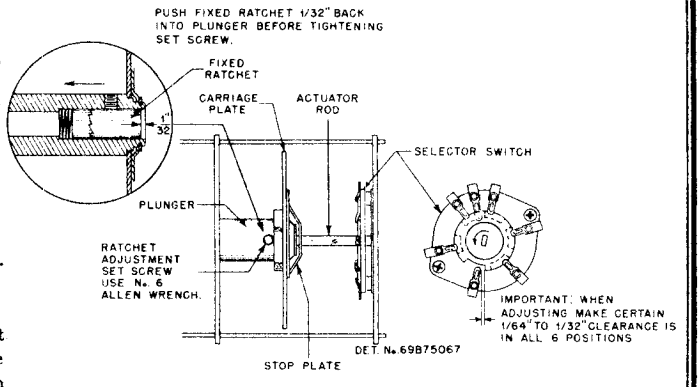


FIGURE 5. PLUNGER RATCHET ADJUSTMENT

SOLENOID SWITCH TRIP ADJUSTMENT

The solenoid switch tripping mechanism should be adjusted as shown in Figure 6.

If the solenoid switch is tripped too early, the ratchet mechanism may fail to operate; if it trips too late, the plunger may hammer violently or should the solenoid switch fail to trip, the plunger would be held within the solenoid.

ADJUSTMENT OF GEAR LEVER LATCH

The gear lever latch holds the station set-up gear train in position while setting up stations. Failure of the latch to engage properly when the set-up button is pushed in will result in the inability to set up pre-set stations. Failure of the latch to disengage after station is set-up will result in faulty automatic tuning because the lead screws might not seat themselves properly against the tuner end plate. Figure 7 shows the latch detail and adjustment.

MODELS ST-60,
ST-78, Tuners

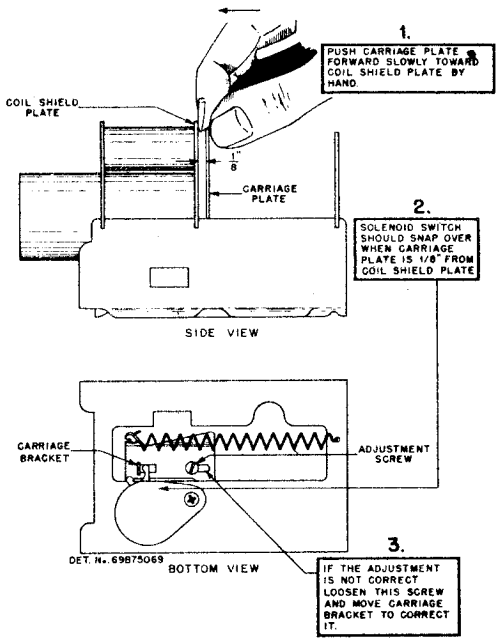


FIGURE 6. SOLENOID SWITCH ADJUSTMENT

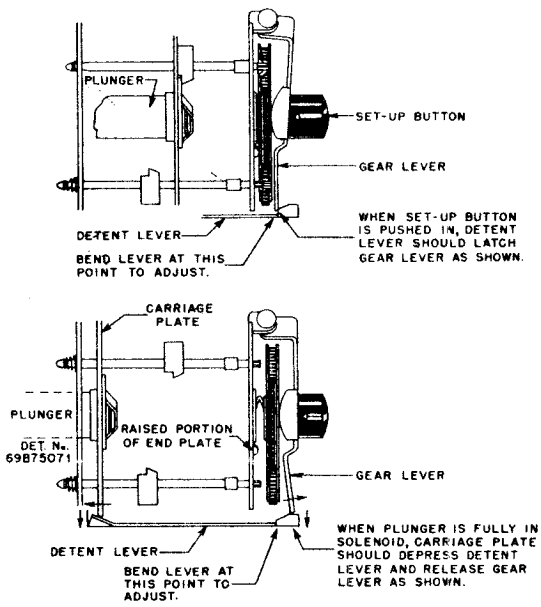


FIGURE 7. GEAR LEVER LATCH ADJUSTMENT

SERVICE NOTES

FAILURE OF SOME LEAD SCREW TO ENGAGE IN SET-UP GEARS

If some of the lead screws fail to engage in the set-up gears during station setting up procedure, check the gear lever to see if it is bent. When the set-up button is pushed in and the gear lever latches on the detent lever, the set-up gear train should be parallel with the tuner end plate and the bottom of the gear train should be resting on the raised portions of the tuner end plate.

LUBRICATION

Should lubrication ever be required, it is recommended that a very fine grease, commercially called DOW-CORNING Silicone (DC 44 Medium Grade), or its equivalent be used.

Remove all old and sticky lubricant with a solvent such as carbon tetrachloride and then, very sparingly, lubricate only the following points:

1. Carriage guide rods.
2. Actuator rod.
3. Manual lead screw.

IMPORTANT

Do not lubricate or permit lubricant to get on Selector Switch contacts. The friction drag is required for proper operation of tuner.

LEAD DRESSING

Make sure that the selector switch and solenoid coil leads are dressed so that carriage plate does not rub against them. Leads rubbing against the carriage plate may cause the tuner to stick, especially at the high frequency end.

REPLACEMENT OF SOLENOID COIL OR SOLENOID PLUNGER

Should replacement of the solenoid coil or solenoid plunger be required, it will be necessary to replace the entire tuner. A close fit between solenoid plunger and solenoid coil form is required; a proper match can only be secured at the factory. When service of this kind is required, return the tuner to the factory for exchange.

ALIGNMENT

In the event that some part of the R.F. circuit has been changed or the adjustments shifted by mishandling, it is suggested that the receiver be realigned. Follow the alignment instructions found in the receiver service manual.

The tuner must be in good working order and assembled onto the chassis before attempting alignment of its tuned circuits.

TO REPLACE ANT. R.F., OR OSC. COILS

IMPORTANT: When ordering replacement coils, order by part number and also specify the color coding (paint dots) on old coil. THE REPLACEMENT COIL SHOULD CARRY THE SAME COLOR CODING AS THE ORIGINAL OR THE TUNER WILL NOT TRACK PROPERLY.

1. Unsolder the two lugs holding the coil to the tuner plate.
2. Carefully remove the old coil. Save the thin paper washer that is found at the base of the coil.
3. Slip the paper washer over the replacement coil and slip coil into shield can.
4. Orient coil so its lugs are in same position as before and resolder to tuner plate.
5. Reassemble tuner and install in receiver.
6. Realign ANT., R.F. and OSC. stages per instructions found in the receiver service manual.

TO REPLACE ANT. R.F. OR OSC. COIL TUNING CORES

IMPORTANT: When ordering coil tuning cores, order by part number and also specify the color coding (paint spot) on the old core. ALL 3 TUNING CORES MUST CARRY THE SAME COLOR CODING OR THE TUNER WILL NOT TRACK PROPERLY.

1. Remove the carriage return spring.
2. Move the carriage plate back as far as it can go. The tuning cores can now be screwed "out" or "in" by grasping the portion that sticks out the back of the coil. When installing a new core, make sure that the insulating washer and adjustment clip are replaced properly. The insulating washer goes on the core side; the core adjustment clip has an ear on it and this ear must fit into a hole in the bakelite insulator on the carriage plate. Refer to Figure 8.
3. Replace the carriage return spring.
4. Install tuner in receiver.
5. Realign ANT., R.F. and OSC. stages following the instructions found in the receiver service manual.

PLUNGER RATCHET REMOVAL

To remove ratchets, proceed as follows:
(Refer to Figure 8 for parts identification).

1. Remove gear plate mounting screw (55).
2. Pull out actuator rod (46). Don't lose washers (83), (88) and (89).
3. Remove stop plate bracket (4) by sliding it out of the retaining slots.
4. Loosen setscrew (50).
5. The large fixed ratchet (34), small floating ratchet (35) and ratchet spring (70) can now be removed.
6. Reassemble in reverse order.

TUNER HANGS UP

The beginning of this trouble is usually a condition where the tuner "runs wild" (fails to stop at a station). Eventually, the stop plate gets "hung up" by getting on the wrong side of the station stops (56). The cause of the trouble is that the selector switch (74) does not turn the correct amount with each dash of the plunger.

Since the actuator rod (46) determines the rotation of the selector switch, it is usually at fault. Check the twist in the actuator rod. It should be 82 degrees. Also check the fit between the "head" end of the actuator rod (46) and the rotary section of the selector switch (77). We have found that some sloppiness sometimes occurs at this point. If the fit is loose, replace the actuator rod (46). This can be easily done by removing gear plate mounting screw (55).

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of tuner in addition to part number and description of part.

Ref. No.	Part Number	Description
	1X472634	Model ST-60 Solenoid Tuner (complete).....
	1X592280	Model ST-78 Solenoid Tuner (complete).....
1	1X71358	Base & Spring Assembly.....
2	7A70928	Bracket, carriage.....
3	7A70986	Bracket, lead screw stop....
4	7A500429	Bracket, stop plate (stainless steel).....
5	38A70945	Button, lever and gear (set-up button) .....
6	38A70954	Button, mute switch; fibre..
7	20K472612	Capacitor, variable: mica; 30-60 mmf; with mounting bracket.....
8	20K472613	Capacitor, variable: mica; 50-280 mmf; with mounting bracket (ST-60 only).....
9	20K481527	Capacitor, variable: mica; 20-180 mmf; with mounting bracket.....
10	42A70980	Clip, lead screw.....
11	42A70184	Clip, core adjustment....
12	1A71881	Coil, antenna or RF (specify color of paint dot on old coil when ordering).....
13	24B592153	Coil, oscillator; (ST-78) (specify color of paint dot on old coil when ordering).
13	24B71879	Coil, oscillator; (ST-60) (specify color of paint dot on old coil when ordering).
14	59B70889	Coil, solenoid (RETURN entire tuner to factory for exchange when this part requires replacement).....
15	46K592080	Core, powdered iron: with molded-in adj screw (ST-78) (specify color of paint dot on old core when ordering)....
15	46A70880	Core, powdered iron: with molded-in adj screw (ST-60) (specify color of paint dot on old core when ordering).
16	32A70972	Gasket, solenoid.....doz
17	14A70876	Insulator, coil sleeve: armite.....doz
18	14A74198	Insulator, magnet winding: armite.....doz
19	14A70979	Insulator, slug: bakelite .....doz
20	14A70973	Insulator, switch: armite .....doz
21	45B70926	Lever, detent.....
22	45B70930	Lever, gear.....
23	29R3014	Lug, solder (ST-78 only).doz
24	29R5331	Lug, solder (ST-60 only).doz
25	4S7651	Lockwasher, steel: #8 internal; cad pl.....per/c
26	2S7003	Nut, steel: 8-32 x 5/16 hex; cad pl.....per/c
27	1X73012	Plate, Bushing and Stud Assembly: stop end plate with actuator rod bushing and gear locating stud.....
28	1X73007	Plate & Coil Shields Assembly: consists of tuner plate solenoid shield, 3 coil shields and 3 solenoid mtg bolts (ST-60 only).....
28	1X592275	Plate & Coil Shields Assembly: consists of tuner plate, solenoid shield, 3 coil shields and 3 solenoid mtg bolts (ST-78 only).....

MODELS ST-60,
ST-78, Tuners

Ref. No.	Part Number	Description
29	1X76556	Plate, end: solenoid end plate assembly; with gasket and adjustable air release.
30	1X71359	Plate & Gears Assembly (station set-up gear train)
31	1X73008	Plate & Plunger Assembly: consists of carriage plate with 3 bakelite core screw insulators and solenoid plunger rod with ratchets and stop plate (RETURN entire tuner to factory for exchange when this part requires replacement).....
32	1X592268	Plate & Trimmers Assembly: consists of coil end plate, 2 trimmers and terminal strip (ST-78).....
32	1X472639	Plate & Trimmers Assembly: consists of coil end plate, 3 trimmers and terminal strip (ST-60).....
33	64K472055	Plate, switch mounting...
34	43A70905	Ratchet, fixed (large)...
35	43A70904	Ratchet, floating (small)
36	9K500055	Receptacle, plug: 9-pin.....
37	17K484497	Resistor, wire-wound: 5.6 ohms 10% 1W (in parallel with solenoid coil).....
38	5S2833	Rivet, brass: .064 x 1/8 (part of actuator rod adj).....
39	5S7770	Rivet, steel: .088 x 5/32; nkl pl (slug insulator mtg).....
40	5S7706	Rivet, steel: .122 x 1/8; nkl pl (lock-up spring mtg).....
41	5S7707	Rivet, steel: .122 x 5/32; nkl pl (trimmer mtg)..
42	5S8497	Rivet, steel: .088 x 1/8; nkl pl (terminal strip mtg).....
43	47A472003	Rod, carriage guide.....
44	47A73787	Rod, manual stop guide..
45	47A70921	Rod, stop guide.....
46	47A480767	Rod, actuator.....
47	3S2950	Screw, machine: 4-40 x 1/4; slotted locking, stl; 3 index head cad pl (carriage brkt mtg).....
48	3S2681	Screw, steel: #4 x 3/8 Phillips filister head; cad pl (selector switch mtg)...
49	3S7327	Screw, machine: 5-40 x 3/8; slotted hex head; stl; cad pl (mute switch mtg)..
50	3S7104	Setscrew, steel: 8-32 x 3/16 slotted headless; cad pl (part of actuator rod adj).....
51	3S7148	Setscrew, steel: 6-32 x 1/8; Allen head; nkl pl (ratchet setscrew in plunger).....
52	3S7200	Screw, machine: 6-32 x 3/16; slotted filister head; stl; cad pl (air release adj screw).....
53	3S2684	Screw, sheet metal: #6 x 1/4 Phillips filister head; stl; cad pl (solenoid switch mtg).....
54	3S7205	Screw (lockscrew): 8-32 x 1/4; slotted hex head; cad pl (base mtg).....
55	3A74390	Screw, special (gear plate mtg).....
56	3S8175	Screw, sheet metal: #4 x 3/16; PKZ; slotted hex head; stl; cad pl (holds lead screw stop brkt to manual lead stop) .....
57	58A70902	Screw & Coupling Assembly: manual lead screw with bakelite coupling.....
58	1A73015	Screw & Stop Assembly: lead screw with carriage stop...
59	47A70934	Shaft, lever.....
60	26K592104	Shield, coil (Osc ST-78)...
61	26A70878	Shield, coil (ST-60 Ant, RF & Osc) (ST-78 Ant & RF)....
62	26B472568	Shield, tuner (ST-60 carriage cover).....
63	43A70881	Sleeve, coil: powdered iron (not in Osc ST-78).....
64	43A70953	Spacer, selector switch: fibre.....
65	2S7988	Speednut, steel: for .093 diameter rod.....
66	41A70958	Spring, coil: iron core .....
67	41A70968	Spring, gear plate.....
68	41A70949	Spring, lead screw.....
69	41A70971	Spring, lock-up.....
70	41A70955	Spring, ratchet.....
71	41A70941	Spring, carriage.....
72	41A472134	Spring, carriage balance.....
73	41A472480	Spring, actuator rod adjustment.....
74	46A70983	Stop, manual lead.....
75	31A70948	Strip, terminal lug.....
76	40A472644	Switch, mute.....
77	40B70952	Switch, selector.....
78	1B70944	Switch, solenoid: with mtg plate.....
79	4A73378	Washer, bumper.....
80	4A70015	Washer, "C" (lever shaft retainer).....
81	47A70873	Washer, coil spacer: fibre.....
82	4A76542	Washer, eccentric (air release hole adjustable cover).....
83	4A70974	Washer, insulator (actuator rod).....
84	4A70956	Washer, iron core insulator; bakelite.....
85	4A74571	Washer, paper.....
86	4A73621	Washer, spring (manual lead screw).....
87	4A70932	Washer, "C" spring (manual lead screw retainer)....
88	4A70961	Washer, actuator rod: rectangular hole.....
89	4A70962	Washer, bearing (actuator rod).....
90	4A75683	Washer, brass: special.

MODELS ST-60,
ST-78, Tuners

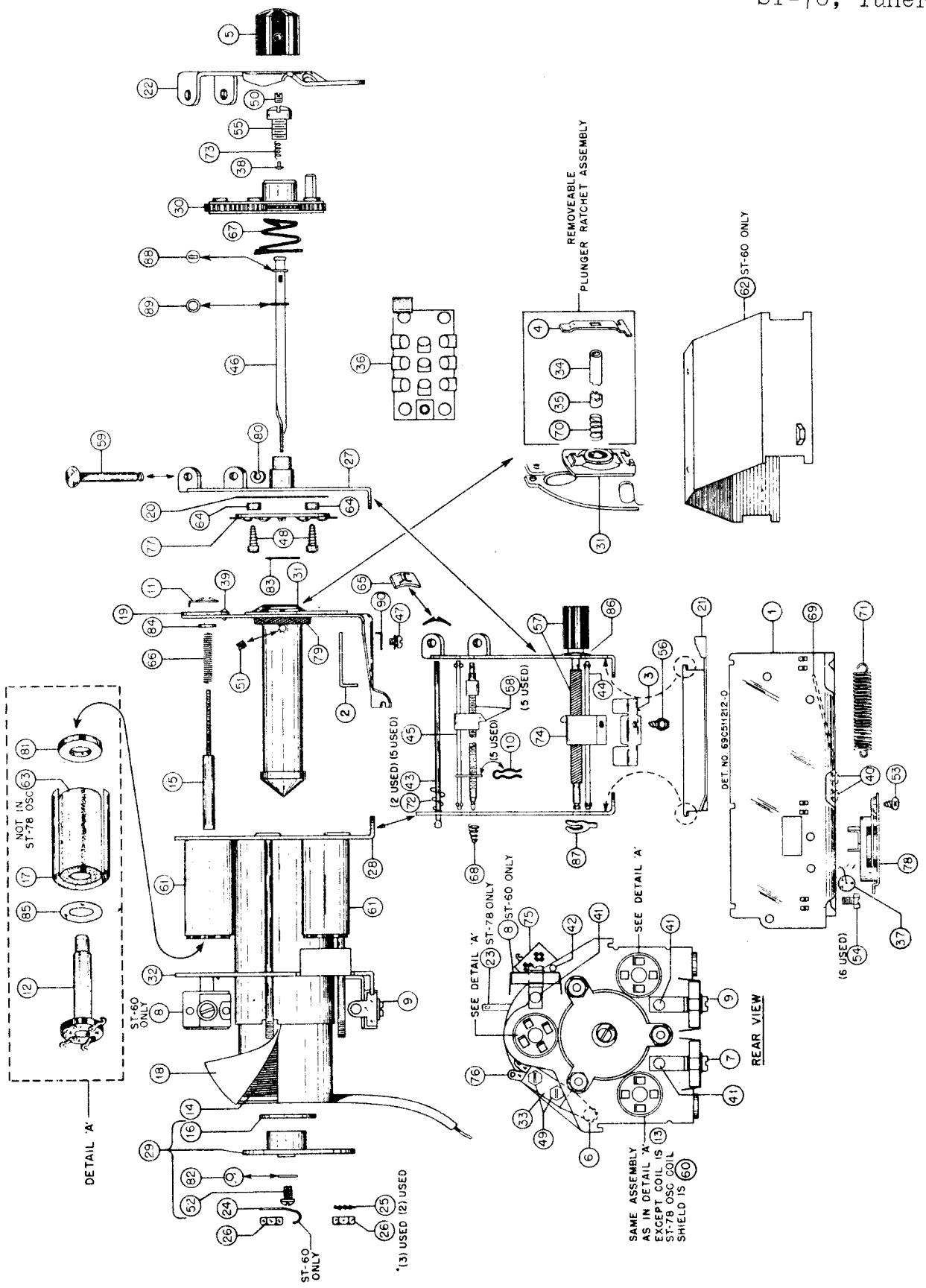


FIGURE 8. PARTS LOCATION

MODEL WS1C, 1951
Willys-Overland

GENERAL INFORMATION

TYPE - Automotive type radio receiver designed for installation in 1951 Willys-Overland cars. An external speaker is used.

TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

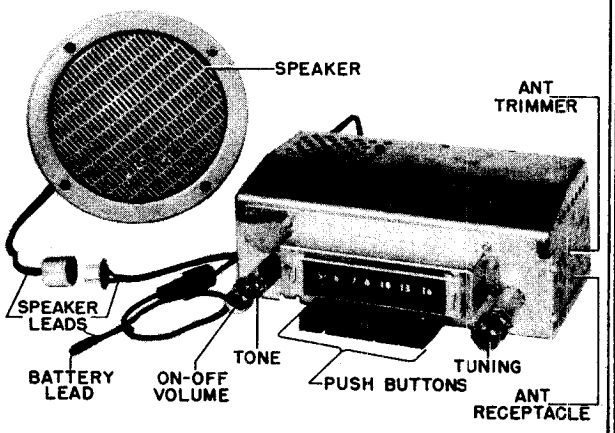
TUBE COMPLEMENT -

6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Diode detector, AVC & 1st AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3V DC

POWER OUTPUT - 3.5 watts (max)

TUNER - Model AT-90. See AT-90 Service Manual for Replacement Parts.



TO SET THE PUSHBUTTONS

Receiver has 5 buttons for automatic station selection. To set the push buttons, proceed as follows:

1. Turn volume up until stations can be heard.

2. Pull button out and with the station selector, tune to the station desired.

3. Push button in. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining four buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Before setting the pushbutton, tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use alignment tool, Motorola Part No. 66A76278.

2. A small screwdriver for IF and RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1.

PROCEDURE

1. To expose the alignment adjustments, remove the top and bottom covers. If the tuner cores require adjustment, remove the dial scale bracket assembly and dial background.

2. Connect a PM speaker (3.2 ohm VC) to speaker cable terminals of the receiver.

3. Connect an output meter across the speaker voice coils.

4. Connect 6.3 volts to the receiver "A" lead terminal and chassis.

5. Turn the receiver "on" and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

7. Antenna Trimmer Adjustment. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL WS1C, 1951
Willys-Overland

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side - 6BE6 grid (pin #7) Low side-chassis	455 Kc	Extreme high frequency end of travel	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
	NOTE: If the tuner is tracking properly over its entire range, the tuner cores 8, 9, & 10 will not require adjustment - proceed as follows:					
2.	Dummy -see Figure 1	Ant receptacle thru dummy antenna	1605 Kc	Extreme high frequency end of travel	5	Peak for maximum.
3.	"	"	1300 Kc	With tuning knob, tune to maximum signal	6 & 7	Peak for maximum in order indicated.
4.	-	-	-	-	-	Repeat steps 2 & 3.
	NOTE: If the tuner coils or cores have been replaced or tampered with, or the tuner does not cover the required range, the tuner cores 8, 9, & 10 require adjustment - proceed as follows:					
5.	Dummy -see Figure 1	Ant receptacle thru dummy antenna	1605 Kc	Extreme high frequency end of travel	5, 6 & 7	Remove dial scale bracket and dial background. Peak for maximum in order indicated.
6.	"	"	1300 Kc	With tuning knob, move carriage "in" 5/16" from position in step 5.	8, 9 & 10	Peak for maximum in order indicated.
7.	"	"	1605 Kc	With tuning knob, tune for maximum signal at high frequency end.	5, 6 & 7	Peak for maximum in order indicated.
8.	"	"	1300 Kc	With tuning knob, tune to maximum signal	8, 9 & 10	Peak for maximum in order indicated.
9.	-	-	-	-	-	Repeat step 7.

POINTER ADJUSTMENT

10. Tune receiver to 1300 Kc and adjust pointer by means of eccentric cam (11) on the tie plate to the 1300 Kc calibration mark on dial scale.

11. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 Kc. Car antenna should be fully extended.

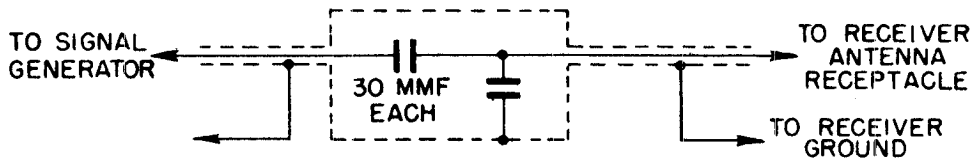


FIGURE 1. DUMMY ANTENNA

MODEL WS1C, 1951
Willys-Overland

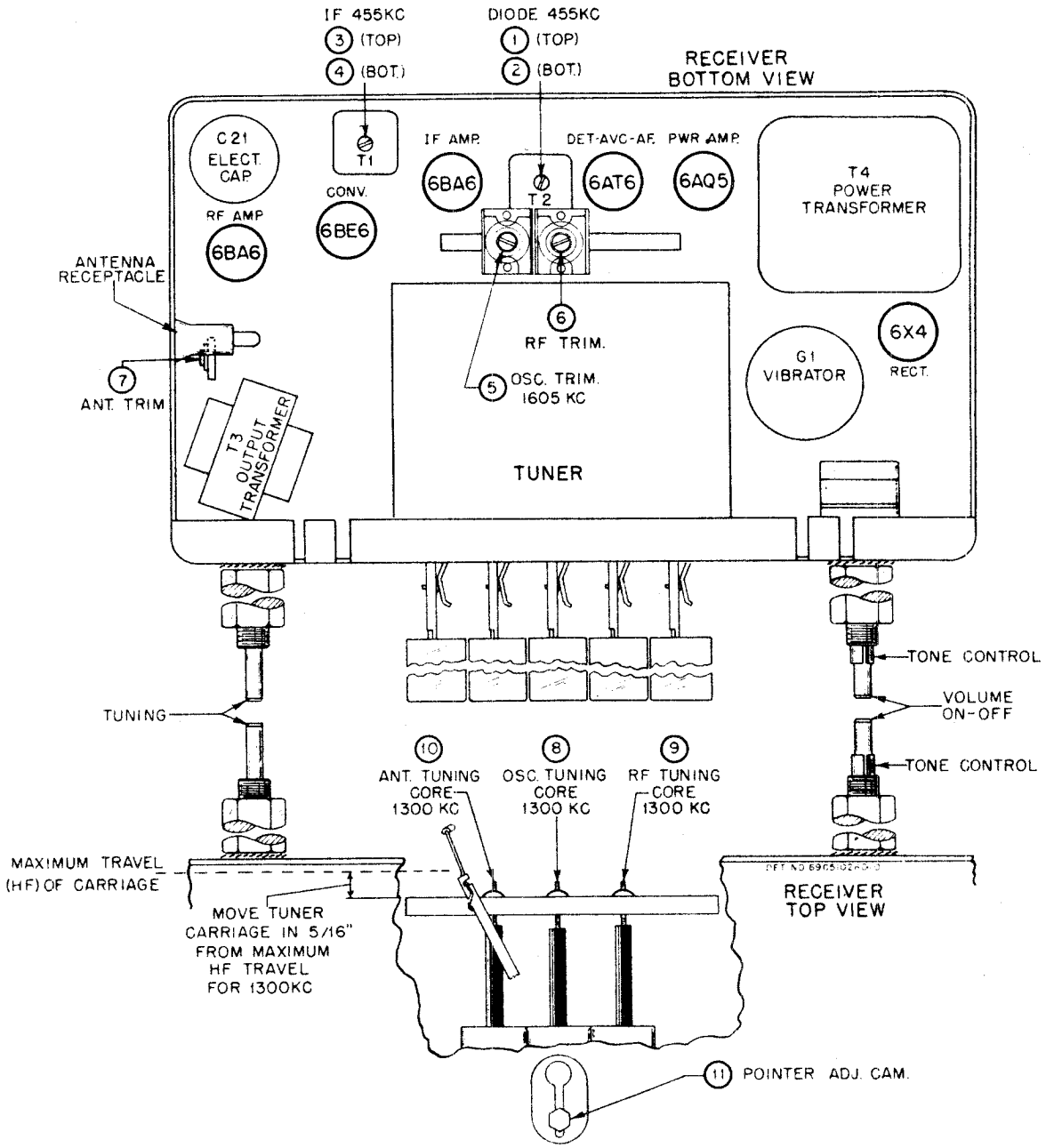


FIGURE 2. TUBE AND TRIMMER LOCATIONS

MODEL WS1C, 1951
Willys-Overland

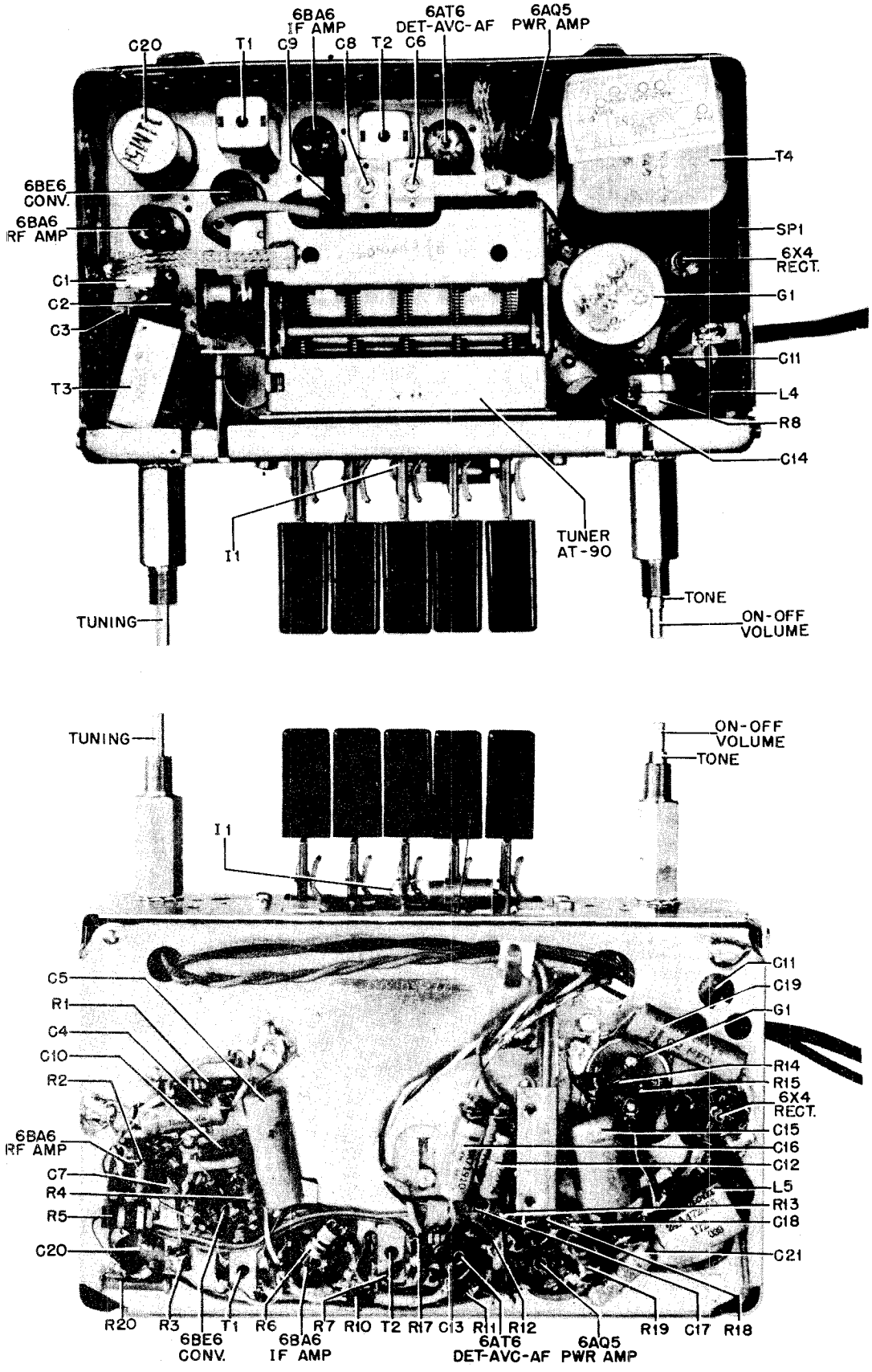


FIGURE 3. CHASSIS PARTS LOCATIONS

MODEL WS1C, 1951
Willys-Overland

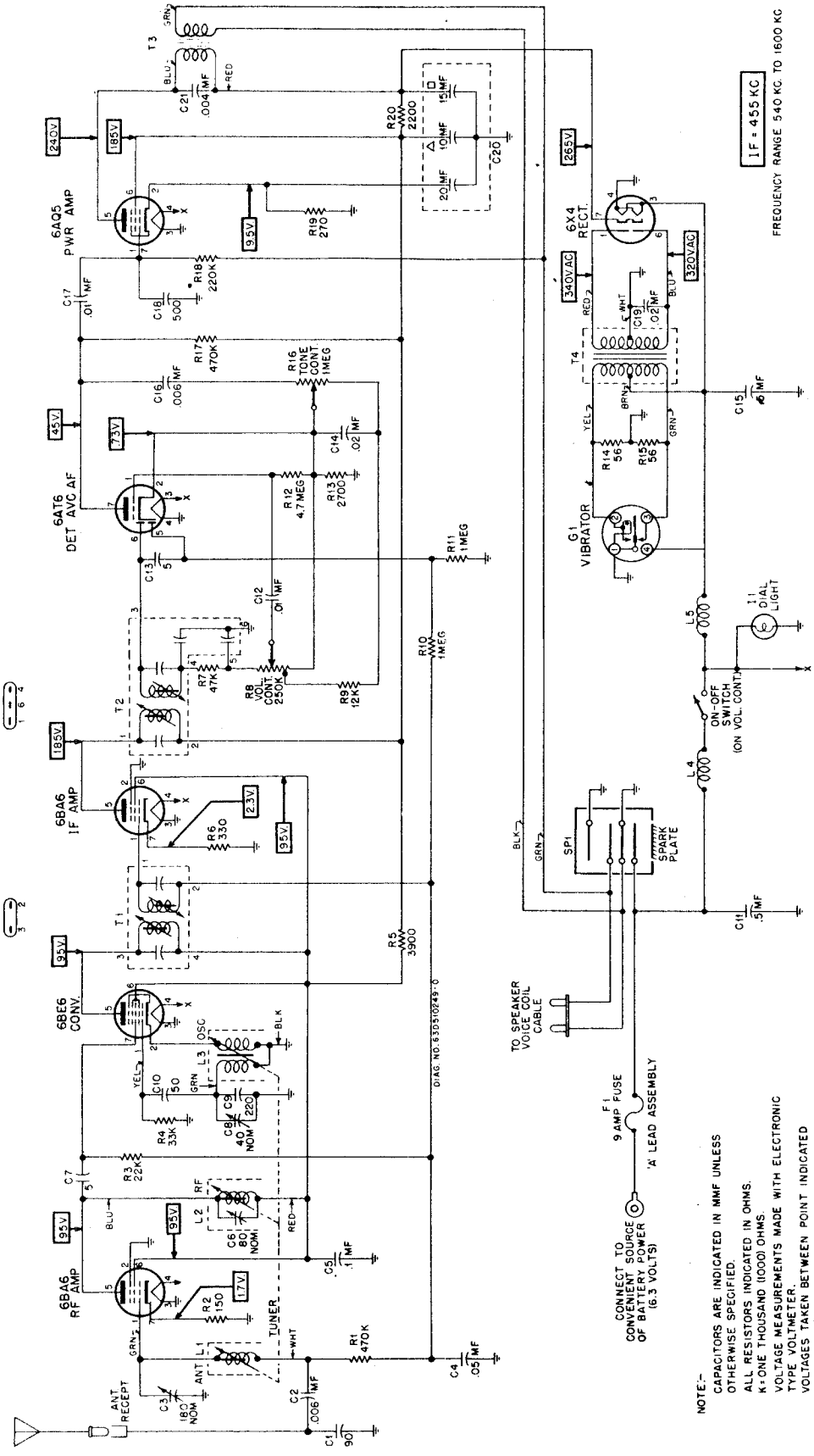
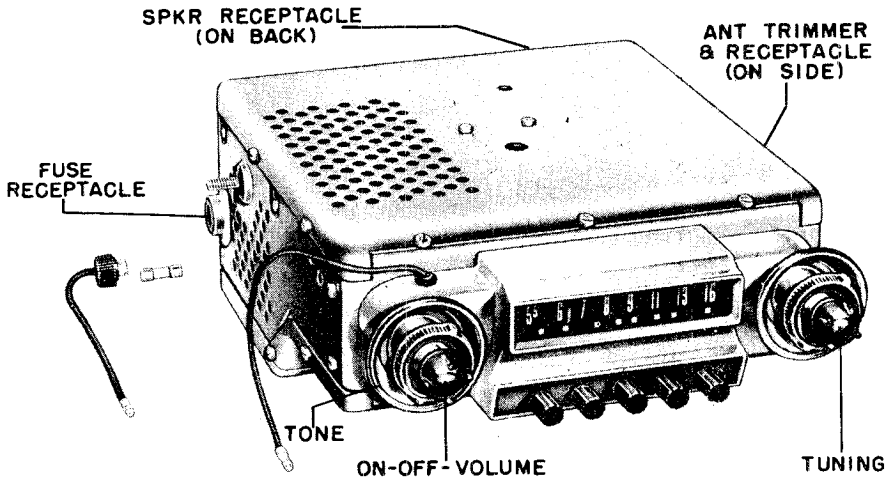


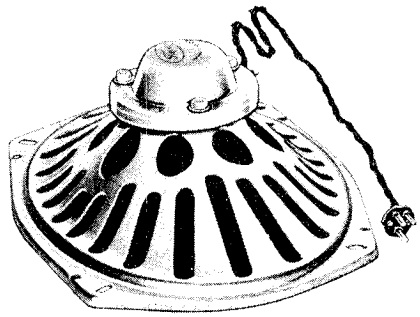
FIGURE 4. SCHEMATIC DIAGRAM

NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ± 10 %
NO SIGNAL INPUT.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Mica, metal: 90 mmf 500V....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20A501419	Mica, variable: 50 to 280 mmf; includes bracket.....
C-4	8R13514	Paper: .05 mf 100V.....
C-5	8R13166	Paper: .1 mf 4000V.....
C-6	-	Variable, mica: RF trimmer (see AT-90 Service Manual).
C-7	21K70720	Molded, miniature: 5 mmf 500V
C-8	-	Variable, mica: osc trimmer (see AT-90 Tuner Service Manual).....
C-9	-	Ceramic: temperature compensating (see AT-90 Tuner Service Manual).....
C-10	21R6513	Mica: 50 mmf 500V.....
C-11	8K17028	Paper: .5 mf 100V.....
C-12	8R472754	Paper: .01 mf 100V.....
C-13	21K70720	Molded, miniature: 5 mmf 500V
C-14	8R51209	Paper: .02 mf 100V.....
C-15	8K17028	Paper: .5 mf 100V.....
C-16	8K71910	Paper: .006 mf 400V.....
C-17	8R23690	Paper: .01 mf 400V.....
C-18	21R6580	Mica: 500 mmf 500V.....
C-19	8K114137	Paper: .02 mf 1000V.....
C-20	23A485677	Electrolytic: 15-10 mf/350V, 20 mf/25V.....
C-21	8K71909	Paper: .004 mf 400V.....
Fuse		
F-1	65K16248	Fuse: 9 amp.....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin...
Pilot Light		
I-1	65X10867	Bulb: 6.3V; .25A; #44 bayonet base....
Coils		
L-1	-	Antenna coil (see AT-90 Tuner Service Manual).....
L-2	-	RF coil (see AT-90 Tuner Service Manual).....
L-3	-	Oscillator coil (see AT-90 Tuner Service Manual).....
L-4	24K592269	Choke, hash.....
L-5	24A472535	Choke, hash.....
Resistors		
	Note: All resistors are carbon insulated type unless otherwise specified.	
R-1	6R6032	470,000 20% ½W.....
R-2	6R3992	150 20% ½W.....
R-3	6R6028	22,000 20% ½W.....
R-4	6R6012	33,000 20% ½W.....
R-5	6R476012	3900 10% 2W.....
R-6	6R6010	330 20% ½W.....
R-7	6R6056	47,000 20% ½W.....
R-8	18K502898	Volume-On-Off: 250,000 ohms; includes tone control R-16.
R-9	6R6394	12,000 10% ½W.....
R-10	6R6004	1 meg 20% ½W.....
R-11	6R6004	1 meg 20% ½W.....
R-12	6R2122	4.7 meg 20% ½W.....
R-13	6R5577	2700 10% ½W.....
R-14	6R5614	56 10% ½W.....
R-15	6R5614	56 10% ½W.....
R-16	18K502898	Tone control: 1 meg; includes volume control R-8..
R-17	6R6032	470,000 20% ½W.....
R-18	6R6014	220,000 20% ½W.....
R-19	6R6336	270 10% 1W.....
R-20	6R476130	2200 20% 2W.....
Spark Plate		
SP-1	1A501207	Spark Plate Assembly.....
Transformers		
T-1	24C485553	IF Transformer, 455 Kc: complete with padding capacitors and tuning cores....
T-2	24K485555	Diode transformer, 455 Kc: complete with padding capacitors and tuning cores....
T-3	25B500727	Output Transformer.....
T-4	25B472533	Power Transformer.....
Tuner - Model AT-90		
	51D502000	Tuner, Model AT-90 (see AT-90 Tuner Service Manual for breakdown).....
CHASSIS PARTS - MECHANICAL		
	7B501177	Bracket, dial background.....
	7C501187	Bracket, dial scale mounting.....
	7B501472	Bracket, shield.....
	43K502884	Bushing, control shaft (volume and tuning shaft mtg).....
	42B500725	Clip, bottom cover retainer.....
	42B485548	Clip, coil can mounting.....
	42K510959	Clip, dial retaining.....
	42A4215	Clip, vibrator grounding.....
	1X500714	Cover Assembly, bottom: includes clips and grounding wiper.....
	15C500663	Cover, top.....
	9K510182	Lead Assembly, fuse: complete; with fuse.....
	4S7668	Lockwasher, ext: 3/8; stl; cad pl (volume and tuning shaft mtg).
	4S7686	Lockwasher, ext: #5; spring stl; cad pl (dial light socket mtg).....
	51A502012	Pinion Shaft and Drive Disc Assembly.....
	64K510429	Plate, chassis front.....
	28A791030	Plug, 2-pin (on spkr cable).....
	1X510728	Pointer, dial.....
	9A472148	Receptacle, antenna.....
	34B502890	Scale, dial.....
	2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg).....
	2S2869	Nut, hex: 5/16-18 x 9/16; pol nkl (receiver and bezel mtg).....
	9A791031	Receptacle, two-prong: less shell & insulator (used on spkr cable).
	64K510084	Screen, speaker.....
	3S410073	Screw, machine: 8-32 x 3/4; Phillips oval head; chrome pl (spkr mtg).....
	3S7454	Screw, sheet metal: #8 x 1/4; plain hex head; stl; cad pl (mtg plate mtg).....
	3S1849	Screw, machine: 1/4-20 x 1/2; slotted round head; stl; cad pl (support bracket mtg).....
	3S410095	Screw, machine: 1/4-20 x 5/8; plain hex head; stl; cad pl (support brkt mtg to dash).....
	3S7104	Setscrew: 8-32 x 3/16; slotted headless; stl; cad pl (control knob).....
	15K74442	Shell and insulator (for spkr receptacle).....
	50B500707 or 50B592352	Speaker, PM; 6"; 3.2 ohm VC.....
	41A77592	Spring, compression (behind volume control knob).....
	6A4141	Suppressor, distributor.....
	4S7562	Washer, flat: 7/16 x .187 x .033; stl; cad pl (spkr mtg).....
	4S1792	Washer, flat: 5/8 x 9/32 x .090; stl; cad pl (support bracket mtg to mtg plate).....
	4S1730	Washer, flat: 3/4 x .453 x .040; stl; cad pl (bezel mtg).....
	4A580282	Washer, spring (behind dummy knob).....
	51K502894	Shaft Assembly, manual drive: complete.....
	9K580218	Socket, tube: 7-prong; with one dummy lug.....
	9A70208	Socket, 4-prong (vibrator).....
	9K510960	Socket, dial light: includes brkt.
	31K490142	Strip, terminal: 2 insulated lugs, #1 mtg.....
	31K490143	Strip, terminal: 2 insulated lugs, #2 mtg.....
	31A500705	Strip, terminal: 3 insulated lugs, #2 mtg.....
	39K502418	Wiper, ground (used on vibrator socket).....
	39K470032	Wiper, grounding (bottom cover)...
	13K510082	Bezel, speaker.....
	1X510730	Button, push.....
	7B502885	Bracket, receiver mtg.....
	8A4491	Capacitor, noise suppression.....
	32B502889	Gasket, speaker.....
	1X473155	Knob, tuning and volume: chrome pl
	37K472939	Knob, tone control: chrome pl.....
	36K502896	Knob, dummy: chrome pl (behind tuning knob).....
	4S7688	Lockwasher, int-ext: 1/4; stl; cad pl (receiver mtg).....
	4S7657	Lockwasher, ext: #8; cad pl (spkr mtg).....
	1A472928	Mounting Plate & Stud Assembly (receiver rear mtg).....

MODEL 1MF, Ford
Part No. 1A-18805-A2





GENERAL INFORMATION

TYPE - Automotive superheterodyne receiver with external speaker.

TUNING RANGE - 540 to 1610 Kc IF - 265 Kc

TUBE COMPLEMENT - 6SK7GT - RF Amplifier; 6SA7GT - Converter; 6SK7GT - IF Amplifier; 6SQ7GT - Det, AVC & AF Amp; 6V6GT - AF Output Amplifier; 6X5GT - Rectifier

OPERATES FROM - 6 volt storage battery

TUNER - Model AT-81 Service Manual for Replacement Parts.

TO SET THE PUSH BUTTONS

Automatic push button tuning is provided for selection of five favorite local stations. The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency. The push buttons should be set up during the daytime because at night, distant stations will be heard with the same intensity as local stations, making it difficult to select local stations. To set the push buttons proceed as follows:

1. Collapse the antenna.

2. Turn the receiver on and allow it to operate for at least fifteen minutes in order for each part to reach normal operating temperature.

3. Loosen the first push button on the left by turning it (with your fingers) counterclockwise one turn.

4. Select the station desired and with low volume tune it in by turning the manual tuning knob. Tune very carefully for clearest reception.

5. Press the first push button in firmly, then release and tighten (with your fingers) by turning clockwise.

The first push button is now set for this station selection. Follow the above procedure for setting each of the other four buttons.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

MODEL 1MF, Ford
Part No. 1A-18805-A2

ALIGNMENT

Connect the receiver "A" lead and receiver chassis to a 6 volt storage battery. Rotate volume and tone controls to maximum clockwise position. Connect an output meter across the speaker voice coil. Use an insulated screwdriver for making all adjustments. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. Remove receiver escutcheon, dial scale, and top & bottom covers to expose all alignment adjustments. See Figure 1.

To adjust the pointer, tune the receiver to a 1300 Kc signal, and rotate the adjusting cam (see Figure 1) until the pointer coincides with the 1300 Kc marker on the dial scale. This cam may be adjusted thru a hole provided in the top cover.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Converter grid (6SA7GT pin 8)	265 Kc	HF end stop	1, 2, 3 & 4	Adjust for maximum. Repeat for greater accuracy.
RF ALIGNMENT						
2.	See Fig. 1	Ant. receptacle	1608 Kc	HF end stop*	C-12, C-8 C-1	Adjust for maximum.
3.	See Fig. 1	Ant. receptacle	1300 Kc	Move carriage "in" 21/64" from HF end stop position. See Fig. 1.	L-4, L-3 L-1	Adjust for maximum.
4.	See Fig. 1	Ant. receptacle	1608 Kc	HF end stop	C-12, C-8 C-1	Adjust for maximum.
5. Repeat steps 3 & 4 until no further increase is obtainable. After final adjustment is made, cement core adjustments in place with speaker cement.						
SENSITIVITY CONTROL						
6.	See Fig. 1	Ant. receptacle	Set to 600 kc & 4 microvolts output	Tune for max	Sensitivity control	Set sensitivity control for 1 watt output (1.79 volts on output meter).
ANTENNA TRIMMER ADJUSTMENT						
7.	-	-	-	Weak station at approx. 1400 Kc	C-1	With receiver installed in car, peak antenna trimmer for maximum volume. Ant. should be fully extended.

*Tuner cores should be backed out to project 1-3/8" from end of coil forms so they will have no effect on trimmer adj.

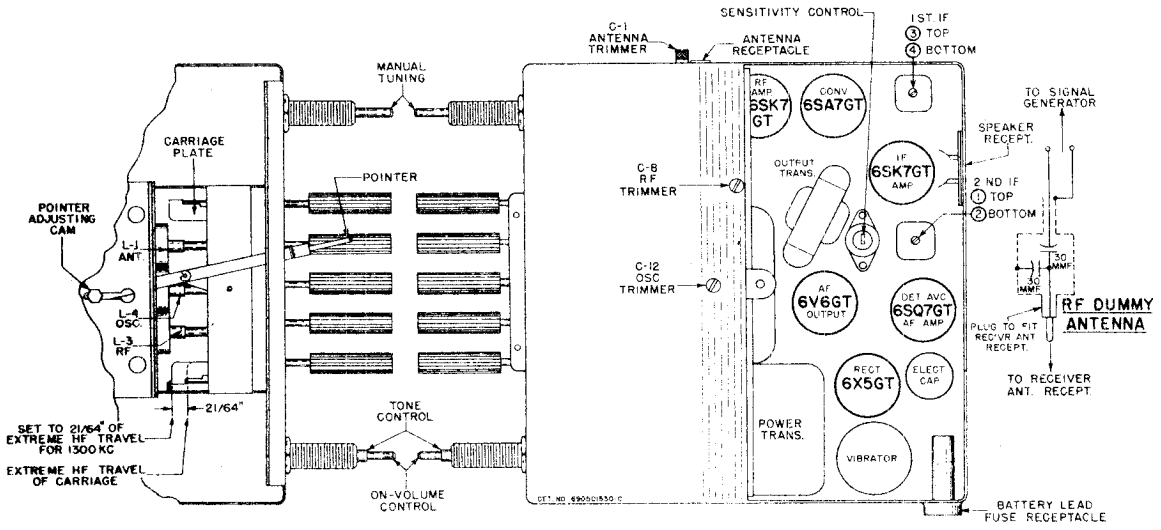
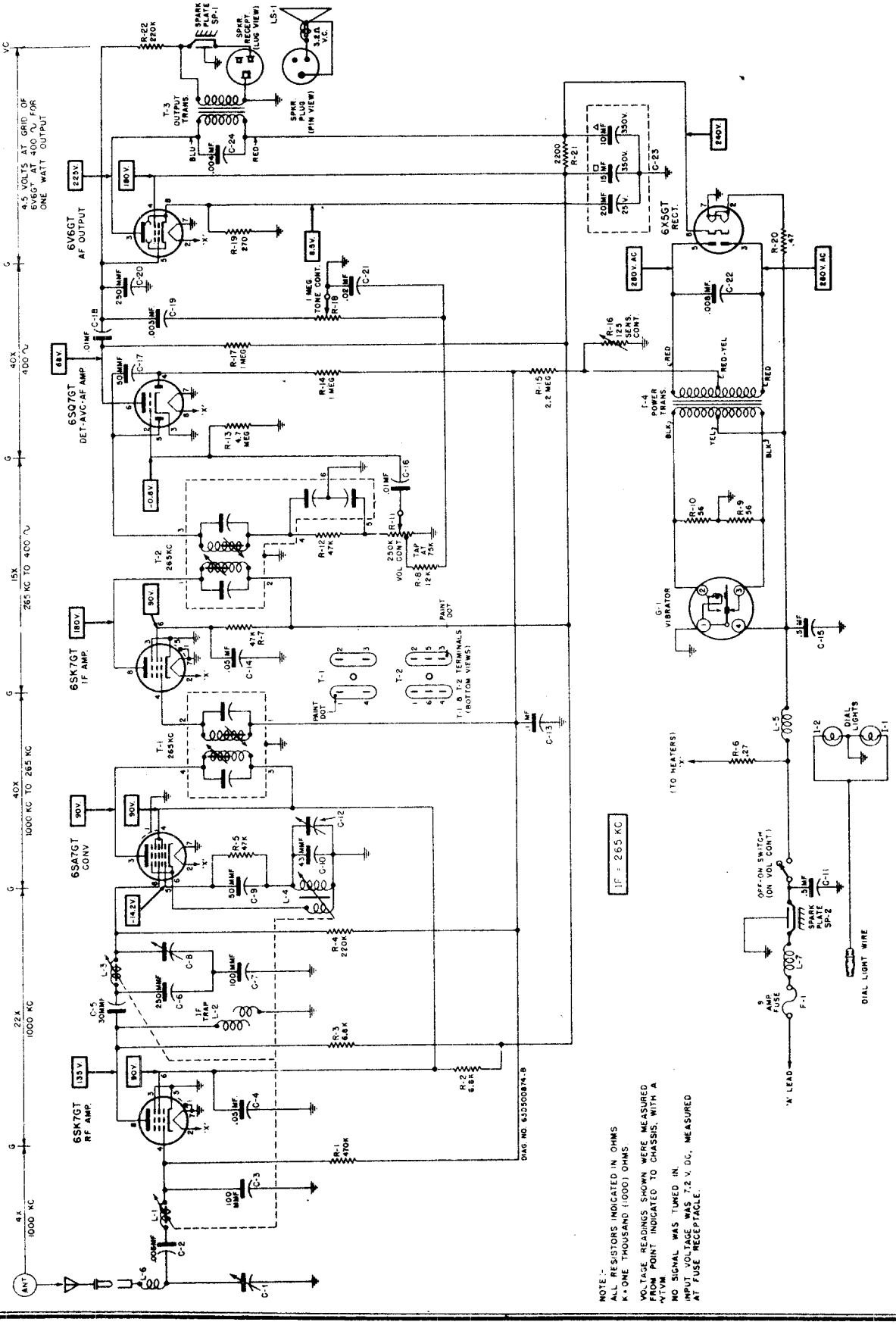


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODEL 1MF, Ford
Part No. 1A-18805-A2



NOTE:-
ALL RESISTORS INDICATED IN OHMS
K = ONE THOUSAND (1000) OHMS

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS, WITH A 1000 ~ VTVM

NO SIGNAL WAS TUNED IN.
INPUT VOLTAGE WAS 7.2 V. DC, MEASURED AT FUSE RECEPTACLE.

FIGURE 2. SCHEMATIC DIAGRAM

MODEL 1MF, Ford
Part No. 1A-18805-A2

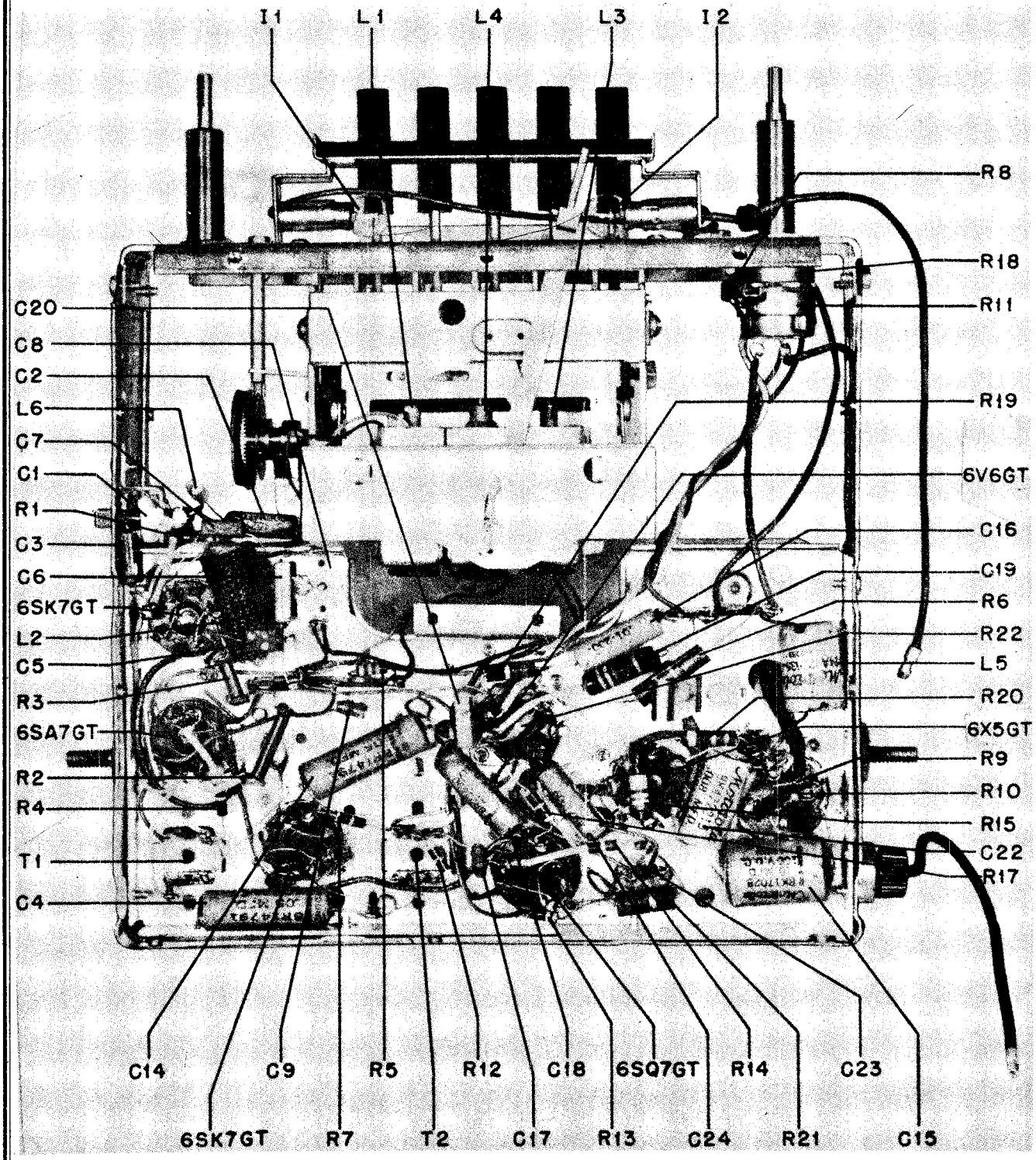


FIGURE 3. PARTS LOCATION

MODEL 1MF, Ford
Part No. 1A-18805-A2

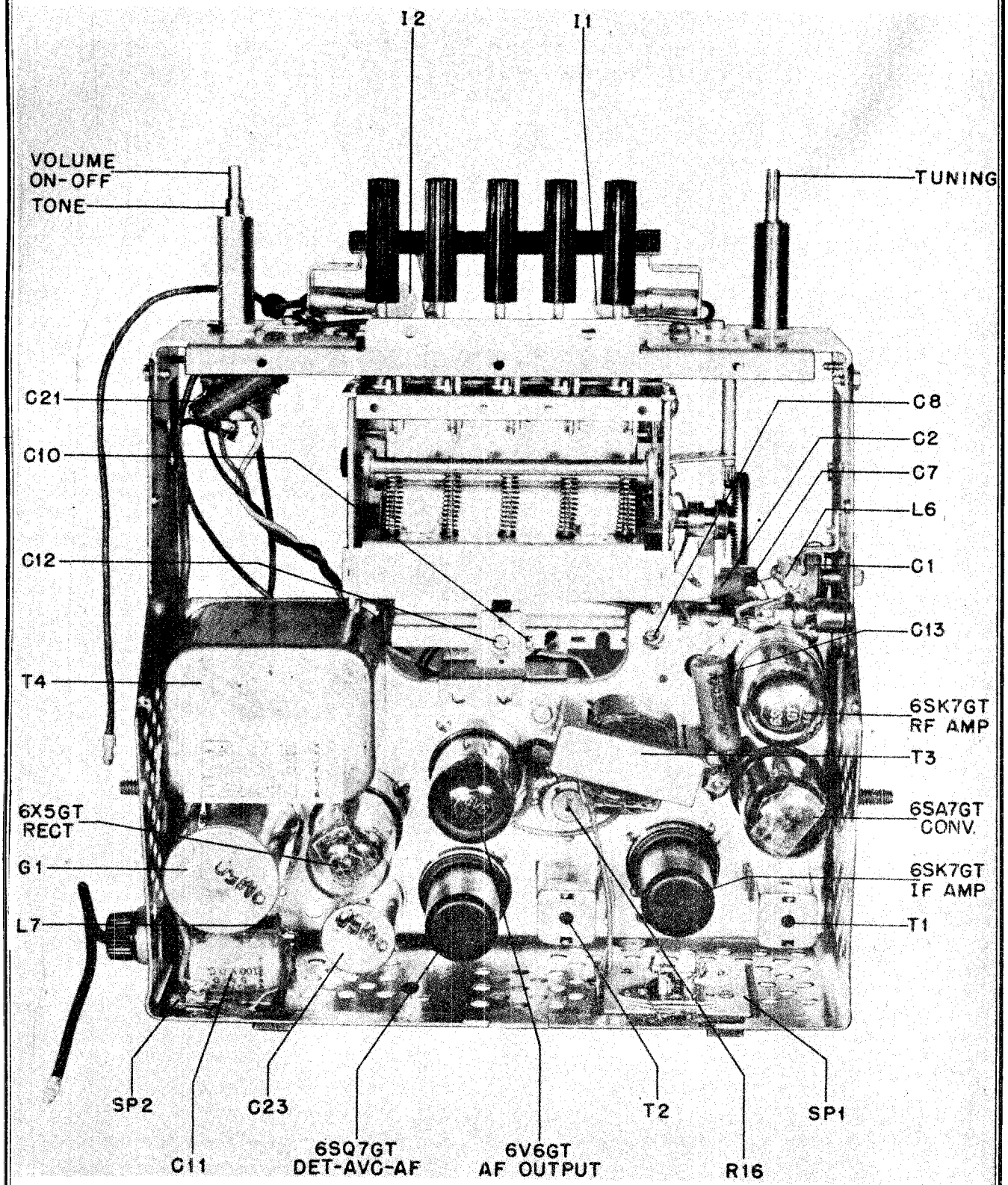


FIGURE 4. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

CHASSIS PARTS - ELECTRICAL

Ref. No.	Motorola Part Number	Description
Capacitors		
C-1	20B591269	Mica, variable: 5 to 80 mmf; includes bracket & thumbscrew
C-2	8A4529	Paper: .006 mf 100V
C-3	21R6619	Mica: 100 mmf 5% 500V
C-4	8R14791	Paper: .05 mf 400V
C-5	21R6665	Mica: 30 mmf 10% 500V
C-6	21R6662	Mica: 250 mmf 10% 500V
C-7	21R6631	Mica: 100 mmf 10% 300V
C-8	20A591272	Mica, variable: 5 to 80 mmf; includes bracket
C-9	21R6513	Mica: 50 mmf 10% 300V
C-10	-	Compensating -See AT-81 Tuner Service Manual
C-11	8K17028	Paper: .5 mf 100V
C-12	-	Mica, variable -See AT-81 Tuner Service Manual
C-13	8R472035	Paper: .1 mf 100V
C-14	8R14791	Paper: .05 mf 400V
C-15	8K17028	Paper: .5 mf 100V
C-16	8R472754	Paper: .01 mf 100V
C-17	21R6513	Mica: 50 mmf 10% 300V
C-18	8R23690	Paper: .01 mf 400V
C-19	8R490437	Paper: .003 mf 400V
C-20	21R6648	Mica: 250 mmf 20% 500V
C-21	8R51209	Paper: .02 mf 100V
C-22	8R472215	Paper: .008 mf 1600V
C-23A, B & C	23A485677	Electrolytic: 10-15-20 mf/ 350-350-25V
C-24	8K71909	Paper: .004 mf 400V
Fuse		
F-1	65K16248	Fuse, 9 amp
Vibrator		
G-1	48B3333	Vibrator, 4-prong: full wave; non sync
Dial Light		
I-1,2	65X4151	Bulb, pilot: 6-8V; .2A, round bayonet base; #55
Coils		
L-1	-	Antenna Coil Assembly -See AT-81 Tuner Service Manual.
L-2	24A591317	Coil, IF trap: 265 kc
L-3	-	RF Coil Assembly -See AT-81 Tuner Service Manual
L-4	-	Oscillator Coil Assembly -See AT-81 Tuner Service Manual.
L-5	24A472535	Choke, hash
L-6	24K592197	Choke, antenna spark
L-7	24A501320	Choke, "A" spark
Speaker		
LS-1	50C501741 or 50C502806 or 50C501967	Speaker, PM: 6" x 9"; 3.2 ohm VC; with cable & plug (Ford 1A-18808-A)
Resistors		

NOTE: All resistors are insulated carbon type unless otherwise specified.

R-1	6R6032	470,000 20% 1/2W
R-2	6R6287	6800 20% 1W N.I.
R-3	6R490492	6800 20% 1W
R-4	6R6015	220,000 20% 1/2W
R-5	6R6056	47,000 20% 1/2W
R-6	17K488267	Wirewound: .27 10% 1W.
R-7	6R6056	47,000 20% 1/2W
R-8	6R6394	12,000 10% 1/2W
R-9	6R5614	56 10% 1/2W
R-10	6R5614	56 10% 1/2W
R-11	18B501153	Volume & tone control: dual; 250,000 ohms each section; rear section tapped at 75,000 ohms; with switch
R-12	6R6056	47,000 20% 1/2W
R-13	6R2122	4.7 meg 20% 1/2W
R-14	6R6046	1 meg 20% 1/2W
R-15	6R3927	2.2 meg 20% 1/2W
R-16	18K591265	Control, sensitivity: 125
R-17	6R6046	1 meg 20% 1/2W
R-18	-	Tone control (part of R-11).
R-19	6R6336	270 10% 1W
R-20	17K488266	Wirewound: .47 10% 1/2W
R-21	6R6006	2200 20% 1W N.I.
R-22	6R6015	220,000 20% 1/2W
Spark Plate		
SP-1	1A591220	Spark Plate Assembly: spkr
SP-2	1A591221	Spark Plate Assembly: "A"
Transformers		
T-1	24B580193	1st IF transformer: 265 Kc; iron core tuning
T-2	24K591267	2nd IF transformer: 265 Kc; iron core tuning
T-3	25B501909	Transformer, output
T-4	25C591264	Transformer, power
Tuner		
	51D501008	Permeability Tuner: Model AT-81 (See AT-81 Service Manual)

Motorola Part Number	Description
Tubes	
6SK7GT	Tube, vacuum: 6SK7GT (RF amp)
6SA7GT	Tube, vacuum: 6SA7GT (converter)
6SK7GT	Tube, vacuum: 6SK7GT (IF amp)
6SQ7GT	Tube, vacuum: 6SQ7GT (detector-AVC-AF amp)
6V6GT	Tube, vacuum: 6V6GT (output)
6X5GT	Tube, vacuum: 6X5GT (rectifier)

CHASSIS PARTS - MECHANICAL

7A912109	Bracket, front cover mounting
51B501304	Bracket and Socket Assembly, dial: complete with leads & bullet terminal; less bulbs
42A485548	Clip, coil can
42A4215	Clip, vibrator ground
1X501260	Escutcheon and Dial Scale Assembly.
9K501325	Fusebody Retainer: includes body, spring and contact assembly
37K85556	Grommet, rubber (dial light lead insulator)
2S2882	Nut, hex: 1/2-28 x 11/16; stl; cad pl (volume control and escutcheon mtg)
2S488296	Nut, speed (fuse retainer mtg)
5S7706	Rivet: .122 x 1/8; stl; nkl pl (grounding wiper mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (tube socket, spark plate, shield, front cover bracket, sensitivity control, terminal strip and antenna socket mtg)
5S7703	Rivet: .122 x 7/32; stl; nkl pl (vibrator clip mtg)
5S7708	Rivet: .122 x 9/32; stl; nkl pl (speaker socket mtg)
34B500603	Scale, dial
3S7350	Screw, machine: 6-32 x 1/4; slotted hex head; locking type; stl; cad pl (ant & RF trim mtg)
3S3397	Screw, sheet metal: #8 x 5/16 PKZ; plain hex head; stl; cad pl (pwr transformer mtg)
3S488298	Screw, sheet metal: #8 x 1/4 PKZ; slotted hex head; stl; cad pl (output trans, tuner mtg and housing screws)
3S7454	Screw, sheet metal: #8 x 1/4 PKZ; plain hex head; stl; cad pl (dial brkt assem mtg)
26A591208	Shield, hash
9A912113	Socket, antenna connector
9A912114	Socket, speaker: 3-prong
9A590099	Socket, tube: octal; molded
9A70208	Socket, tube: 4-prong, wafer
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 3/8" spacing
31K490147	Strip, terminal, 3 insulated lugs, #2 mtg; 3/8" spacing
31K490151	Strip, terminal: 4 insulated lugs, #2 mtg; 3/8" spacing
28A501322	Terminal, bullet type (on dial light lead)
4A501321	Washer, insulating (fuse retainer)
39A591399	Wiper, ground (pwr transformer)

HOUSING PARTS & ACCESSORIES

30K501326	Cable, fuse: includes knob & insert.
8A590751	Capacitor, fuel gauge (Ford 51AF-18871)
8B591375	Capacitor, generator (Ford 51AF-18827)
8B500736	Capacitor, oil gauge (Ford 8M18826).
8A500737	Capacitor, voltage regulator (Ford 8M18832)
42A591234	Clip, cover tension
1X501404	Cover, bottom front: includes brkt & grounding wiper
15C591222	Cover, bottom rear
15D500675	Cover, top
1C501211	Baffle and Gasket Assembly, speaker (Ford 1A-18836)
13B500596	Bezel, cup: chrome pl (Ford 1A-18835)
7C500695	Bracket, receiver mtg: RH (Ford 1A-18888)
7K500697	Bracket, receiver mtg: LH (Ford 1A-18890)
1X501261	Knob, manual tuning: chrome pl (Ford 1A-18824)
36B500598	Knob, tone control: chrome pl (Ford 1A-18830)
1X501262	Knob, volume control and on-off (Ford 1A-18820)
4S7693	Lockwasher, split: 1/4; stl; cad pl (receiver mtg) (Ford 34805-S8)
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) (Ford 33795-S8)
2S2882	Nut, hex: 1/2-28 x 11/16; stl; cad pl (receiver mtg to instrument panel and bezel cup mtg)(Ford 356098-S8)
2A912119	Nut, wing: 8-32; stl; cad pl (spkr mtg) (Ford 33900-S8)
3A580587	Screw, cap: cad pl (bottom cover mtg)
3S488298	Screw, sheet metal: #8 x 1/4 PKZ; slotted hex head; stl; cad pl (housing screws)
6A912121	Suppressor, distributor (Ford 1GA-18811-A)
4A500702	Washer, serrated (receiver mtg) (Ford OL-18869)
1X591404	Wheel Static Collector Assembly
39A51490	Wiper ground (on bottom front cover)

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

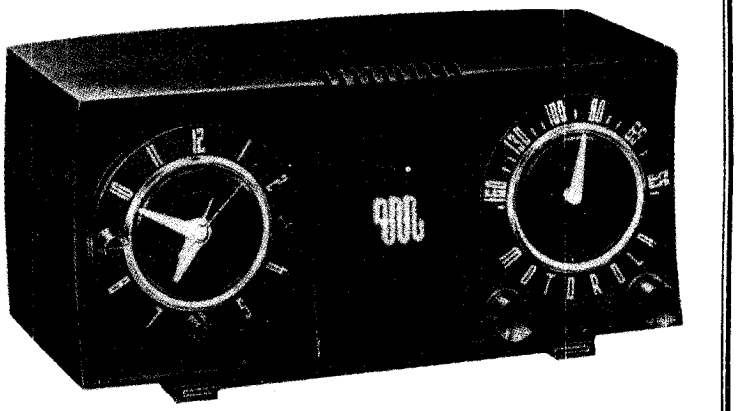
GENERAL INFORMATION

TYPE - AC table model superheterodyne with appliance outlet and self-contained electric clock for controlling automatically the operation of the radio and the outlet.

APPLIANCE OUTLET - For use with 117 volt AC appliances only, rated at 1100 watts or less.

RECEIVER MODELS -

Model	Color	Chassis
5C4	Green	HS-270
5C5	Ivory	HS-271
5C6	Walnut	HS-272



TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier

POWER SUPPLY - Operates from 117 volts, 60 cycle, alternating current only. Power consumption 37 watts.

CLOCK - Telechron self-starting electric clock (Telechron basic movement No. C-57, with Motorola face, hands, and escutcheon).

INSTALLATION & OPERATING INSTRUCTIONS

The locations and functions of the clock and radio controls are shown in Figure 1.

NORMAL RADIO OPERATION

Knob "A" on the clock turns the radio on or off. Select stations with the TUNING knob, and adjust volume with the VOLUME control.

A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

CLOCK OPERATION

The clock will start as soon as the receiver is plugged into an electrical outlet. To set the hands to the correct time, rotate the TIME SET knob (on the rear of the radio) in a clockwise direction only.

ALARM OPERATION

To set the alarm, pull out knob "C" and rotate it in a counterclockwise direction to the desired time on the alarm dial scale. The alarm will ring for one hour, or until knob "C" is pushed in. The alarm function is completely independent of the other controls on the clock.

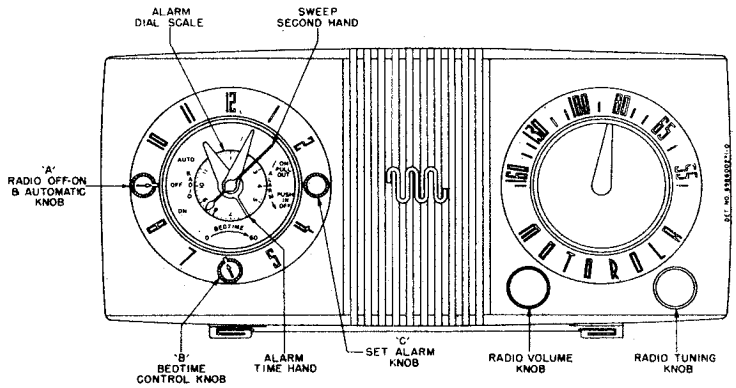


FIGURE 1. OPERATING CONTROLS

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

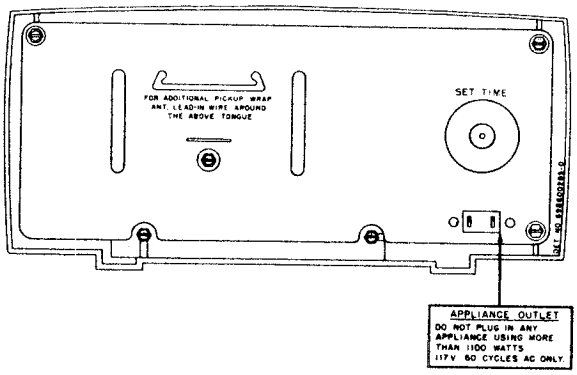


FIGURE 2. REAR VIEW

APPLIANCE OUTLET

To control an electrical appliance automatically, plug it into the receptacle on the back of the radio. See Figure 2. It will then be turned on or off simultaneously with the radio. CAUTION: Note that the rating of the outlet is 1100 watts or less.

If radio reception is not desired when operating the appliance, rotate the radio volume control to the minimum volume position.

BEDTIME CONTROL

The BEDTIME control will turn the radio and appliance off after any pre-set interval of time up to one hour.

Turn knob "A" to the "OFF" position and rotate knob "B" to any period of time between 0 and 60 minutes. The radio and appliance will be turned off automatically after the proper time has elapsed, and they will remain off until turned on again manually.

AUTOMATIC RADIO OPERATION

The clock controls may be pre-set to turn the radio on automatically at any time up to twelve hours in advance.

If an appliance is plugged into the receptacle on the back of the receiver, it will be turned on automatically, along with the radio.

Pull out knob "C", rotate it counterclockwise to the desired time on the alarm dial scale, and push the knob back in. Rotate knob "A" first to the "OFF" and then to the "AUTO" position. At the pre-set time, the radio will come on and will continue to play until turned off manually. The alarm will ring also if the knob "C" is left pulled out. The radio will come on first and, after an interval of about ten minutes, the alarm will ring.

BEDTIME AND AUTOMATIC OPERATIONS COMBINED

By combining the operations in the two sections above, the radio may be turned off automatically and on again automatically.

When setting the BEDTIME control, rotate knob "A" to the "AUTO" position instead of "OFF". IMPORTANT: It is necessary to turn knob "A" first to the "OFF" position before proceeding to "AUTO", otherwise the radio may not shut off.

ALIGNMENT

NOTE: It is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 3 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	-	Set pointer to horizontal position.
3.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
4.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

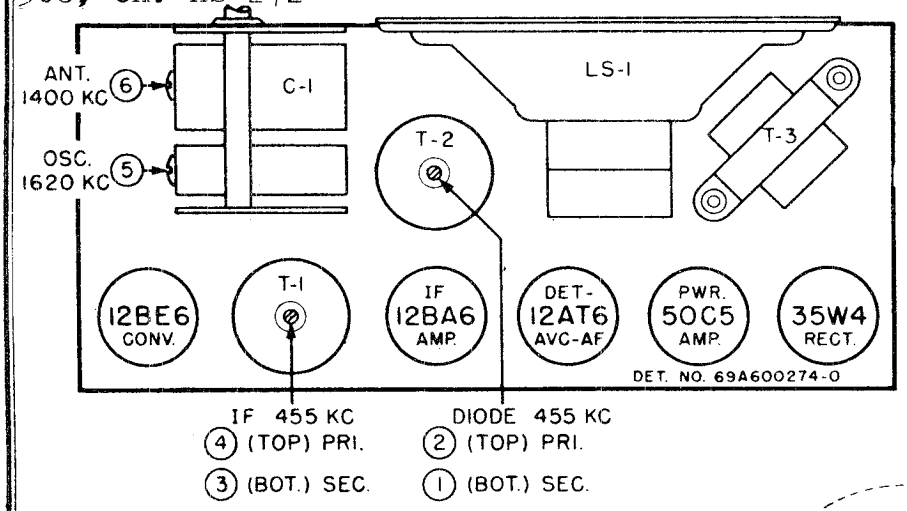


FIGURE 3. TUBE & TRIMMER LOCATIONS

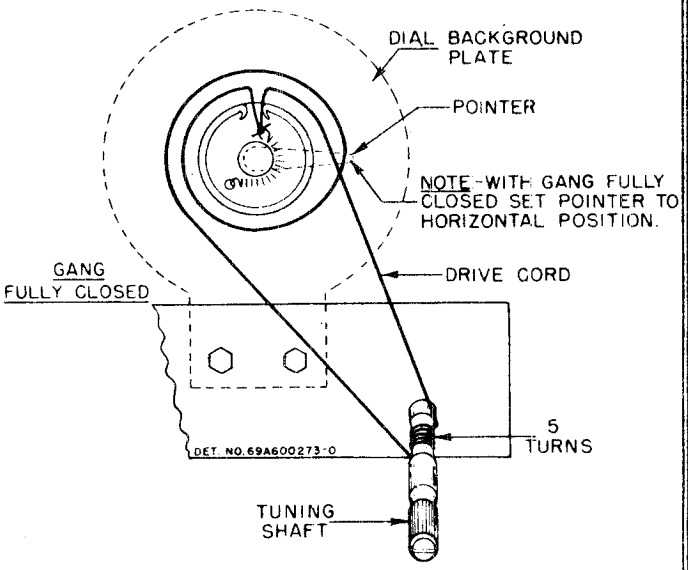


FIGURE 4. STRING DRIVE DETAIL

SERVICE NOTES

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the two radio control knobs.
2. Remove the three hex head screws which hold the loop to the cabinet.
3. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.
4. Slide the radio chassis and loop from the cabinet.
5. Disconnect the power leads to the radio chassis and to the appliance receptacle.

TO REMOVE CLOCK FROM CABINET

1. Remove radio chassis as above.
2. Remove the three nuts and lockwashers holding the shield behind the clock.
3. Slide the shield from the cabinet.
4. Turn the BEDTIME control knob to "60".
5. Pull out the ALARM set knob.
6. Turn the RADIO control knob to "AUTO".
7. While observing the clock from the back to avoid bending or breaking any parts, gently push the clock forward, at the same time twisting it slightly to eliminate binding.

TO REPLACE CLOCK DIAL FACE

1. Remove the clock from the cabinet as above.
2. Pull off the RADIO control and BEDTIME knobs.
3. Turn the ALARM set knob clockwise to remove.
4. Remove the escutcheon and crystal.
5. Carefully pull off the three hands.
6. Remove the alarm dial and the clock face.
7. Turn the radio control shaft to "AUTO" position.
8. Slowly rotate the time set shaft clockwise until the switch contacts behind the radio control shaft close.
9. Reassemble the clock face, alarm dial and three hands. Set all the hands to indicate 12 o'clock. Set the figure "12" on the alarm dial to index with the small pointer on the hour hand.
10. Replace the crystal, the escutcheon, and the knobs.
11. Check the automatic operation to be sure the switch contacts close at the time indicated on the alarm dial.

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

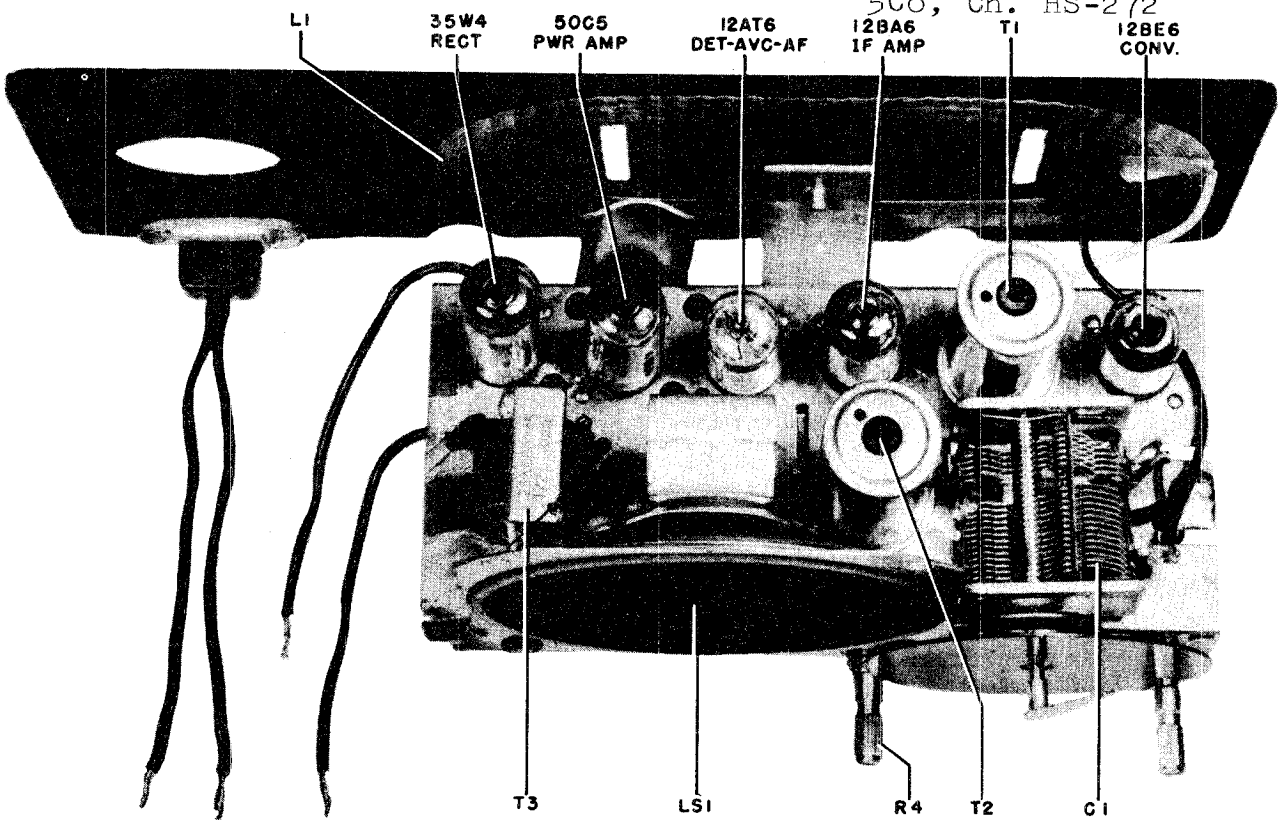


FIGURE 5. TOP VIEW OF CHASSIS

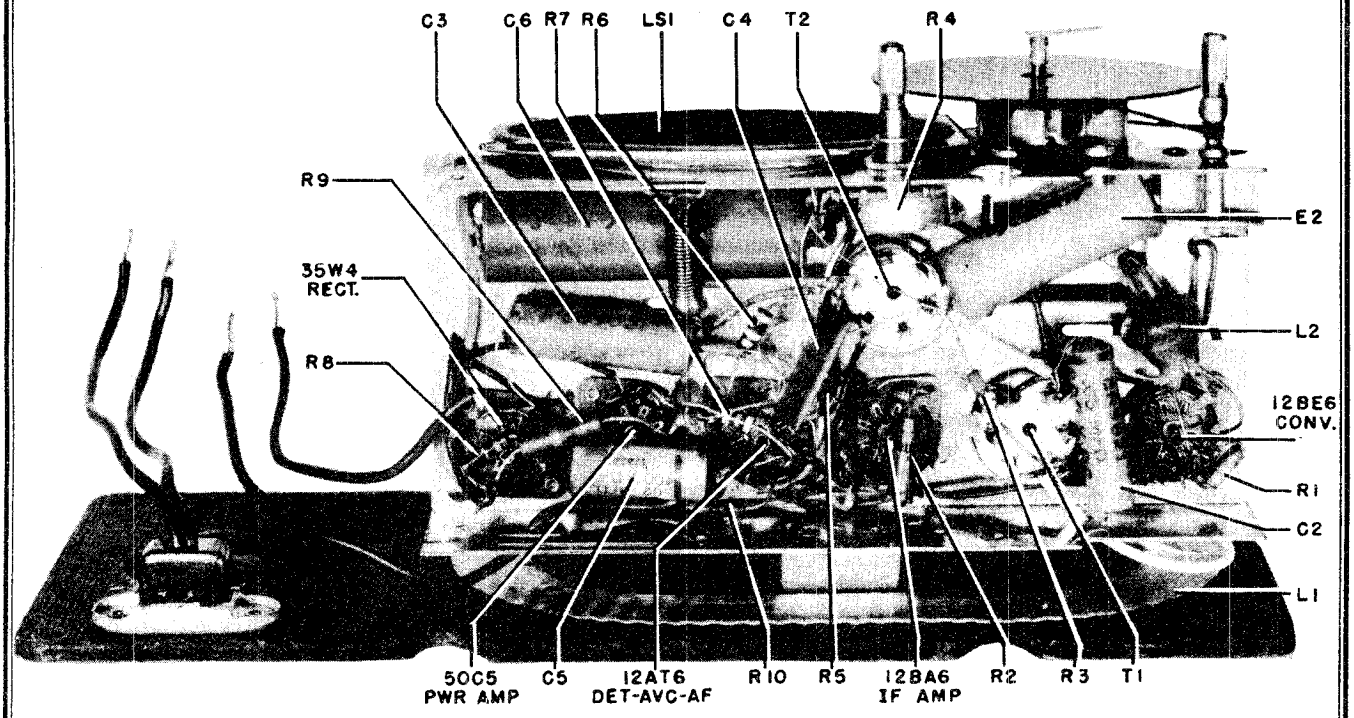
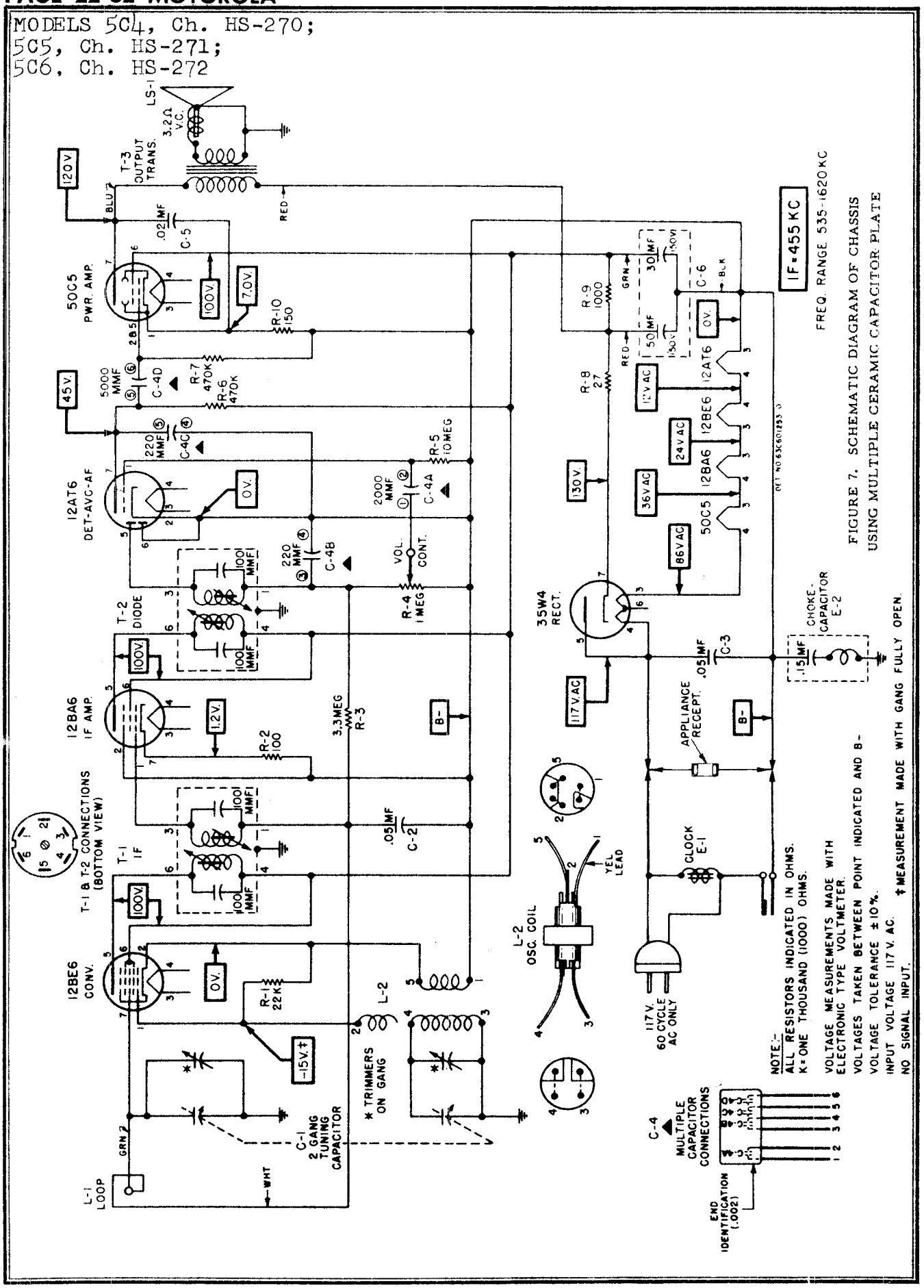


FIGURE 6. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272



MODELS 5C4, Ch. HS-270;
5C5, Ch. HS-271;
5C6, Ch. HS-272

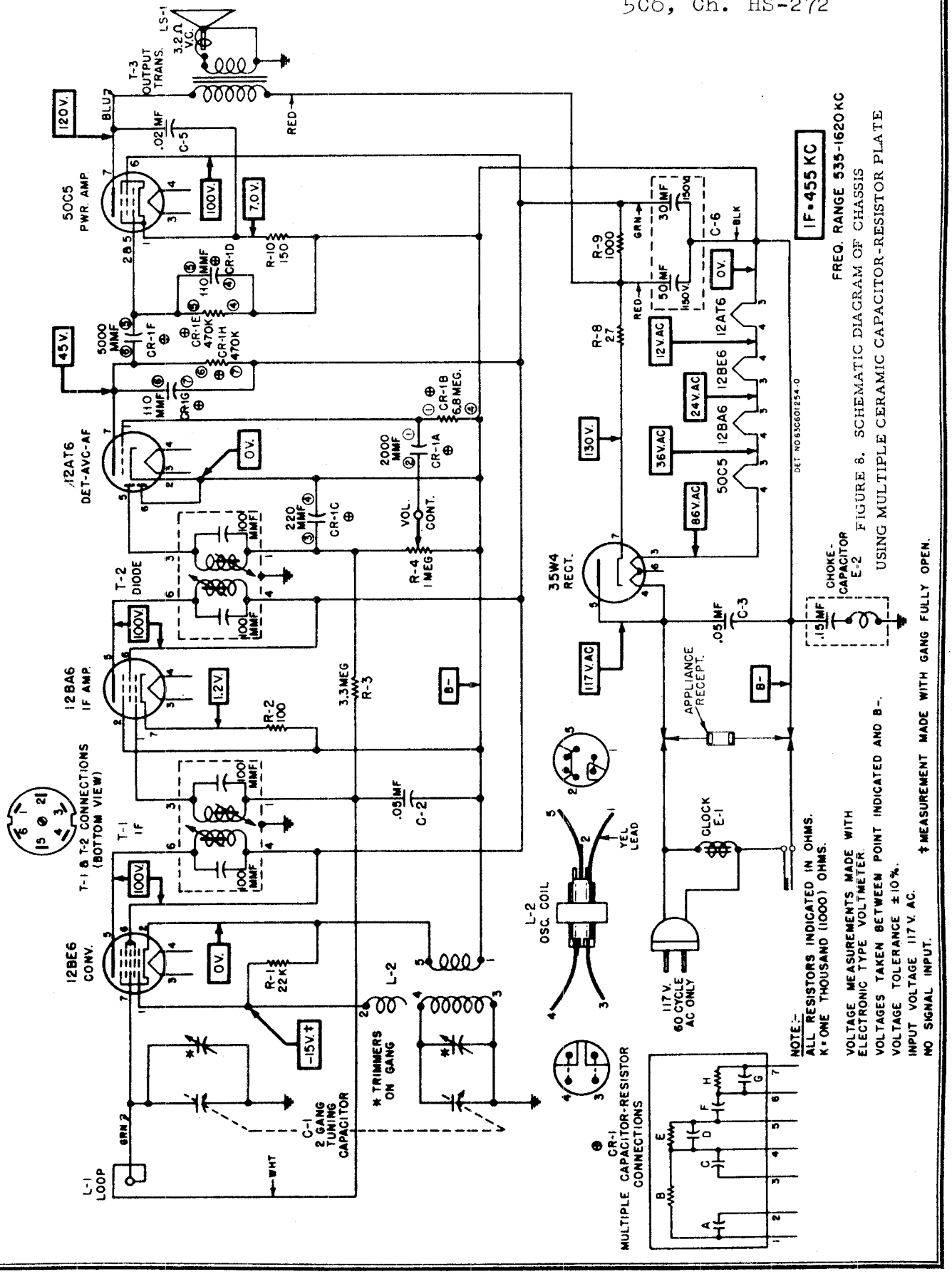


FIGURE 8. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

NOTE:-
ALL RESISTORS INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-.
VOLTAGE TOLERANCE ±10%.
INPUT VOLTAGE 117 V. AC.
NO SIGNAL INPUT.
‡MEASUREMENT MADE WITH GANG FULLY OPEN.

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600021	Variable: 2 gang; with pulley .....
C-2	8R9821	Paper: .05 mf 200V .....
C-3	8R9816	Paper: .05 mf 400V .....
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf .....
C-5	8R9802	Paper: .02 mf 400V .....
C-6	23B600855	Electrolytic: 50-30 mf/150V.....
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000, 220, 110, 5000, 110 mmf; 6.8 meg; 470,000, 470,000 ohms .....
Clock		
E-1	59C600007	Electric Clock Assembly: Telechron movement No. C-57,with Motorola face, hands, crystal, escutcheon and knobs (for green cabinet)(5C4)
	59K600198	Same as above except color (for ivory cabinet)(5C5) .....
	59K600788	Same as above except color (for walnut cabinet)(5C6) .....
Choke & Capacitor		
E-2	8A690487	Choke & .15 mf paper capacitor ....
Coils		
L-1	1X601033	Antenna Loop, Panel, and Receptacle Assembly: complete .....
	24K601023	Antenna Loop and Panel Assembly: less receptacle .....
L-2	24B680364	Oscillator coil .....
Speaker		
LS-1	50C600017 or 50C600857	Speaker: 4" PM; 3.2 ohm VC .....
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W .....
R-2	6R6018	100 20% 1/2W .....
R-3	6R2118	3.3 meg 20% 1/2W .....
R-4	18A600018	Volume control: 1 meg .....
R-5	6R2109	10 meg 20% 1/2W .....
R-6	6R6032	470,000 20% 1/2W .....
R-7	6R6032	470,000 20% 1/2W .....
R-8	6R5683	27 10% 1/2W .....
R-9	6R3953	1000 20% 1W .....
R-10	6R3992	150 20% 1/2W .....

Transformers		
T-1	24B482863	IF Transformer (brown dot): 455 Kc: complete with capacitor and cores; less shield .....
T-2	24B482865	Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield .....
T-3	25K680345	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
	7A478118	Bracket, loop mtg .....
	7A77337	Bracket, tuning shaft .....
	42B482867	Clip, spring: blued finish (holds IF transformers) .....
	11M8944	Cord, dial: 18 lb; black .....
	5A484268	Grommet, speaker mtg: rubber .....
	14A478119	Insulator, loop brkt mtg: fibre .....
	4S7691	Lockwasher, internal: 3/8; cad pl (vol control mtg) .....
	2A780465	Nut, knurled (vol control mtg) .....
	64A600025	Plate, dial background: green (HS-270) .
	64K600193	Plate, dial background: ivory (HS-271) .
	64K600779	Plate, dial background: walnut (HS-272)..
	52A600027	Pointer, dial: light green color (HS-270 & HS-272) .....
	52K600194	Pointer, dial: dark green color (HS-271).
	9A601018	Receptacle, appliance (on loop panel) ...
	5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32 stl; nkl pl (output trans mtg) .....
	5S7701	Rivet: .122 x 3/16 stl; nkl pl (tuning shaft brkt mtg) .....
	5S7703	Rivet: .122 x 7/32 stl; nkl pl (loop bracket & speaker mtg) .....
	5S7700	Rivet: .122 x 1/4 stl; nkl pl (appliance receptacle mtg) .....
	3S7247	Screw, machine: 6-32 x 3/16 slotted locking hex head; cad pl (gang mtg) .....
	3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; cad pl (dial background plate mtg) .....
	3S7467	Screw, sheet metal: #8 x 3/8 PKZ plain hex head; cad pl (loop mtg) .....
	47A600022	Shaft, tuning .....
	26K485936	Shield, coil (for IF transformers).....
	26A478117	Shield, electrostatic (on rear of chassis) .....
	43A600095	Sleeve, paper: black (on pointer shaft) (HS-270 & HS-272) .....
	43K600195	Sleeve, paper: ivory (on pointer shaft) (HS-271) .....
	9A472534	Socket, tube: miniature; 7-prong ..
	41A73996	Spring, tension (electrolytic mtg).
	41A73619	Spring, tension (gang drive cord)...
	4A70015	Washer, "C" (tuning shaft mtg).....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (loop mtg) .....
	14A11493	Washer, shoulder: fibre (loop bracket mtg) .....

CABINET PARTS		
	16E600005	Cabinet, table model: plastic; green (5C4)
	16K600199	Cabinet, table model: plastic; ivory (5C5)
	16K600791	Cabinet, table model: plastic; walnut(5C6)
	28A600064	Connector, wire (connects clock & radio power leads) .....
	61A600001	Crystal: plastic (cover over radio dial).
	13K600003	Escutcheon, radio dial: green (5C4).....
	13K600197	Escutcheon, radio dial: ivory (5C5).....
	13K600790	Escutcheon, radio dial: walnut (5C6).....
	14A16304	Grommet, fibre (on clock shield).....
	36A600065	Knob, radio control: green plastic(5C4)..
	36K600192	Knob, radio control: ivory plastic (5C5).
	36K600787	Knob, radio control: walnut plastic (5C6)
	4S7667	Lockwasher: #4 ext: cad pl (clock shield mtg).....
	13A792195	Medallion: brass (on front of speaker grille) .....
	2S7019	Nut, hex: 4-40 x 1/4 stl; cad pl (clock shield mtg) .....
	3S476083	Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (radio chassis mtg) .....
	3S2991	Screw, machine: 6-32 x 1/2 plain hex head; cad pl (mounts loop to cabinet).....
	1X600799	Shield, clock: with grommet (covers rear of clock) .....
	2S490840	Speednut: for 1/16" stud (medallion mtg) .....
	11M488253	Tape, aluminum foil (inside top of cabinet) .....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (mounts loop to cabinet).....
CLOCK PARTS		
		Note: The following Motorola parts are for use with the basic Telechron clock movement No. C-57.
	34K600993	Alarm dial: green color (5C4) .....
	34K600994	Alarm dial: ivory color (5C5) .....
	34K600995	Alarm dial: walnut color (5C6) .....
	30K600980	Cord, line: with plug; 6 ft long .....
	61A600001	Crystal: plastic (cover over face of clock)
	34K600990	Dial Face: green color (5C4) .....
	34K600991	Dial Face: ivory color (5C5) .....
	34K600992	Dial Face: walnut color (5C6) .....
	13C600002	Escutcheon, clock: green color (5C4) ....
	13K600196	Escutcheon, clock: ivory color (5C5) ....
	13K600789	Escutcheon, clock: walnut color (5C6)....
	52K600996	Hand, hour: light green color (5C4 & 5C6)
	52K600997	Hand, hour: dark green color (5C5).....
	52K600998	Hand, minute: light green color (5C4 & 5C6) .....
	52K600999	Hand, minute: dark green color (5C5).....
	52K601001	Hand, second: brass .....
	36K600987	Knob, clock control: plain; green (5C4)..
	36K600988	Knob, clock control: plain; ivory (5C5)..
	36K600989	Knob, clock control: plain; walnut (5C6).
	36K600984	Knob, clock control: with arrow; green (5C4) .....
	36K600985	Knob, clock control: with arrow; ivory (5C5) .....
	36K600986	Knob, clock control: with arrow; walnut (5C6) .....
	36K601002	Knob, time set .....

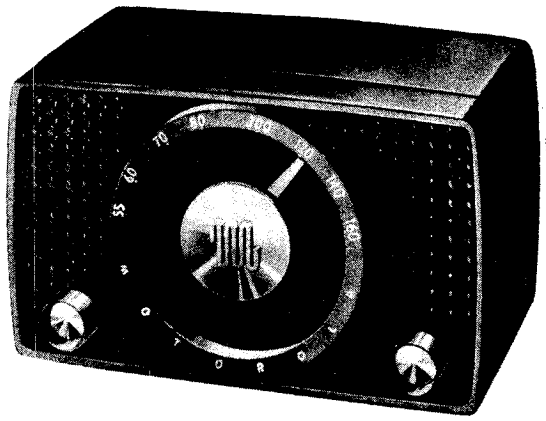
MODELS 5H11, 5H12, 5H13, Ch. HS-256

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.

RECEIVER MODELS

Model	Color
5H11	Walnut
5H12	Ivory
5H13	Green



TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 12BE6 - Converter
12BA6 - IF Amplifier
12AT6 - Det, AVC & 1st AF Amp
50C5 - Power Amplifier
35W4 - Rectifier

POWER SUPPLY - 117 volts AC or DC, 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

VOLUME CONTROL & OFF-ON SWITCH. The "off-on" switch and volume control are combined and are operated with the left-hand knob. NOTE: If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet.

TUNING CONTROL. Stations are tuned in with the right-hand knob.

ANTENNA. A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

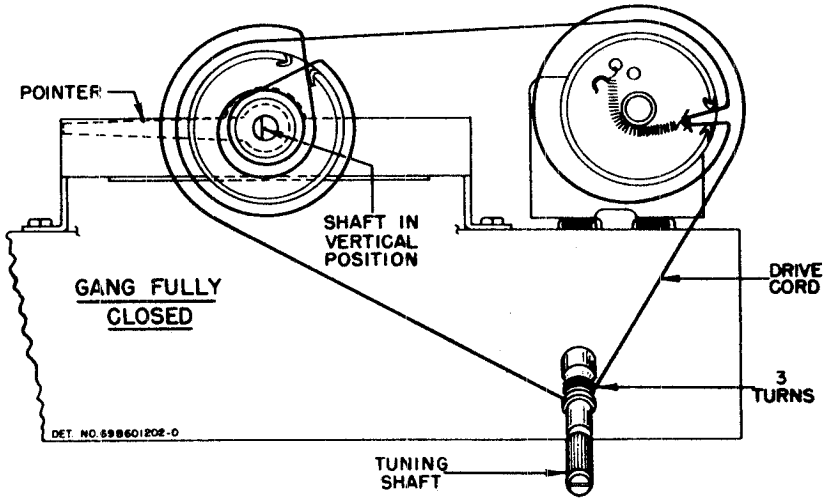


FIGURE 1. STRING DRIVE DETAIL

MODELS 5H11, 5H12,
5H13, Ch. HS-256

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the chassis (from an AC line) outside of its cabinet, use an isolation transformer between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two radio control knobs.

2. Pull off the brass cover over the pointer.

3. Pull off the pointer.

4. Remove the split plugs which hold the loop to the cabinet.

5. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.

6. Slide the radio chassis and loop from the cabinet.

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to chassis.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

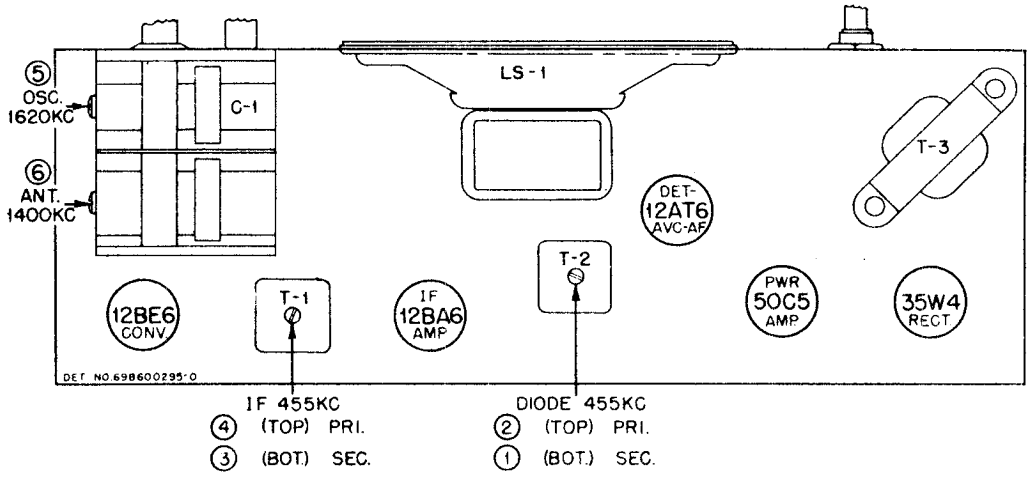


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODELS 5H11, 5H12, 5H13, Ch. HS-256

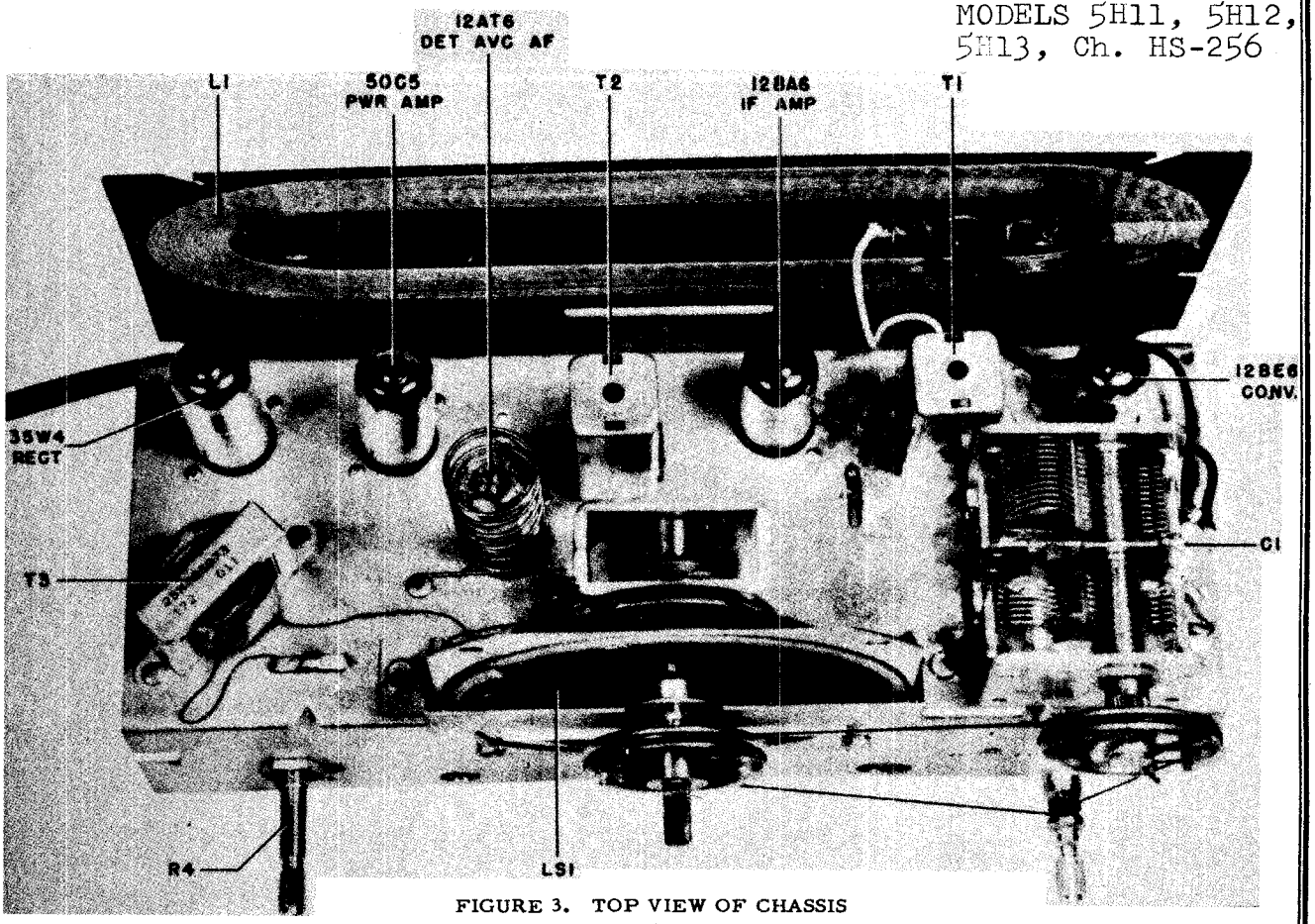


FIGURE 3. TOP VIEW OF CHASSIS

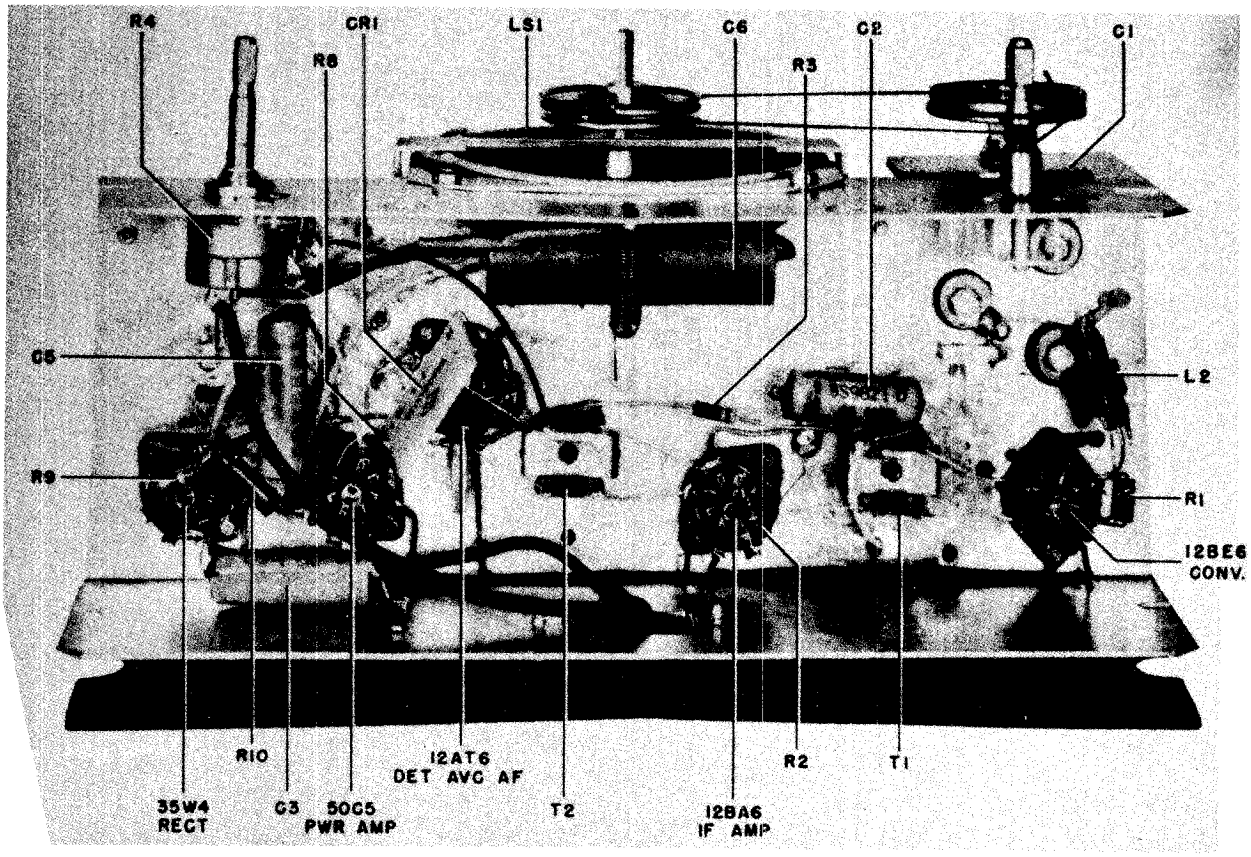
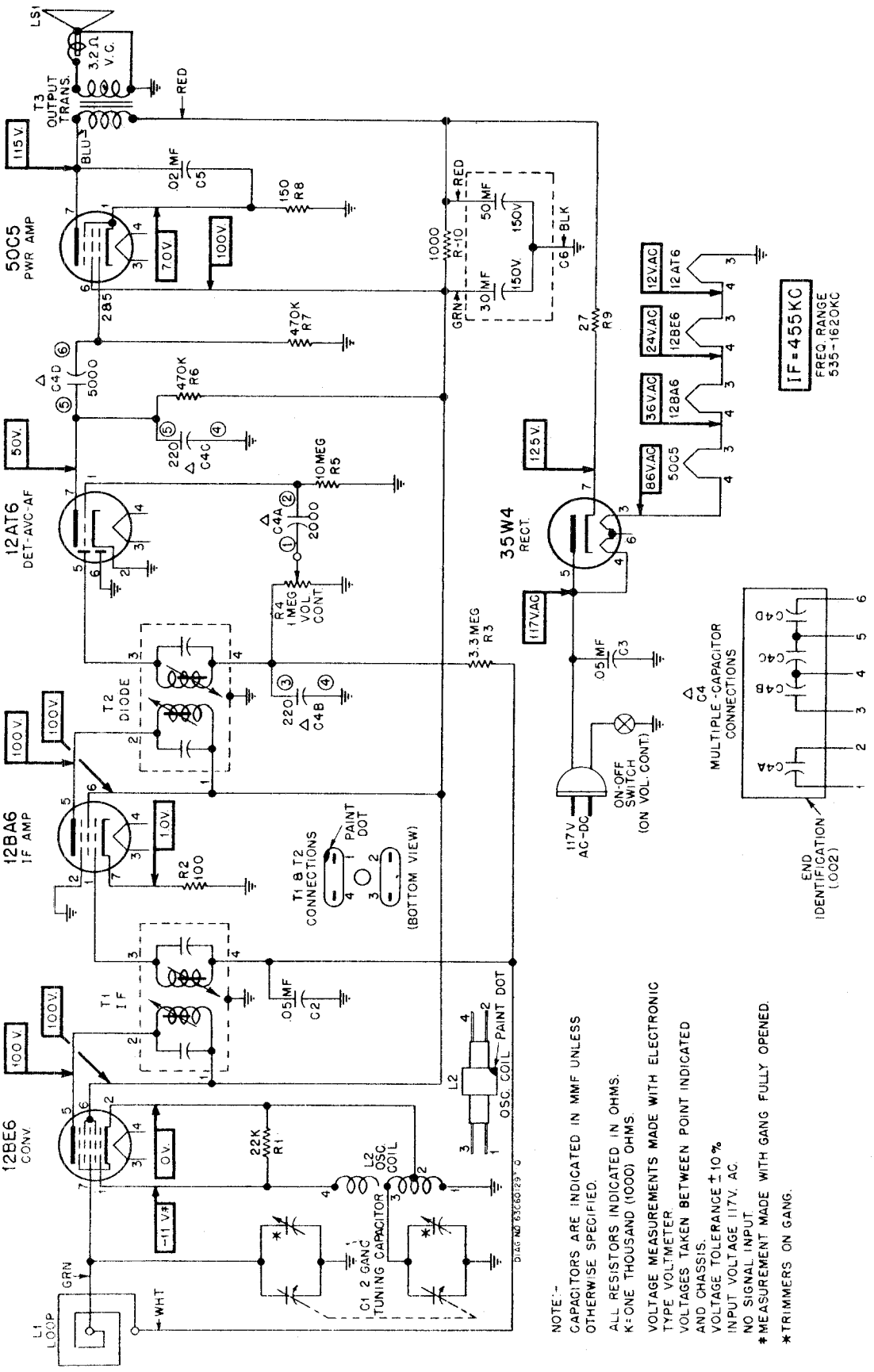


FIGURE 4. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

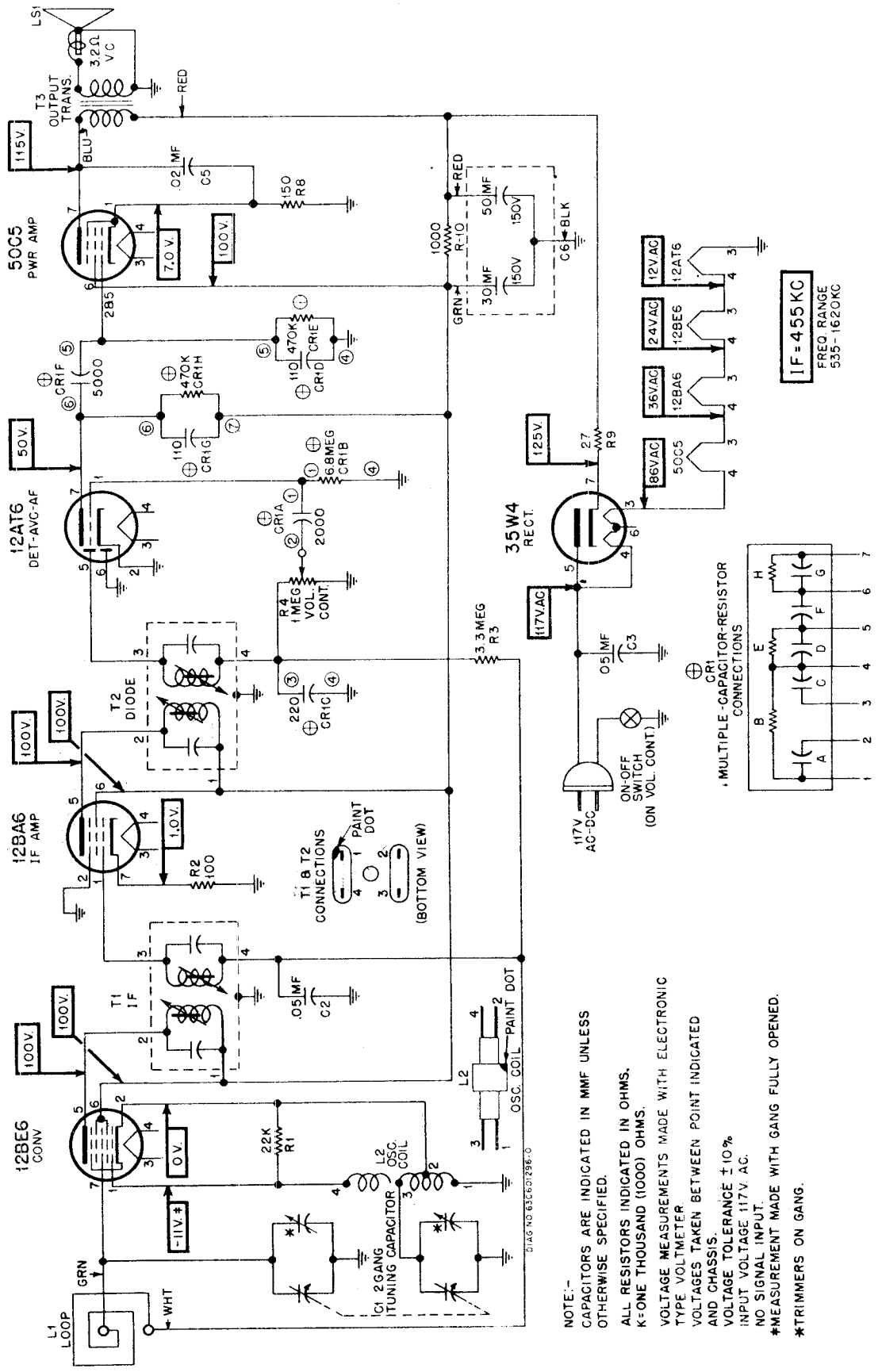
MODELS 5H11, 5H12,
5H13, Ch. HS-256



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS INDICATED IN OHMS. K=ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V. AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.
*TRIMMERS ON GANG.

FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5H11, 5H12, 5H13, Ch. HS-256



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS INDICATED IN OHMS. K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.

*TRIMMERS ON GANG.

FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 5H11, 5H12, 5H13, Ch. HS-256

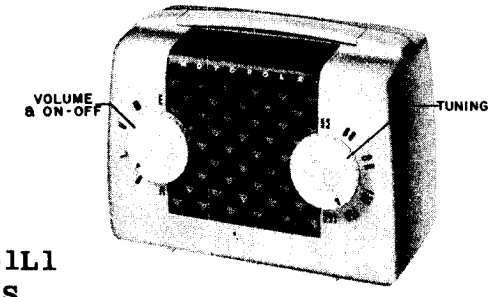
REPLACEMENT PARTS LIST

NOTE: When ordering parts specify model number of set in addition to part number and description of part.

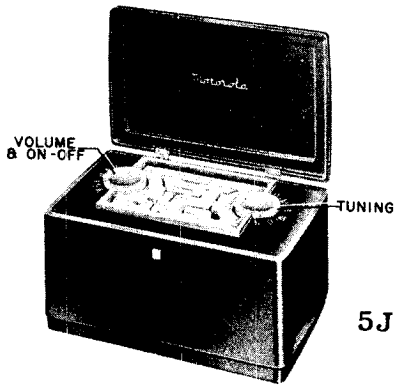
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600483	Variable: 2 gang; with pulley.....
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R9816	Paper: .05 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000,220 220, 5000 mmf.....
C-5	8R9802	Paper: .02 mf 400V.... ....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-resistor: 2000, 220,110,110,5000 mmf; 6.8 meg; 470,000, 470,000 ohms
Coils		
L-1	24C600518	Loop Antenna Assembly: includes back panel.....
L-2	24K600896	Oscillator coil(green dot).
Speaker		
LS-1	50C691401	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
		Note: All resistors are insulated carbon type unless other specified.
R-1	6R6028	22,000 20% 1/2W.....
R-2	6R6018	100 20% 1/2W.....
R-3	6R2118	3.3 meg 20% 1/2W.....
R-4	18K600473	Volume control: 1 meg; includes on-off switch...
R-5	6R2109	10 meg 20% 1/2W.....
R-6	6R6032	470,000 20% 1/2W.....
R-7	6R6032	470,000 20% 1/2W.....
R-8	6R3992	150 20% 1/2W.....
R-9	6R5683	27 10% 1/2W.....
R-10	6R3953	1000 20% 1W.....
Transformers		
T-1,2	24B485553	IF and Diode transformer (green dot): 455 Kc; complete with capacitors, cores, and shield.....
T-3	25K485973	Output transformer.....

Ref. No.	Description
CHASSIS PARTS - MECHANICAL	
7K485971	Bracket, loop mtg.....
7A600476	Bracket,tuning shaft mtg.....
1X600606	Bracket, pointer shaft mtg: with bushing.....
42A485548	Clip, IF coil mtg.....
11M8944	Cord, dial: 18 lb; black.....
30A470651	Cord, line: with plug; 6 ft long
5A19658	Eyelet, spacer (gang mtg).....
5A70404	Grommet, rubber (gang mtg).....
14A482844	Insulator,line cord: fibre.....
29R3010	Lug, soldering (under gang mtg screw).....
2S7051	Nut, hex palnut: 3/8-32 x 9/16 (volume control mtg).....
1X600590	Pulley and Bushing Assembly, pointer drive.....
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg).....
5S7707	Rivet: .122 x 5/32 stl; nkl pl (tube shield, output transformer, and tuning shaft bracket mtg)....
3S2294	Screw, machine: 6-32 x 1/2 plain hex head lock screw; cad pl (gang mtg).....
3S7477	Screw, machine: 3-32 x 1/4; type #1; plain hex head; cad pl (back panel mtg).....
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (pointer bracket mtg).....
3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; cad pl (loop bracket mtg).....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; cad pl (speaker mtg).....
3S7148	Setscrew: 6-32 x 1/8; Allen head; cad pl (pointer drive pulley mtg)
47K600598	Shaft, pointer.....
1K600594	Shaft, tuning.....
26A481521	Shield, spring (for 12BA6 tube)
9A472534	Socket, tube: miniature; 7-prong.
41A73996	Spring, tension(electrolytic mtg)
41A14244	Spring, tension (pointer drive cord).....
4K692188	Washer, "C" (tuning shaft and pointer shaft mtg).....
4S7633	Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (back panel mtg)..
4K482859	Washer, shoulder: fibre (loop bracket mtg).....
CABINET PARTS	
16E600461	Cabinet, table model: walnut(5H11)
16K600463	Cabinet, table model: ivory (5H12)
16K600465	Cabinet, table model: green (5H13)
15B600569	Cover, pointer.....
36B600566	Knob, control: walnut (5H11).....
36K600567	Knob, control: ivory (5H12).....
36K600568	Knob, control: green (5H13)....
38A25507	Plug, split (back panel mtg)...
52B600537	Pointer, dial.....
3S3371	Screw, sheet metal: #8 x 3/8 PKF plain hex head; cad pl (chassis mtg).....

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250



5L1 & 51L1 SERIES



5J1 SERIES

GENERAL INFORMATION

TYPE - Three-power (AC/DC, Battery) portable receiver. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

MODEL	COLOR	CHASSIS
5L1	Tan	HS-250
5L1U	Tan	HS-224
5L2	Maroon	HS-250
5L2U	Maroon	HS-224
51L1U	Green	HS-224
51L2U	Maroon	HS-224
5J1	Black	HS-250
5J1U	Black	HS-224
5J2	Green	HS-250
5J2U	Green	HS-224

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
1R5	Converter
1U4	IF Amplifier
1U5	Det. AVC & 1st AF Amp
3S4	Power Amplifier
Rect	Selenium type (for AC/DC Operation)

POWER SUPPLY - Operates from 117V AC/DC (15 watts) or from the following batteries:

2 - 1-1/2V flashlight cells (Eveready #950 or equivalent)

1 - 67-1/2V "B" battery (Eveready #467 or equivalent)

OPERATING INSTRUCTIONS

TO OPEN FRONT COVER (5J1 & 5J2 Series). The front covers of the models 5J1 and 5J2 Series contain the loop antenna. They may be opened simply by lifting them upward with the fingers. A special hinge holds the covers in either the closed, half-opened, or fully open position.

VOLUME CONTROL & OFF-ON SWITCH. The "off-on" switch and volume control are operated with the left-hand knob.

TO TURN OFF. Turn the receiver "off" by rotating the volume knob to the left until a click is heard.

TUNING CONTROL. Stations are tuned in with the right-hand knob.

TO OPEN BACK COVER. The back cover may be opened by inserting the fingertips into the slots in the cover and pulling it open. When closing the cover be careful not to pinch the power line cord or other leads between the cover and the cabinet.

117 VOLT AC OR DC OPERATION. The power cord is located inside the cabinet and may be reached by opening the back cover. Pass the line cord through the slot on the side of the receiver, and plug it into any 117 volt AC or DC power outlet. If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet. It is not necessary that batteries be installed if the receiver is to be operated only from house power lines.

BATTERY OPERATION. Open the back cover and install the batteries, following the instructions on the label inside the back cover (or see Figure 1). Insert the line cord plug into the receptacle on the chassis, or the receiver will not play from batteries. If the receiver is to be operated for a long period of time from 117 volts AC or DC, or is to be placed in storage, remove the batteries and store in a cool place. IMPORTANT: Never leave low or run-down batteries in the receiver, as they will leak or swell and damage it.

ANTENNA. A loop antenna is built into the front cover of models 5J1 and 5J2 series and into the rear cover of models 5L1, 5L2 and 51L1U and 51L2U Series. Because of the slightly directional characteristics of the loop antenna, re-

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev.; 5J2,
5J2U; Ch. HS-224, HS-250

ception from some stations may be improved by rotating the entire receiver. In extremely noisy locations, rotate the receiver until minimum noise and maximum signal pickup are obtained.

BATTERY REPLACEMENT. If low volume or fuzzy tone is noticed when operating from batteries, replace the flashlight cells. Normally, the 67-1/2V "B" battery will last for 3 or 4 changes of the flashlight cells. The condition of the batteries will not affect the operation of the receiver from 117 volts AC or DC. Complete battery replacement instructions will be found inside the cabinet back cover (or see Figure 1).

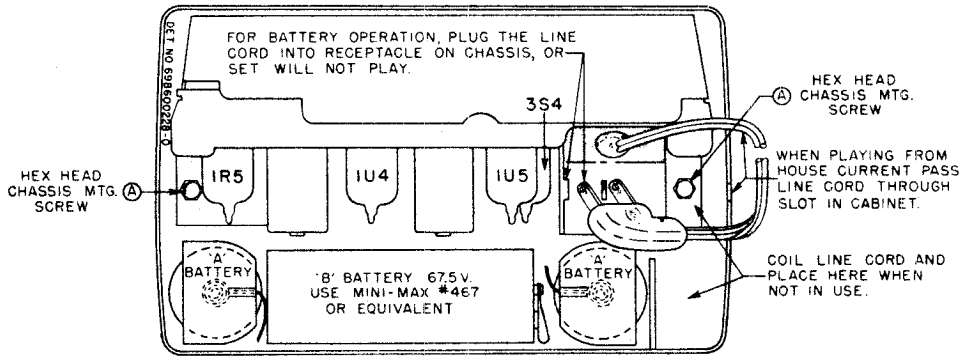


FIGURE 1. BATTERY INSTALLATION AND CHASSIS REMOVAL INSTRUCTIONS

ALIGNMENT

NOTE: The receiver may be operated either from a battery or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.
2. Connect the low side of the signal generator to B-.
3. Set the signal generator for 400 cycle, 30% modulation.
4. Turn the receiver volume control to maximum.
5. Use a small fibre screwdriver for aligning the IF and diode transformers.
6. As stages are brought into alignment, reduce the signal generator output to keep the output of the receiver at approximately .05 watt (.05 watt = .40 volts on the output meter) to avoid overloading the receiver.
7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 6, 1R5)*	455 Kc	Fully open	1, 2 & 3 (IF Cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 6, 1R5)*	1620 Kc	Fully open	4 (osc.)	Adjust for maximum.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker. NOTE: Batteries should be in cabinet.
4.	-	Radiation loop**	1400 Kc	Tune for maximum	5 (Ant.)	Adjust for maximum. Trimmer is reached through hole under plug button on side of cabinet.

*On chassis HS-250 return the grid of the converter tube to AVC either through the loop or through a 4.7 meg resistor (as in chassis HS-224).
**Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250

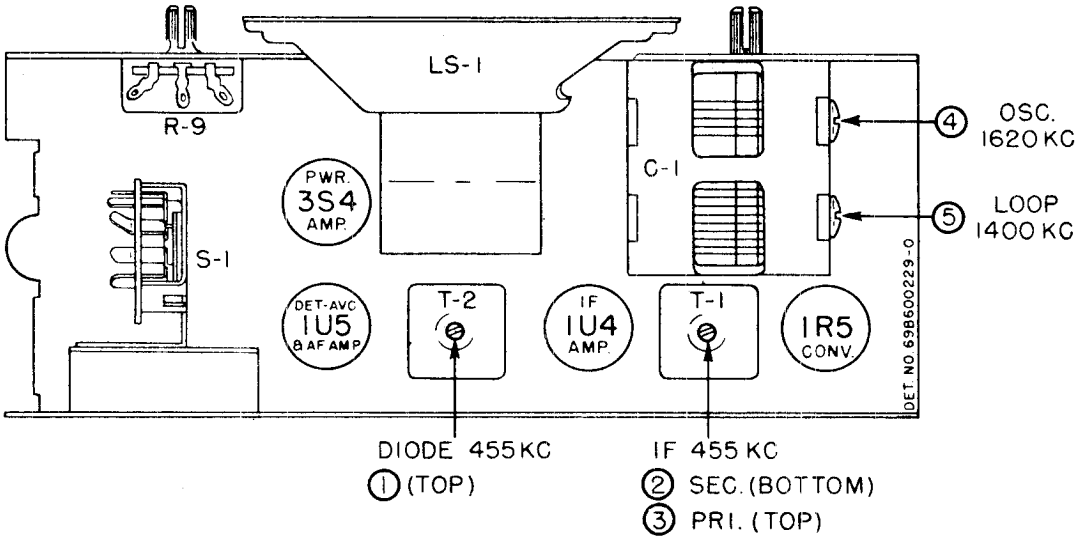


FIGURE 2. TUBE AND TRIMMER LOCATIONS

SERVICE NOTES

GENERAL

The chassis of this receiver is isolated from the AC power line circuit by a capacitor-choke assembly to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

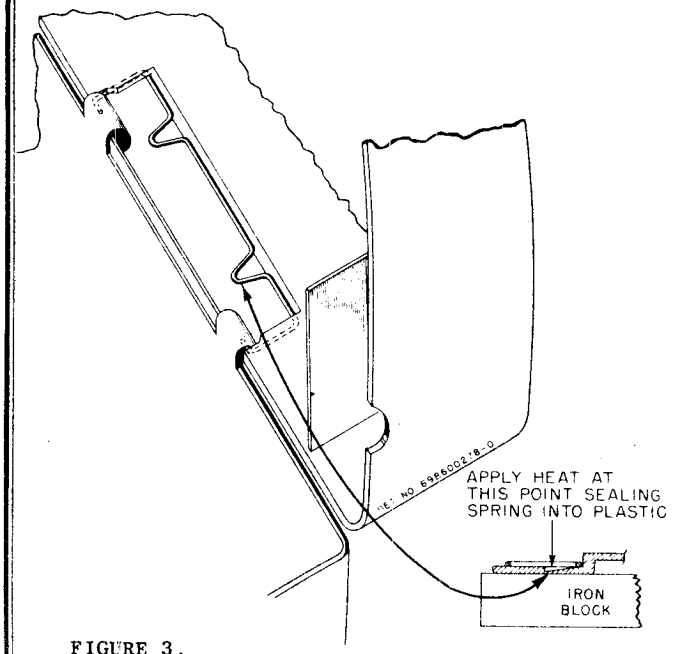


FIGURE 3.

HINGE INSTALLATION FOR 5L1 AND 51L1U SERIES

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two control knobs on the front of the cabinet.
2. Open the rear cover and remove the batteries.
3. Disconnect the two loop antenna leads from the chassis.
4. Remove the two hex head screws holding the chassis to the cabinet ("A" - "A" in Figure 1).
5. Slide the chassis from the cabinet.

PRODUCTION REVISIONS

The following revisions in the chassis and cabinets have been made from early production receivers:

1. Alternate IF and diode transformers have been added, with connections as shown on the circuit diagrams. Electrically, the original and the alternate transformers are interchangeable.

2. A multiple capacitor-resistor plate is used in some chassis to replace several resistors and capacitors in the audio circuit. Refer to the appropriate circuit diagram when servicing a chassis.

3. A battery retainer spring, which clips to the rear edge of the chassis, has been provided for the 5J1 and 5J2 series models to prevent the "B" battery from forcing off the rear cover.

4. The rear cover locking clips on the early 5J1 and 5J2 series models were replaced with a different type to provide better locking. The new type clips are interchangeable with the old clips.

REAR COVER HINGE INSTALLATION

The proper method for installing a new hinge in the 5L1, 5L2 and 51L1U, 51L2U series is shown in Figure 3. Note that the under side of the cabinet should rest on an iron block during the heating process to prevent the formation of a heat bubble on the bottom of the cabinet.

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev; 5J2, 5J2U;
Ch. HS-224, HS-250

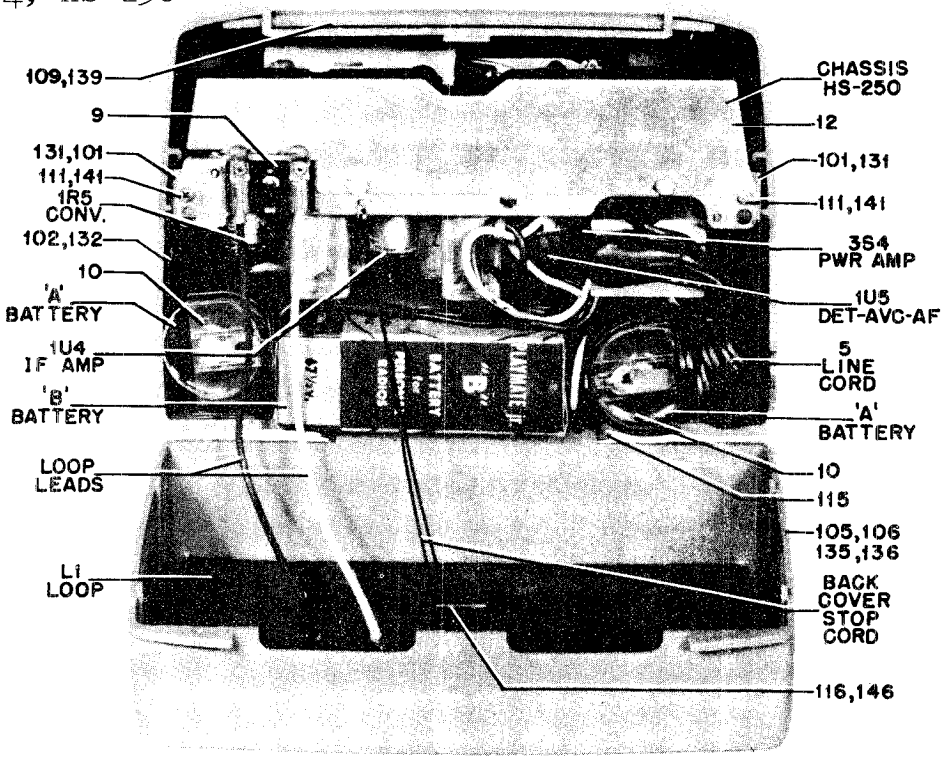


FIGURE 4. 5L1 AND 5L2 REAR VIEW

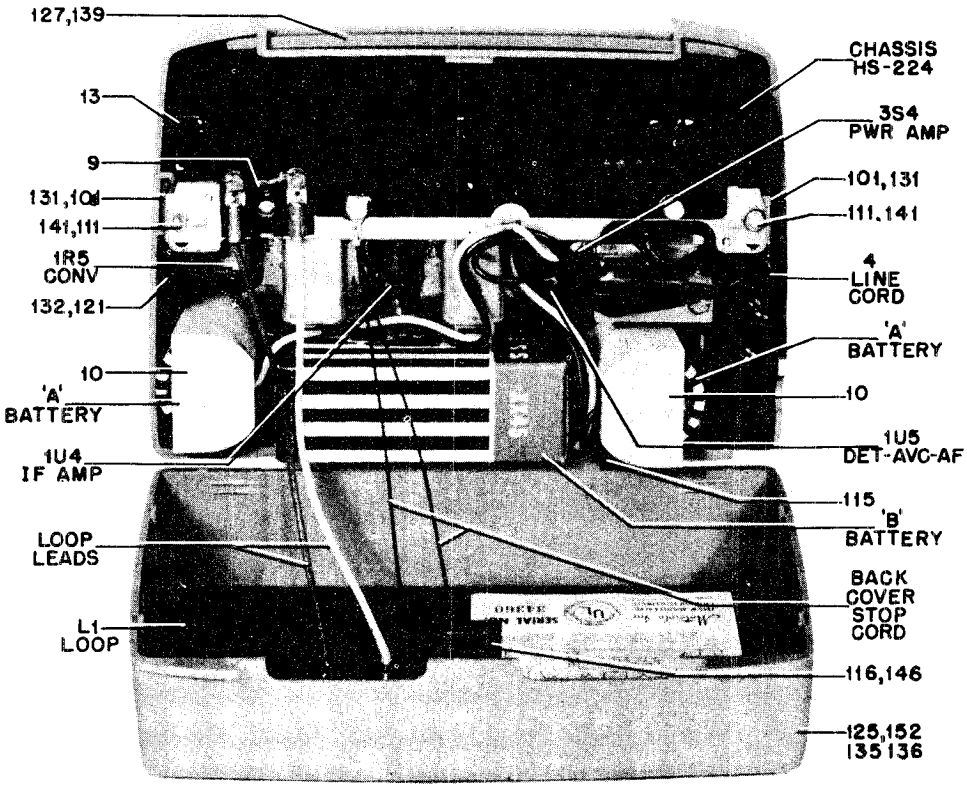


FIGURE 5. 51L1U AND 51L2U REAR VIEW

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250

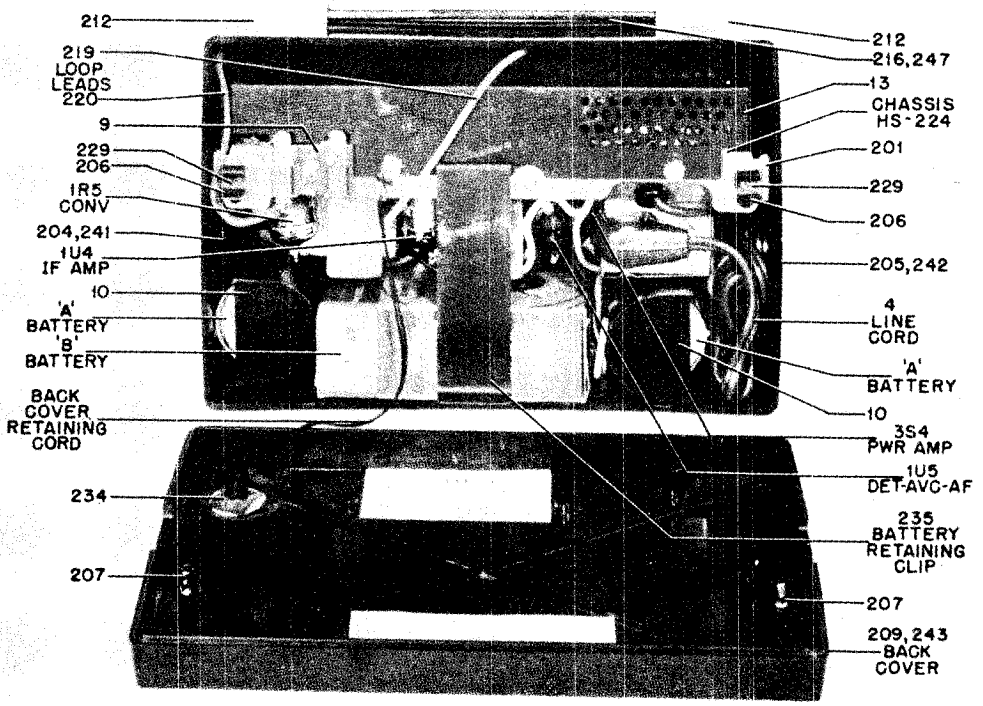


FIGURE 6. 5J1U AND 5J2U REAR VIEW

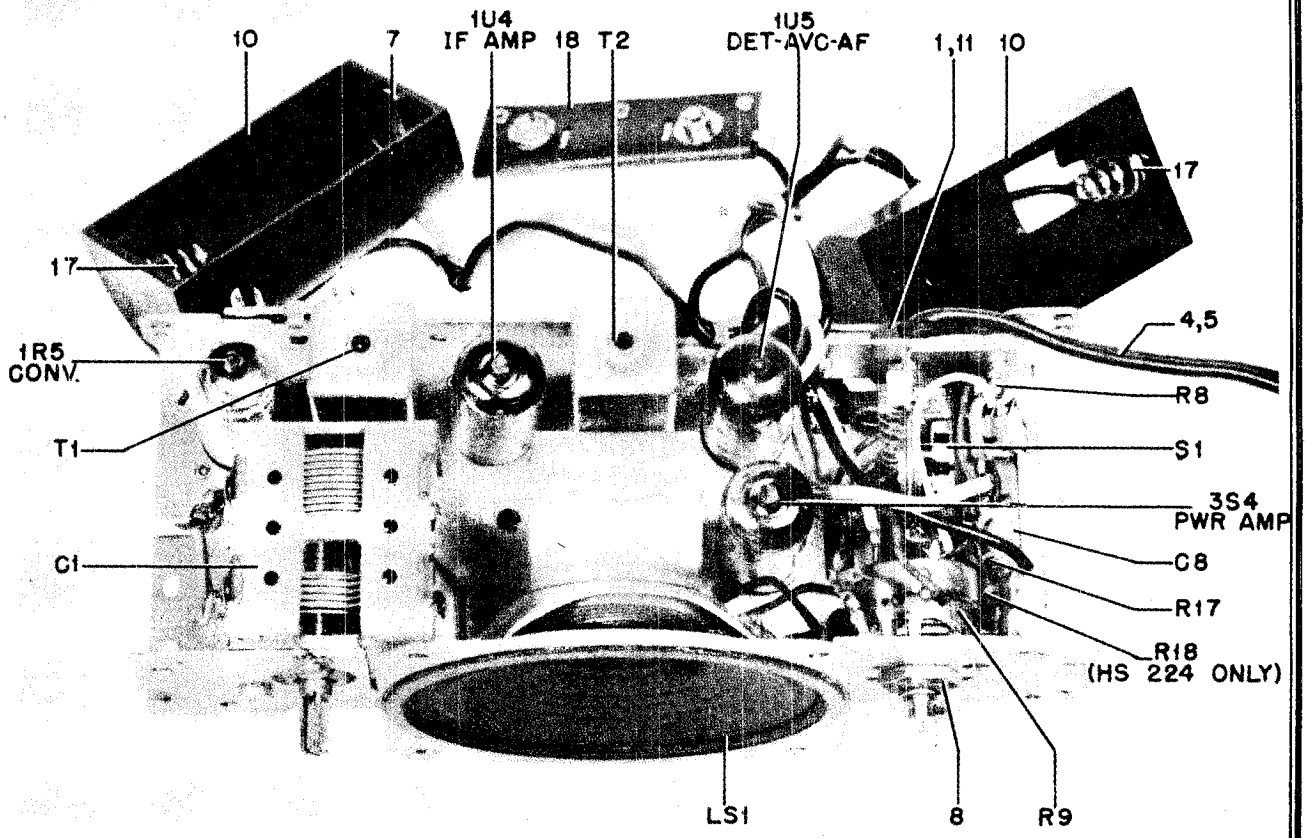


FIGURE 7. HS-224 AND HS-250 TOP VIEW OF CHASSIS

MODELS 5L1, 5L1U, Rev.;
5L2, 5L2U, 51L1U, 51L2U;
5J1, 5J1U, Rev.; 5J2,
5J2U; Ch. HS-224, HS-250

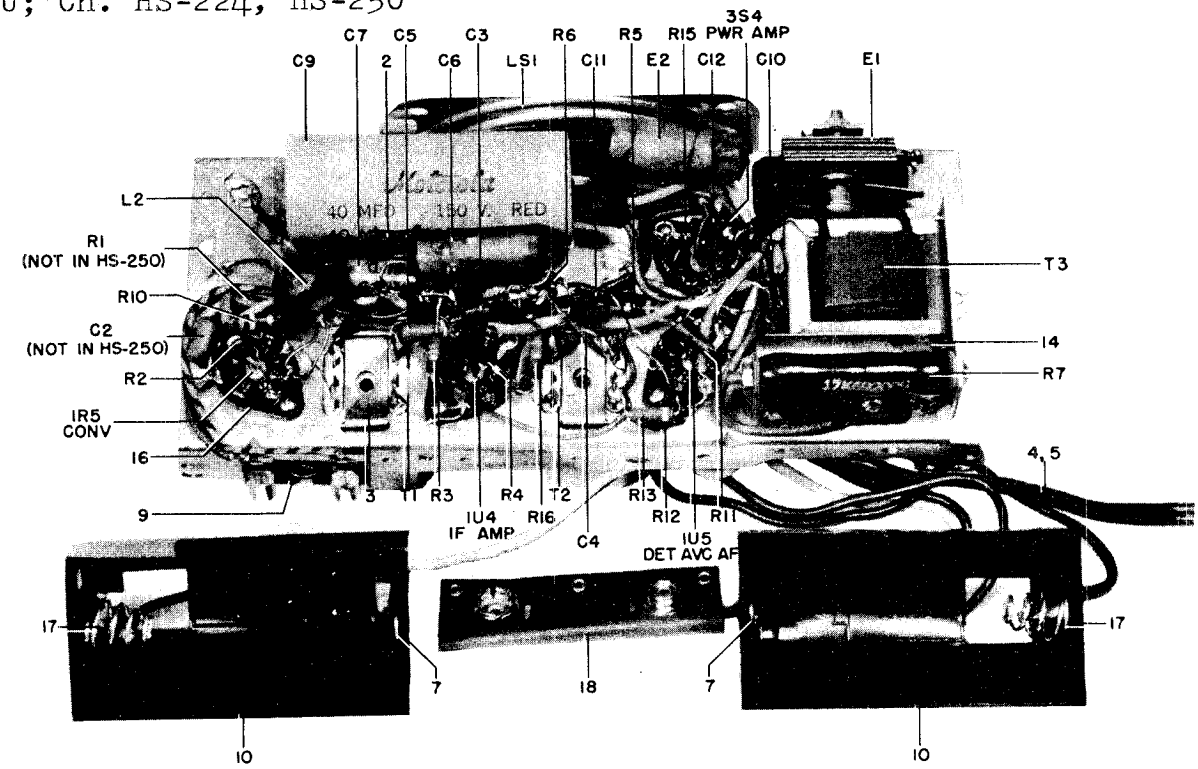


FIGURE 8. BOTTOM VIEW OF CHASSIS HS-224 AND HS-250 SHOWING MULTIPLE CAPACITOR PLATE

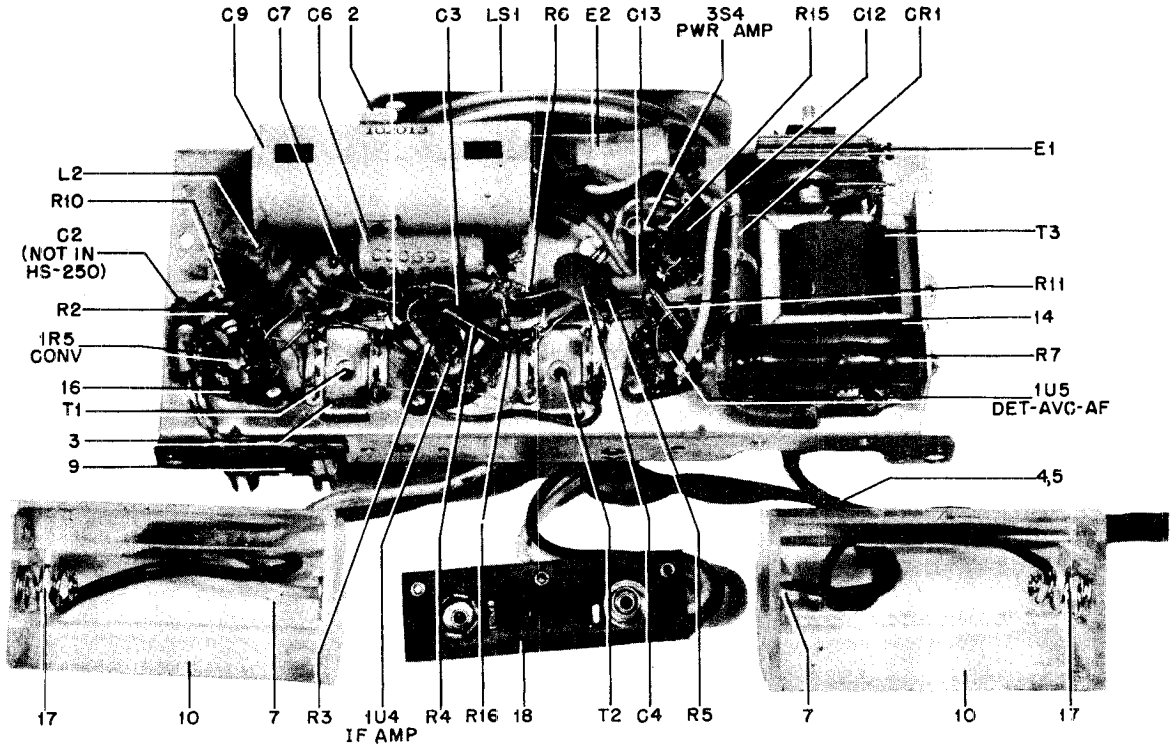


FIGURE 9. BOTTOM VIEW OF CHASSIS HS-224 AND HS-250 SHOWING MULTIPLE CAPACITOR-RESISTOR PLATE

MODELS 5L1U, 5L2U, 51L1U, 51L2U, 5J1U, 5J2U, Ch. HS-224

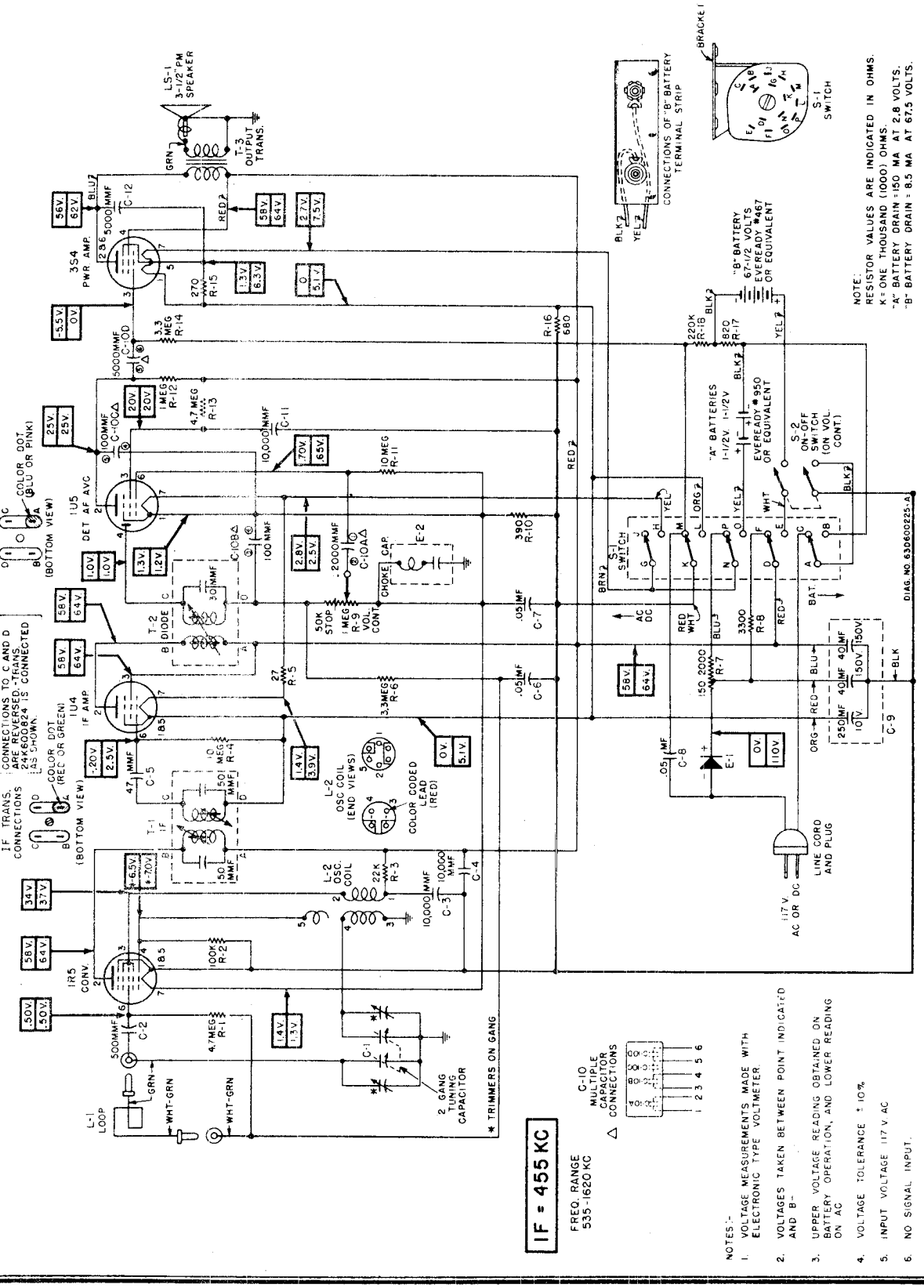
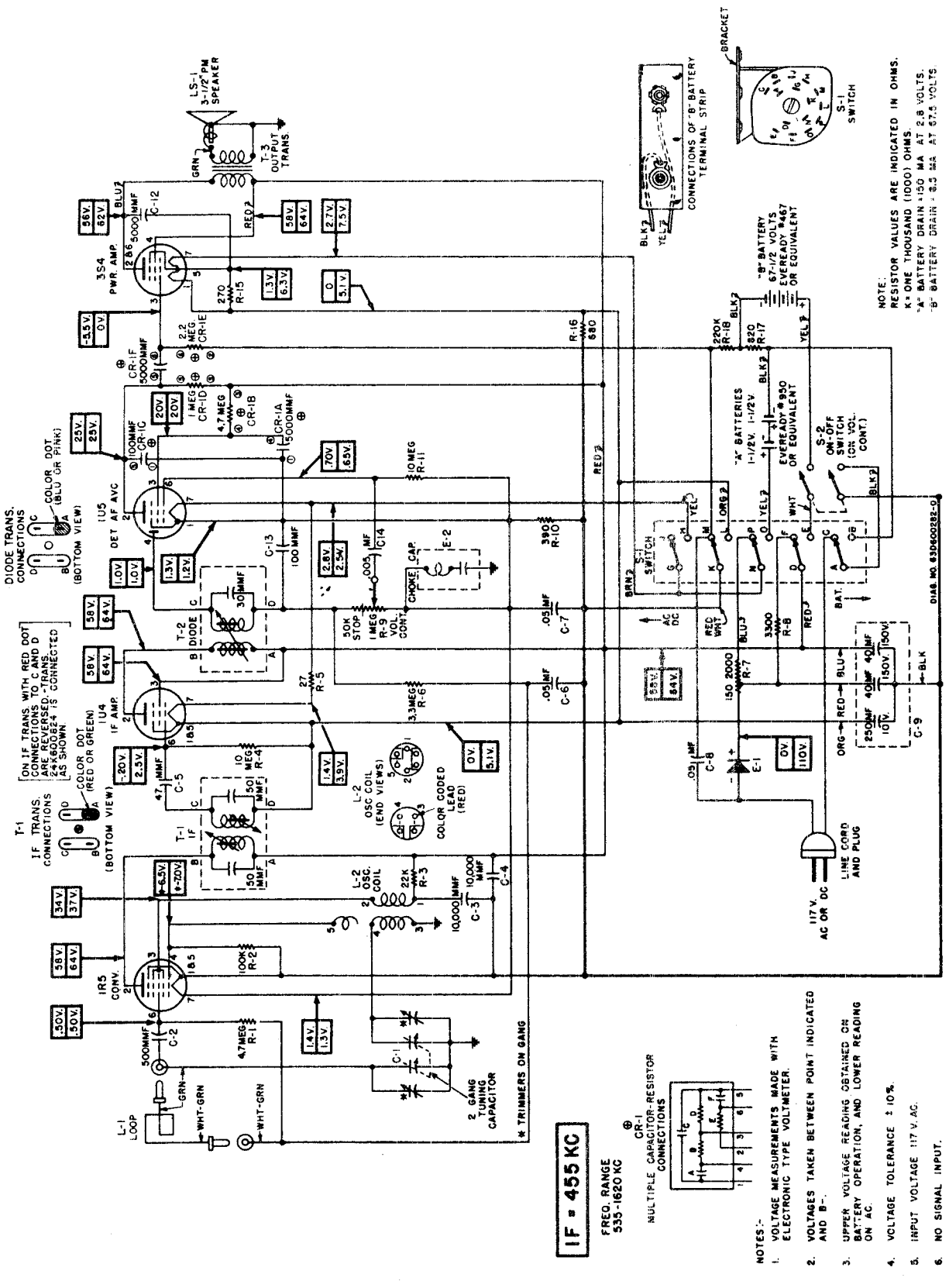


FIGURE 10. SCHEMATIC DIAGRAM OF HS-224 USING MULTIPLE CAPACITOR PLATE.

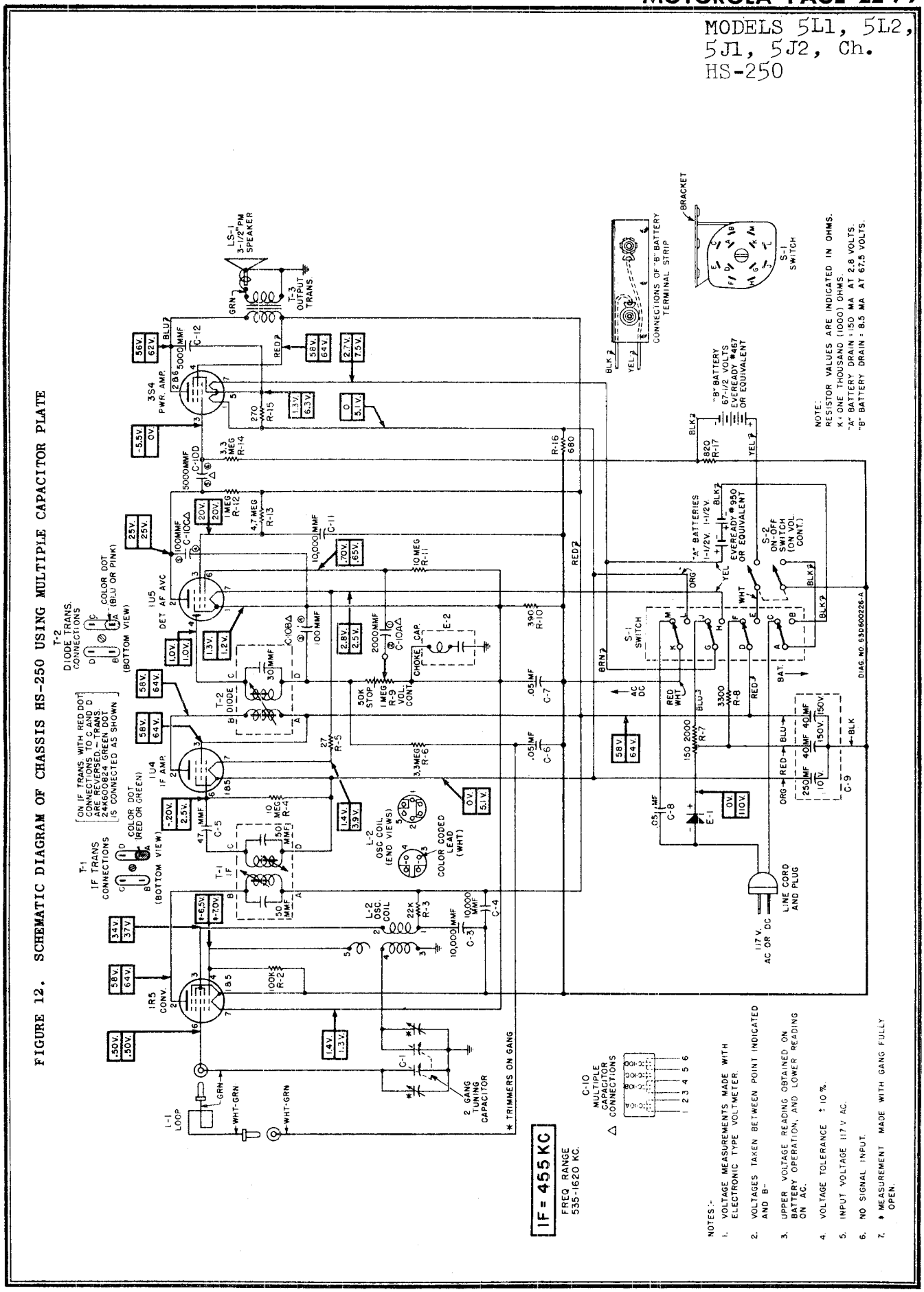
MODELS 5L1U, 5L2U,
51L1U, 51L2U, 5J1U,
5J2U, Ch. HS-224

FIGURE 11. SCHEMATIC DIAGRAM OF CHASSIS HS-224 USING MULTIPLE CAPACITOR-RESISTOR PLATE



MODELS 5L1, 5L2, 5J1, 5J2, Ch. HS-250

FIGURE 12. SCHEMATIC DIAGRAM OF CHASSIS HS-250 USING MULTIPLE CAPACITOR PLATE



MODELS 5L1, 5L2, 5J1,
5J2, Ch. HS-250

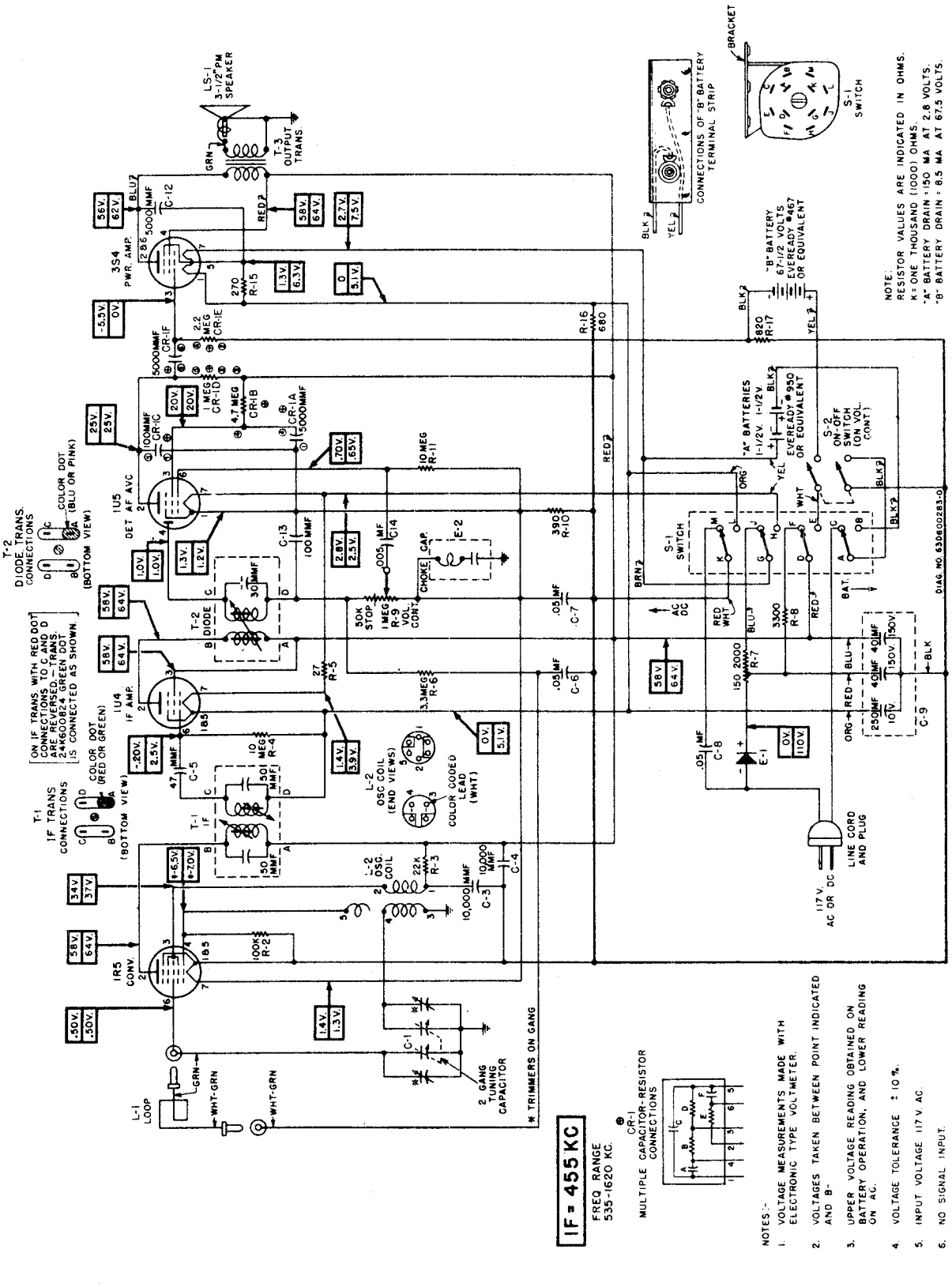


FIGURE 13. SCHEMATIC DIAGRAM OF CHASSIS HS-250 USING MULTIPLE CAPACITOR-RESISTOR PLATE

NOTES:-

1. VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
2. VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
3. UPPER VOLTAGE READING OBTAINED ON BATTERY OPERATION, AND LOWER READING ON AC.
4. VOLTAGE TOLERANCE ± 10 %.
5. INPUT VOLTAGE 117 V. AC.
6. NO SIGNAL INPUT.
7. * MEASUREMENT MADE WITH GANG FULLY OPEN.

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19K692008	Variable, 2 gang.....
C-2	21K481377	Ceramic: 500 mmf 500V.....
C-3	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-5	21K77373	Ceramic, 47 mmf 500V.....
C-6	8K71213	Paper: .05 mf 100V.....
C-7	8K71213	Paper: .05 mf 100V.....
C-8	8K471635	Paper: .05 mf 400V.....
C-9	23B691995	Electrolytic: 40-40 mf 150V/250 mf 10V.....
C-10	21K691992	Ceramic, multiple: 2000 mmf, 100 mmf, 100 mmf 5000 mmf.....
C-11	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-12	21A470789	Ceramic, disc type: 5000 mmf 450V.....
C-13	21B772286	Ceramic: 100 mmf 500V.....
C-14	8A24966	Paper: .005 mf 100V.....
Capacitor-Resistor		
CR-1	21B601036	Capacitor-Resistor: 5000 mmf, 100 mmf, 5000 mmf; 4.7 meg, 1 meg, 2.2 meg...
Rectifier		
E-1	48B791092	Selenium Rectifier: half wave.....
Choke & Capacitor		
E-2	24K691986	Choke & .05 mf 200V Paper Capacitor.....
Coils		
L-1	1X692056	Antenna Loop & Lead Assembly (5L1 & 51L1 series)...
	1X692141	Antenna Loop, Panel & Hinge Assembly: less front cover; black plastic (5J1 series)
	1X600437	Antenna Loop, Panel & Hinge Assembly: less front cover; green plastic (5J2 series)
	24B691936	Antenna Loop & Panel Assembly: less hinges; black plastic (5J1 series).....
	24K600403	Antenna Loop & Panel Assembly: less hinges; green plastic (5J2 series).....
L-2	24B691987	Oscillator Coil (red code) (HS-224 only).....
	24K600154	Oscillator Coil (white code) (HS-250 only).....
Speaker		
LS-1	50B692037	Speaker: 3½" PM; 3.2 ohm VC
	or 50B692038	Speaker: 3½" PM; 3.2 ohm VC

Ref. No.	Part Number	Description
Resistors		
	Note:	All resistors are insulated carbon type unless otherwise specified.
R-1	6R2122	4.7 meg 20% ½W .....
R-2	6R6031	100,000 10% ½W .....
R-3	6R6397	22,000 10% ½W .....
R-4	6R2109	10 meg 20% ½W .....
R-5	6R5683	27 10% ½W .....
R-6	6R2118	3.3 meg 20% ½W .....
R-7	17K692009	Wire Wound: 2150 5% 10W; tapped.....
R-8	6R5581	3300 10% ½W .....
R-9	18A692018	Volume Control: 1 meg; with on-off switch.....
R-10	6R5554	390 10% ½W .....
R-11	6R2109	10 meg 20% ½W .....
R-12	6R6004	1 meg 20% ½W .....
R-13	6R2122	4.7 meg 20% ½W .....
R-14	6R2118	3.3 meg 20% ½W .....
R-15	6R6432	270 10% ½W .....
R-16	6R6040	680 10% ½W .....
R-17	6R6269	820 10% ½W .....
R-18	6R6015	220,000 20% ½W .....
Switches		
S-1	40B471927	Rotary Switch, 5PDT (AC/DC, battery selector) (HS-224 only).....
	40K600156	Rotary Switch, 4PDT (AC/DC, battery selector) (HS-250 only).....
Transformers		
T-1	24K600824	IF Transformer, 455 Kc: complete with capacitors and shield (green dot)....
	or 24B692014	IF Transformer, 455 Kc: complete with capacitors and shield (red dot).....
T-2	24K600825	Diode Transformer 455 Kc: complete with capacitors and shield (pink dot).....
	or 24B692015	Diode Transformer, 455 Kc: complete with capacitors and shield (blue dot).....
T-3	25K692006	Output Transformer.....
CHASSIS PARTS - MECHANICAL		
1	43A692012	Bushing, strain relief: line cord (use with 43K692013).....
2	42K75826	Clip, electrolytic mtg..
3	42A485548	Clip, IF Coil mtg.....
4	30B691994	Cord, line: with plug; 6 ft long (HS-224 only).....
5	30K600125	Cord, line: with plug; 6 ft long (HS-250 only).....
	29R5294	Lug, soldering (holds battery leads).....
7	29R3020	Lug, soldering: battery contact (in "A" battery retainer).....

CHASSIS HS-224, HS-250

Ref. No.	Part Number	Description
8	2S7051	Nut, hex: Palnut; 3/8-32 x 9/16; volume control mtg) .....
9	9A691988	Receptacle, 2 pin (antenna lead receptacle).....
10	15B481896	Retainer, "A" battery.....
11	43K692013	Retainer, strain relief (on line cord bushing).....
12	26K600155	Shield, back (on rear of chassis)(HS-250 only).....
13	26C691983	Shield, bottom: black (over chassis bottom) (HS-224 only).....
14	26A692005	Shield, heat (around R-7) .....
	26K691997	Shield, switch: (over AC/DC Battery switch).....
16	9A690129	Socket, tube: miniature; 7 prong.....
17	41K680029	Spring, battery contact (in "A" battery retainer).....
18	31K691985	Strip, "B" battery terminal with leads.....
	31K37504	Strip, terminal: 1 insulated lug; #1 mtg.....
	31K470746	Strip, terminal: 3 insulated lugs #2 mtg.....
	4K470939	Washer, fibre (antenna receptacle mtg & R-7 mtg) .....

MODELS 5L1 & 5L1U CABINET PARTS

101	7B600059	Bracket, chassis support (on sides of chassis).....
102	38K692051	Button, plug: tan.....
	16E691902	Cabinet & Grille Assembly, front section; complete, less carrying handle; tan plastic.....
	16K691903	Cabinet, front section: less grille & carrying handle; tan plastic.....
105	1X600168	Cover and Loop Assembly cabinet back: complete with latch spring and stop cord; tan plastic.....
106	16D691905	Cover, cabinet back: tan plastic; less latch spring and loop antenna.....
	5S7855	Eyelet: .156 x .484 (on loop leads).....
	16K691904	Grille, speaker: brown plastic.....
109	1X600082	Handle Assembly, complete: tan.....
	36B691906	Knob, tuning: tan plastic..
111	3S8175	Screw, sheet metal: #4 x 3/16 PKZ; plain hex head (chassis support bracket mtg).....
	3S490390	Screw, thread-cutting: #4 x 3/8; type 25 phillips round head(speaker grille mtg) .....
	3S488009	Screw, thread-cutting: #6 x 3/8; type 25 plain hex head (mounts chassis to cabinet)
	2S7089	Speednut: for .187 stud; black (loop mtg).....
115	41A480094	Spring, hinge (rear cover) .....
116	55B692068	Spring, rear cover latch..

MODEL 51L1U CABINET PARTS - Same as 5L1 & 5L1U except

121	38K692050	Button, plug: green.....
	16K610023	Cabinet & Grille Assembly, front section: complete, less carrying handle; green plastic.....
	16K610024	Cabinet, front section: less grille & carrying handle; green plastic.....
125	16K601704	Cover, cabinet back: less latch spring and loop antenna; green plastic.....
	16K610025	Grille, speaker: green plastic.....
127	1X610018	Handle Assembly, complete: green.....
	36K610022	Knob, tuning: green.....

MODEL 5L2 & 5L2U CABINET PARTS

131	7B600059	Bracket, chassis support (on sides of chassis)....
132	38K600106	Button, plug: maroon.....
	16K600410	Cabinet & Grille Assembly, front section: complete, less carrying handle; maroon plastic.....
	16K600411	Cabinet, front section: less grille and carrying handle ;maroon plastic ...
135	1X600431	Cover and Loop Assembly, cabinet back: complete with latch spring, and stop cord ;maroon plastic
136	16K600413	Cover, cabinet back: less latch spring and antenna loop; maroon plastic.....
	5S7855	Eyelet: .156 x .484 (on loop leads).....
	16K600412	Grille, speaker: maroon plastic.....
139	1X600429	Handle Assembly, complete: maroon.....
	36K600406	Knob, tuning: maroon plastic
141	3S8175	Screw, sheet metal: #4 x 3/16 PKZ; plain hex head (chassis support bracket mtg).....
	3S490390	Screw, thread-cutting: #4 x 3/8; type 25 phillips round head;(speaker grille mtg).....
	3S488009	Screw, thread-cutting: #6 x 3/8; type 25 plain hex head (mts chassis to cabinet).
	2S7089	Speednut: for .187 stud: black (loop mtg).....
145	41A480094	Spring, hinge (rear cover). .....
146	55B692068	Spring, rear cover latch.

MODELS 5L1, 5L1U, Rev.; 5L2, 5L2U, 51L1U, 51L2U; 5J1, 5J1U, Rev.; 5J2, 5J2U; Ch. HS-224, HS-250

Ref. No.	Part Number	Description
MODEL 51L2U CABINET PARTS - Same as 5L2 & 5L2U except:		
152	16K601703	Cover, cabinet back: less latch spring and loop antenna.....
	36K610034	Knob, tuning: maroon plastic
MODEL 5J1 & 5J1U CABINET PARTS		
201	7A600078	Bracket, chassis support (on sides of chassis).....
	7A692061	Bracket, hinge mtg: black nickel finish (inside cabinet front).....
	14K600713	Bushing, insulating: bakelite (on handle mtg cover) .....
204	38K692052	Button, plug: black.....
205	16E691798	Cabinet, front section: less grille, loop and front cover; black plastic
206	42A600664	Clip, cabinet locking (on front section of cabinet) (replaces 42K692143)..
207	42A600665	Clip, cabinet locking (on rear cover) (replaces 42A480078).....
	13A691938	Cloth, grille.....
209	1X600173	Cover Assembly, cabinet back: complete with locking clip and stop cord; black plastic.....
	1X692139	Cover and Loop Assembly, cabinet front: complete with hinges and medallion; black plastic.....
	15D691894	Cover, cabinet front: less medallion and loop; black plastic.....
212	55A692058	Cover, handle mtg: brass plated (over ends of handle).....
	7A691932	Frame, grille: satin brass finish (around top of speaker grille).....
	7K691934	Frame, grille: satin brass finish (around bottom of speaker grille).....
	13C691896	Grille, speaker: green plastic.....
216	55A691944	Handle, carrying: black plastic; less spring.....
	1X692142	Hinge Assembly, front cover: complete.....
	36B691923	Knob, control: green plastic
219	1X692137	Lead and Eyelet Assembly: white (loop lead).....
220	1X692138	Lead and Eyelet Assembly: green (loop lead).....
	29R3037	Lug, soldering: #6 hole (loop lead connector-on loop panel).....
	13A691927	Medallion: brass plated (on front cover).....
	64A692191	Plate, handle mtg (under ends of handle).....
	64A600044	Plate, loop panel support (under loop hinges on loop panel).....
	5S490843	Rivet: .122 x 7/32 stl; black nkl (mounts hinge to loop panel).....
	3S7327	Screw, machine: 5-40 x 3/8 plain hex head (handle mtg).....
	3S7155	Screw, machine: 6-32 x 3/16; plain hex head (holds hinge to hinge mtg bracket).....
	3S490018	Screw, sheet metal: #2 x ¼; PKZ; phillips flat head; blk nkl (mounts loop to front cover).....
229	3S8136	Screw, sheet metal: #4 x ¼; PKZ; phillips round head; blk nkl (chassis support bracket mtg).....
	3S400036	Screw, thread cutting: #6 x ¼; PKF; slotted binder head (holds hinge mtg brkt).....
	3S488009	Screw, thread cutting: #6 x 3/8; type 25 plain hex head (mounts chassis to cabinet).....
	2S490840	Speednut: for 1/16 stud; black parkerized finish (medallion mtg).....
	2S7092	Speednut: for .125 stud; black parkerized finish (spkr grille mtg).....
234	2S490842	Speednut: for .271 stud; black parkerized finish (holds cover stop cord) .....
235	42A600663	Spring, battery retainer..
	41A692060	Spring, handle (inside plastic handle).....
	4S1719	Washer, flat; 3/8 x .140 x .030 stl; (handle mtg)
MODEL 5J2 & 5J2U CABINET PARTS - Same as 5J1 except		
241	38K600402	Button, plug: green.....
242	16K600409	Cabinet, front section: less grille, loop and front cover; green plastic
243	1X600438	Cover Assembly, cabinet back: complete with locking clip and stop cord; green plastic.....
	1X600435	Cover and Loop Assembly, cabinet front: complete with hinges and medallion; green plastic.....
	15K600414	Cover, cabinet front: less medallion and loop; green plastic.....
	13K600408	Grille, speaker: black plastic.....
247	55K600401	Handle, carrying: less spring; green plastic.....
	36K600859	Knob, control black plastic
	5S7773	Rivet: .122 x 7/32 stl; ant copper (mounts hinge to loop panel).....
	3S3389	Screw, sheet metal: #2 x ¼ PKZ; phillips flat head; statuary bronze finish (mounts loop to front cover) .....

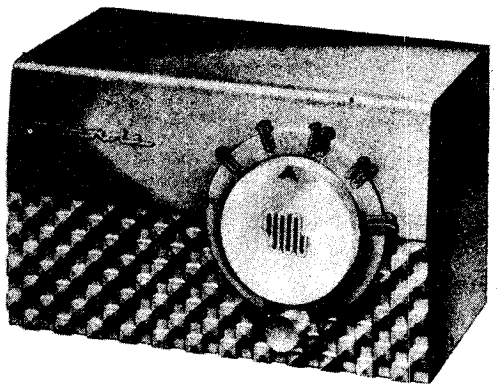
MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.

RECEIVER MODELS -

Model	Color
5R11	Walnut-Mahogany
5R12	Ivory
5R13	Maroon
5R14	Gray
5R15	Green
5R16	Yellow



TUBE COMPLEMENT -

12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts, AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

POWER SWITCH & VOLUME CONTROL. The "off-on" switch and the volume control are combined and are operated with the small lower knob. NOTE: If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet.

TUNING CONTROL. Stations are tuned in with the large upper knob.

ANTENNA. A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating the chassis (from an AC line) outside of its cabinet, use an isolation transformer between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11, 5R12, 5R13, 5R14, 5R15, 5R16, Ch. HS-254

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to chassis.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully Open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

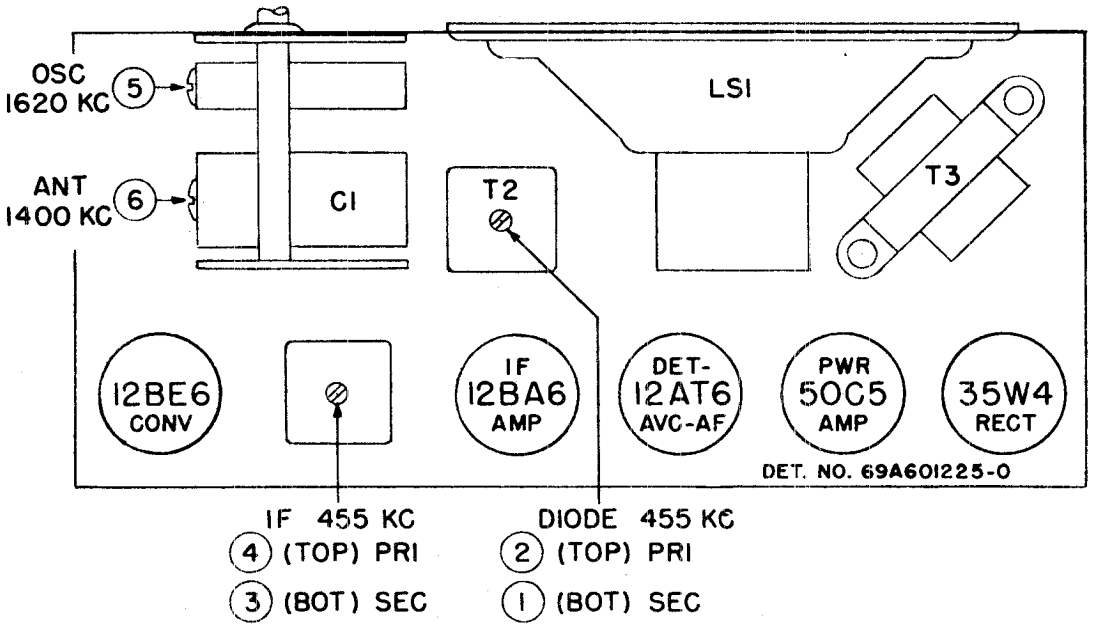


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254

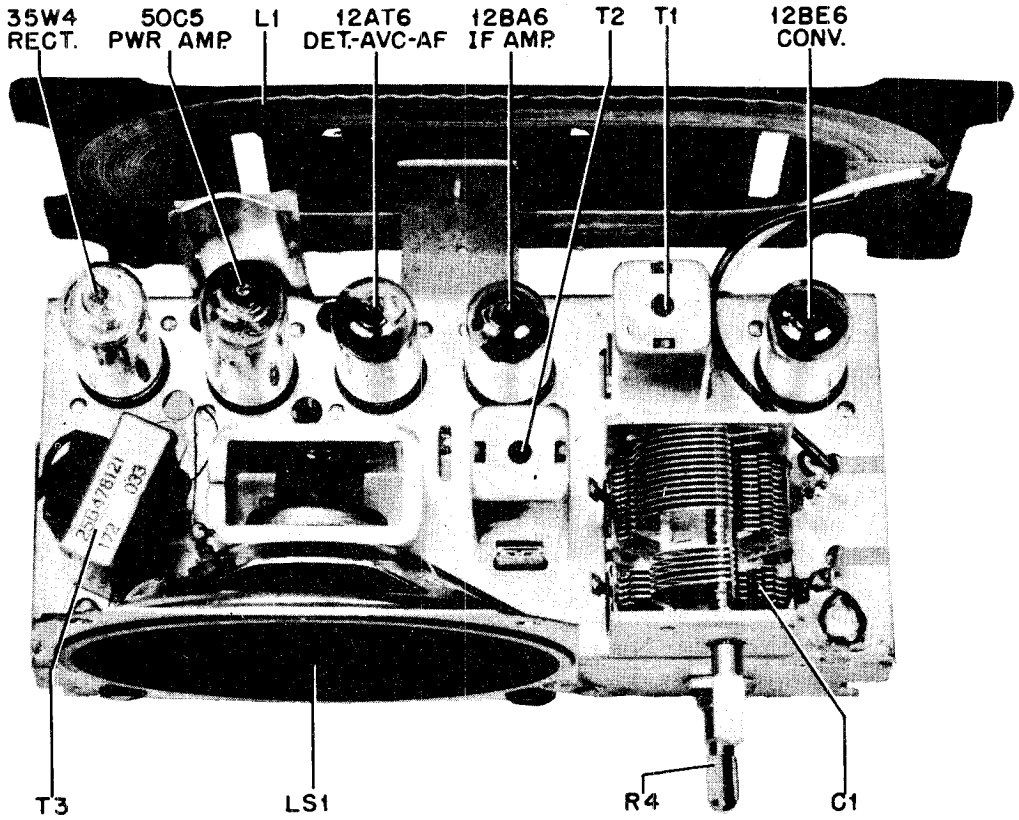


FIGURE 2. TOP VIEW OF CHASSIS

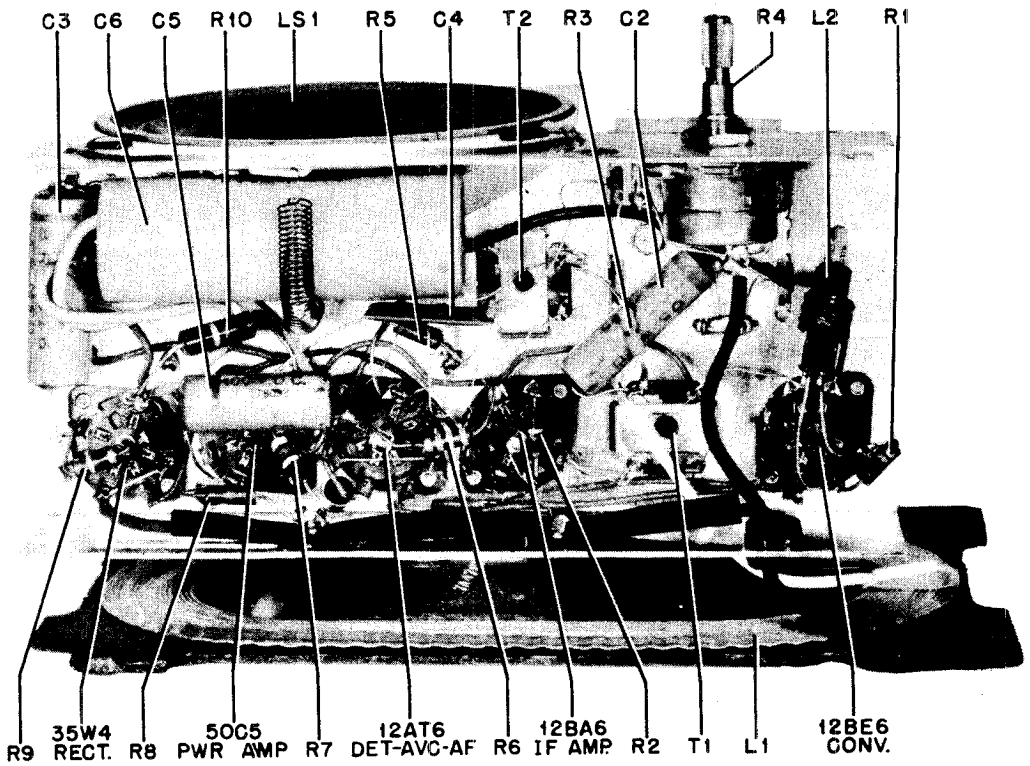


FIGURE 3. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11, 5R12, 5R13, 5R14, 5R15, 5R16, Ch. HS-254

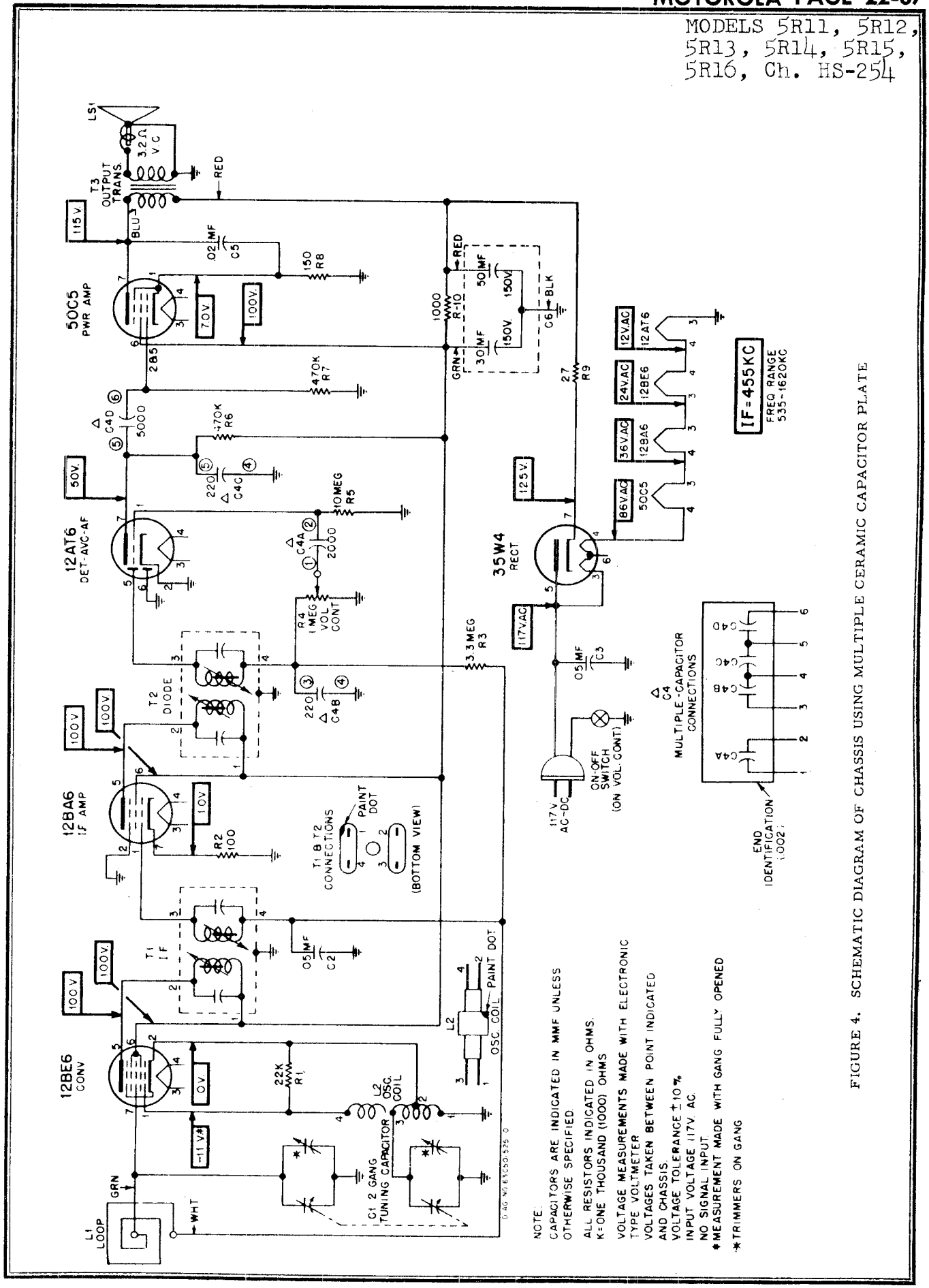
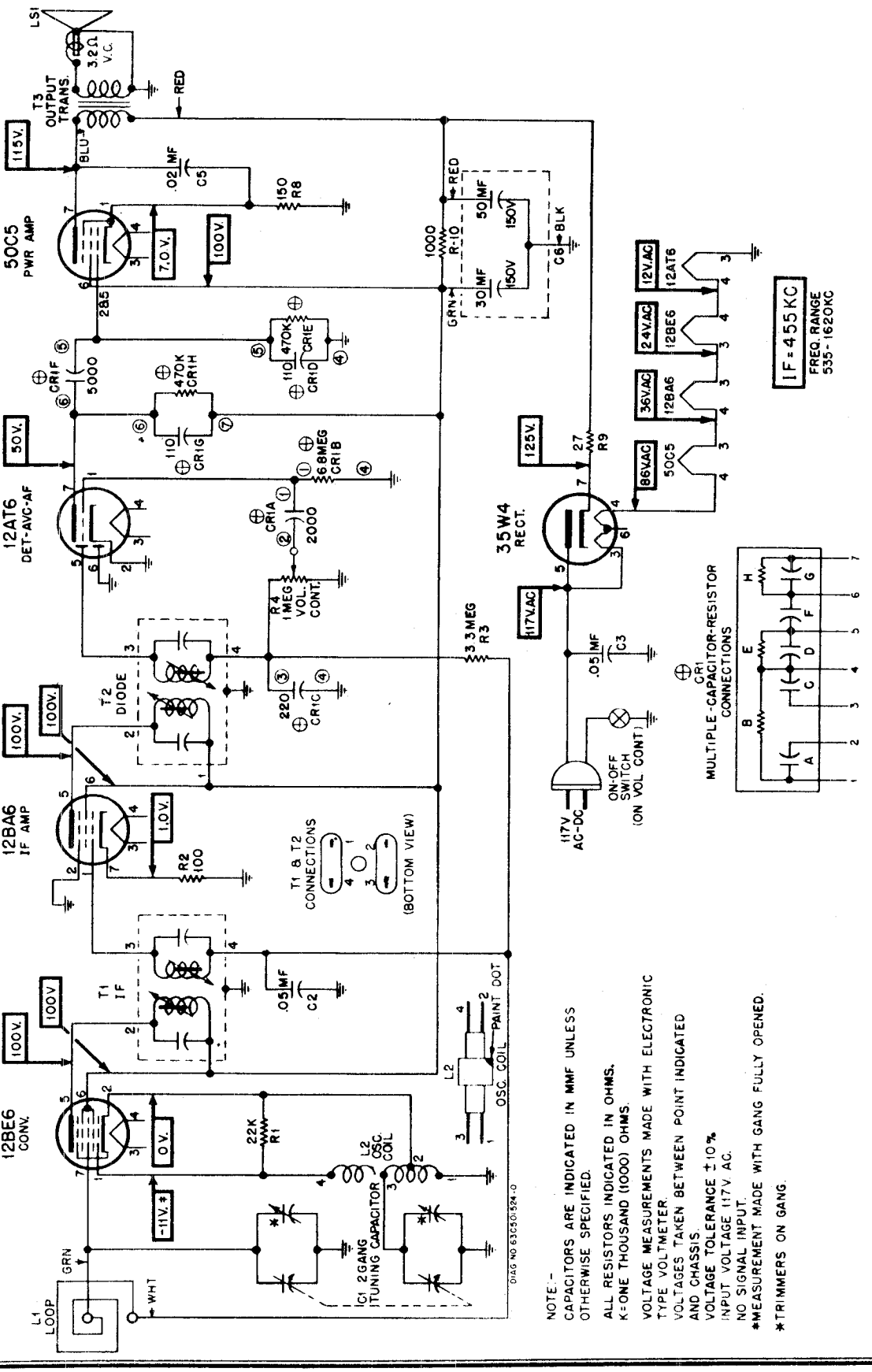


FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11, 5R12,
5R13, 5R14, 5R15,
5R16, Ch. HS-254



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS INDICATED IN OHMS, K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V. A.C.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.

*TRIMMERS ON GANG.

FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 5R11, 5R12, 5R13, 5R14, 5R15, 5R16, Ch. HS-254

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

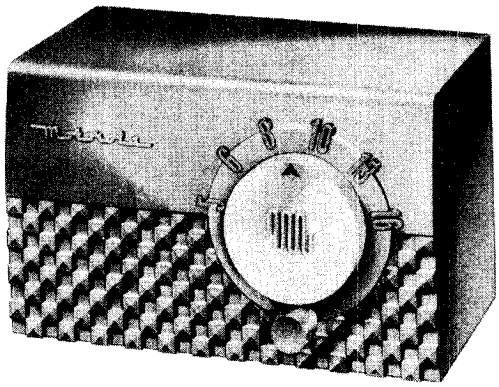
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600458	Variable: 2 gang; with pulley.....
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R9816	Paper: .05 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000, 220,220, 5000 mmf.....
C-5	8R9802	Paper: .02 mf 400V.....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000, 220, 5000, 110, 110 mmf, 6.8 meg, 470,000, 470,000 ohms.....
Coils		
L-1	24C600543	Antenna Loop and Panel Assembly.....
L-2	24A478129	Oscillator coil (red dot)..
Speaker		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified
R-1	6R6028	22,000 20% 1/2W.....
R-2	6R6018	110 20% 1/2W.....
R-3	6R2118	3.3 meg 20% 1/2W.....
R-4	18K600449	Volume control: 1 meg; with switch.....
R-5	6R2109	10 meg 20% 1/2W.....
R-6	6R6032	470,000 20% 1/2W.....
R-7	6R6032	470,000 20% 1/2W.....
R-8	6R3992	150 20% 1/2W.....
R-9	6R5683	27 10% 1/2W.....
R-10	6R3953	1000 20% 1W.....
Transformers		
T-1,2	24B485553	IF and Diode Transformer (green dot): 455 KC; complete with capacitors, cores, and shield.....
T-3	25B478121	Output Transformer.....

Part No.	Description
CHASSIS PARTS - MECHANICAL	
7A478118	Bracket, loop mtg.....
43A692012	Bushing, strain relief: line cord (use with 43K692013).....
42A485548	Clip, IF coil mtg.....
30K478137	Cord, line: with plug; 6 feet long
5A484268	Grommet, rubber (speaker mtg).
14A478119	Insulator, loop bracket mtg: fibre
2S7051	Nut, hex palnut: 3/8-32 x 9/16 (volume control mtg).....
43K692013	Retainer, strain relief: line cord (use with 43A692012).....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans mtg).....
5S7703	Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg).....
3S7247	Screw, machine: 6-32 x 3/16 slotted locking hex head; cad pl (gang mtg).....
26A478117	Shield, electrostatic (on rear of chassis).....
9A472534	Socket, tube: miniature; 7 prong..
41A73996	Spring, tension (electrolytic mtg)
46A478145	Stud, tri-mount (mounts loop to bracket).....
14A11493	Washer, shoulder: fibre (loop bracket mtg).....
CABINET PARTS	
16K600181	Cabinet, table model: walnut-mahogany (5R11).....
16E600157	Cabinet, table model: ivory(5R12).
16K600183	Cabinet, table model: maroon(5R13)
16K600184	Cabinet, table model: gray (5R14).
16K600185	Cabinet, table model: green(5R15).
16K600186	Cabinet, table model: yellow(5R16)
36B600485	Knob, tuning: ivory (5R11,5R13, 5R14, and 5R15).....
36K600486	Knob, tuning: red (5R12).....
36K600487	Knob, tuning: blue(5R16).....
36B600544	Knob, volume control: walnut(5R11)
36K600545	Knob, volume control: ivory (5R12)
36K600546	Knob, volume control: maroon(5R13)
36K600547	Knob, volume control: gray(5R14)..
36K600548	Knob, volume control: green (5R15)
36K600549	Knob, volume control: yellow(5R16)
3S476083	Screw, machine: 6-32 x 5/16; slotted locking hex head; cad pl; (chassis mtg).....
38A25507	Plug, split (mounts back panel to cabinet).....
11M488253	Tape, aluminum foil: 2 1/2" wide.....

MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.



RECEIVER MODELS -

Model	Color
5R11A	Walnut-Mahogany
5R12A	Ivory
5R13A	Maroon
5R14A	Gray
5R15A	Green
5R16A	Yellow

TUBE COMPLEMENT -

Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier

RECTIFIER - Selenium type

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUCTIONS

ON-OFF SWITCH & VOLUME CONTROL. Operated with the small lower knob. NOTE: To operate on DC, the line plug must be inserted in the electrical outlet for correct polarity. If the set does not function, reverse the plug. When operating from AC, reversal of the line plug may improve reception.

TUNING CONTROL. Stations are tuned in with the large upper knob.

ANTENNA. The built-in loop antenna provides satisfactory reception in most locations. When receiving a distant or weak station, rotate the receiver slightly to get maximum signal pick-up. If additional pick-up is necessary, connect an external antenna by following the instructions printed on the rear panel. CAUTION: Never connect the chassis to a water pipe, radiator or other ground.

SERVICE NOTES

This receiver has one lead of the power line connected directly to the chassis. If AC power is used, it is recommended, when operating the chassis outside of its cabinet, that an isolation transformer be placed between the power line and the receiver to reduce the possibility of an electrical shock.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11A, 5R12A, 5R13A, 5R14A, 5R15A, 5R16A, Ch. HS-280

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to chassis through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to chassis.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3, & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

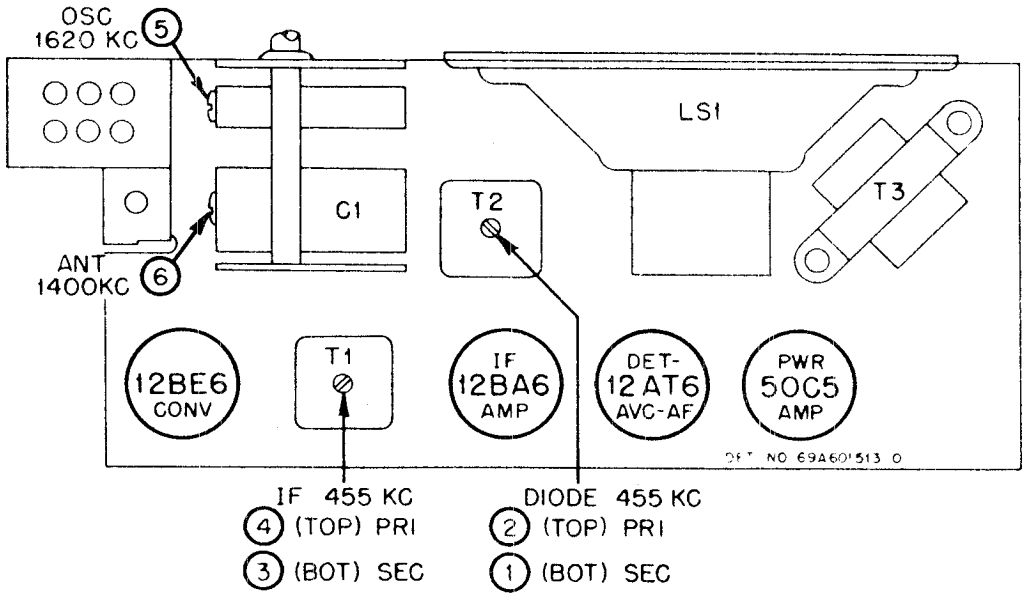


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280

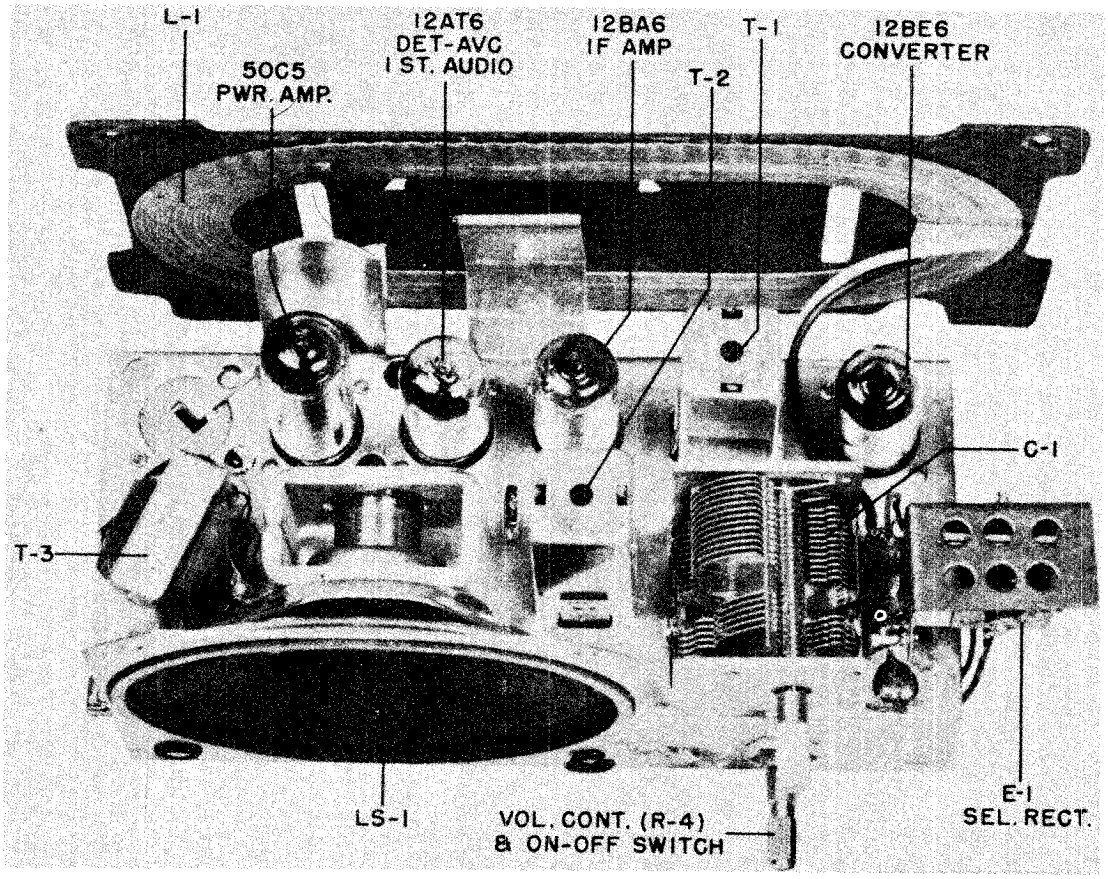


FIGURE 2. TOP VIEW OF CHASSIS

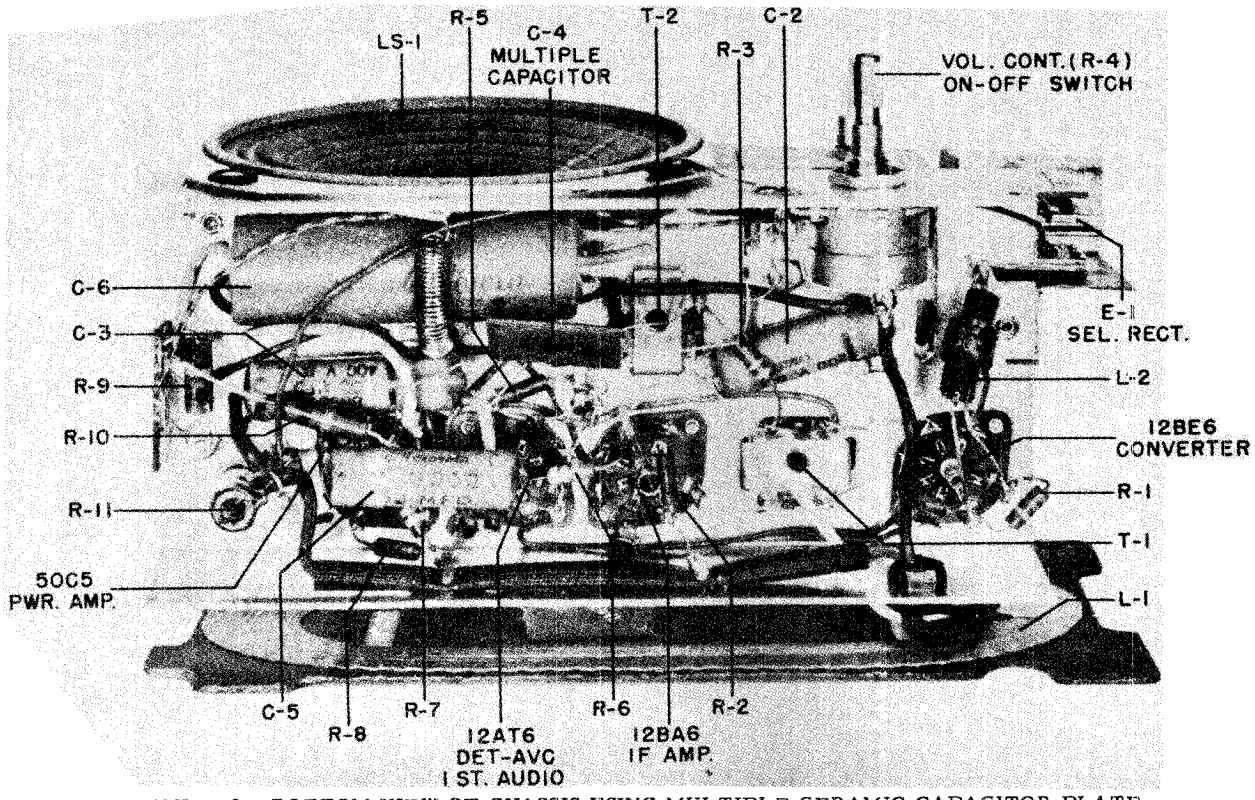
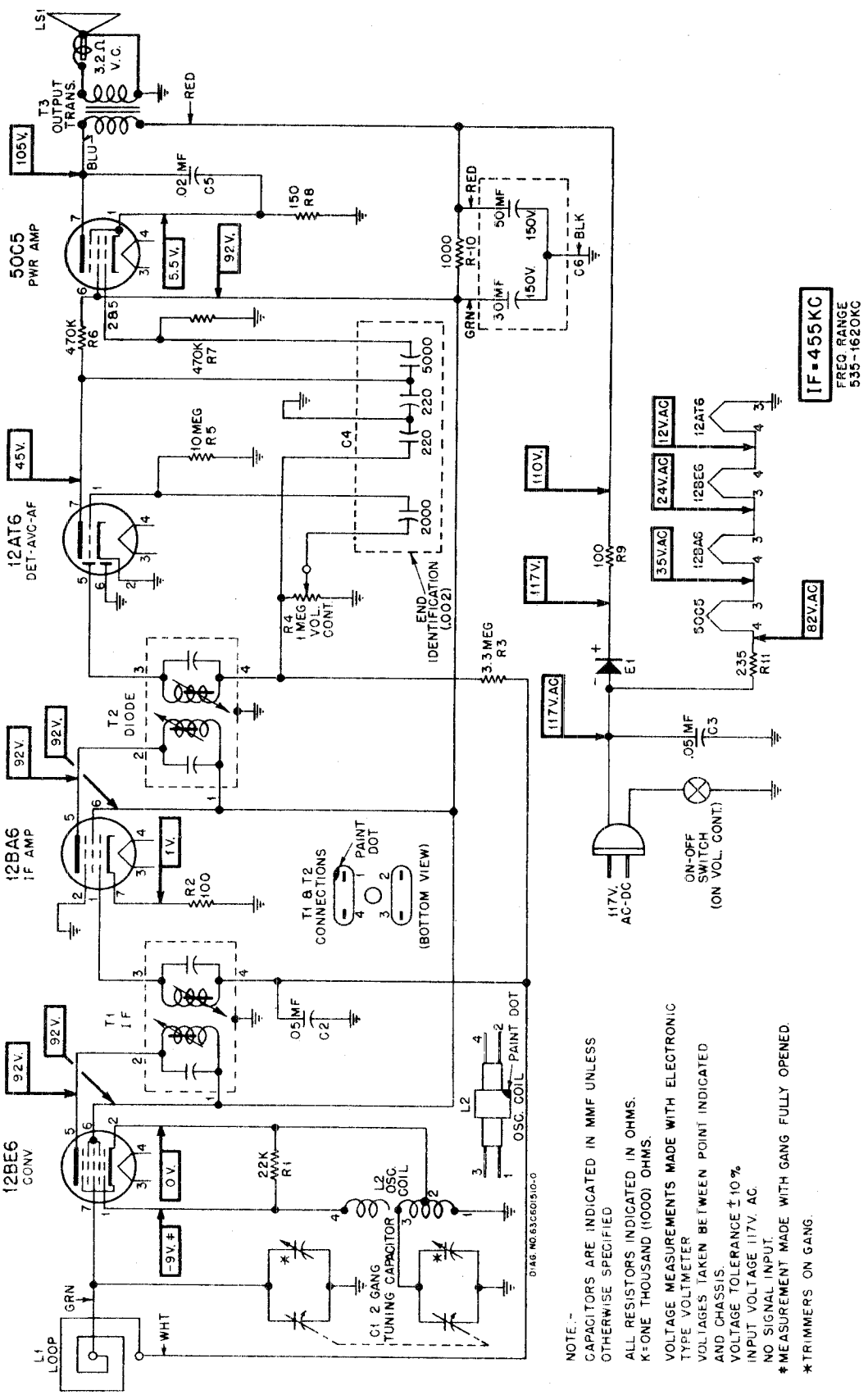


FIGURE 3. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11A, 5R12A, 5R13A, 5R14A, 5R15A, 5R16A, Ch. HS-280



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED

ALL RESISTORS INDICATED IN OHMS. K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER

VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.

VOLTAGE TOLERANCE ±10%

INPUT VOLTAGE 117V. AC.

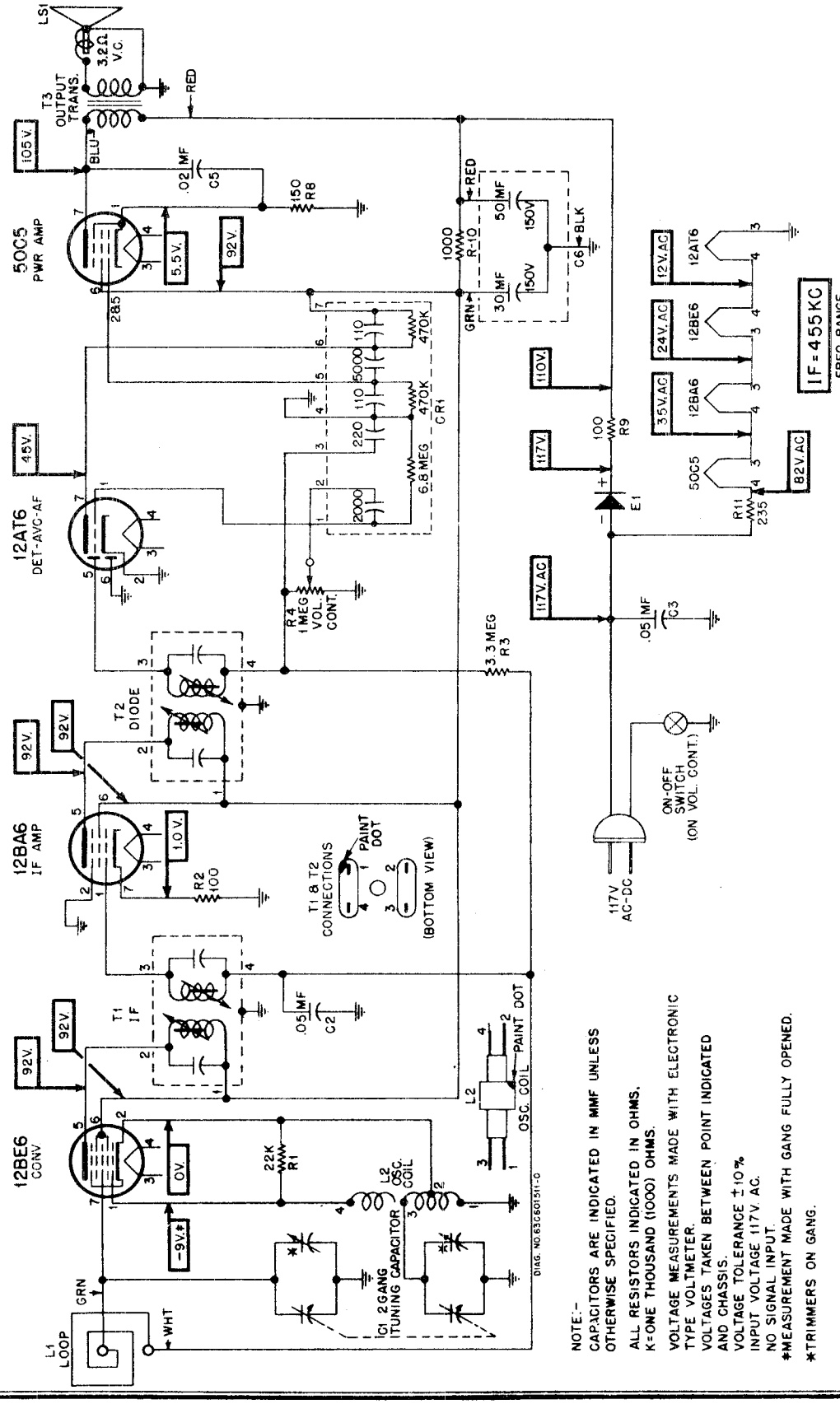
NO SIGNAL INPUT.

*MEASUREMENT MADE WITH GANG FULLY OPENED.

★TRIMMERS ON GANG.

FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11A, 5R12A,
5R13A, 5R14A, 5R15A,
5R16A, Ch. HS-280



NOTE:-
CAPACITORS ARE INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS INDICATED IN OHMS, K=ONE THOUSAND (1000) OHMS.

VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND CHASSIS.
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V AC.
NO SIGNAL INPUT.
*MEASUREMENT MADE WITH GANG FULLY OPENED.

*TRIMMERS ON GANG.

FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

REPLACEMENT PARTS LIST

MODELS 5R11A, 5R12A, 5R13A, 5R14A, 5R15A, 5R16A, Ch. HS-280

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

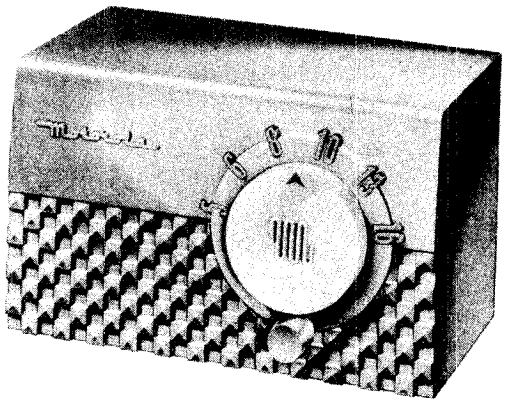
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600485	Variable: 2 gang; with pulley.....
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R9816	Paper: .05 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf.....
C-5	8R9802	Paper: .02 mf 400V.....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000 mmf, 220 mmf, 5000 mmf, 110 mmf, 110 mmf, 6.8 meg, 470,000 ohms, 470,000 ohms.....
Rectifier		
E-1	48B791092	Rectifier, selenium: half wave.....
Coils		
L-1	24K601662	Antenna Loop and Panel Assembly.....
L-2	24A478129	Oscillator coil.....
Speaker		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC.....
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W.....
R-2	6R6018	100 20% 1/2W.....
R-3	6R2118	3.3 meg 20% 1/2W.....
R-4	18K600449	Volume control: 1 meg; with switch.....
R-5	6R2109	10 meg 20% 1/2W.....
R-6	6R6032	470,000 20% 1/2W.....
R-7	6R6032	470,000 20% 1/2W.....
R-8	6R3992	150 20% 1/2W.....
R-9	6R6415	100 10% 1W.....
R-10	6R3953	1000 20% 1W.....
R-11	17A601647	Wirewound: 235 10% 5W.
Transformers		
T-1,2	24B485553	IF and Diode, Transformer (green dot): 455 KC; complete with capacitors, cores, and shield.....
T-3	25B478121	Output Transformer.....

Part No.	Description
CHASSIS PARTS - MECHANICAL	
7A478118	Bracket, loop mtg.....
7B601649	Bracket, rectifier mtg.....
43A692012	Bushing, strain relief(line cord)
43A692013	Bushing, retainer: strain relief (line cord).....
42A485548	Clip, IF & Diode Transformer mtg
30K478137	Cord, line and plug: 6 feet long
5A484268	Grommet, rubber (speaker mtg).
14A478119	Insulator, fibre (loop bracket mtg).....
2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (volume control mtg).....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg).....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans mtg & rect bracket mtg).....
5S7703	Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg)
3S7247	Screw,machine: 6-32 x 3/16 slotted hex head; locking type; stl; cad pl (gang mtg).....
3S490507	Screw, sheet metal: #6 x 18 x 1 plain hex head; stl; cad pl (rectifier mtg).....
26A478117	Shield, electrostatic (on rear of chassis).....
9A472534	Socket, tube: miniature; 7 prong..
41A73996	Spring, tension (electrolytic mtg)
31K83993	Strip, terminal: 2 insulated lugs, #1 gnd; 3/8" spacing.....
46A478145	Stud, tri-mount (loop mtg to bracket).....
14A11493	Washer, shoulder: fibre (loop bracket mtg).....
CABINET PARTS	
16K600181	Cabinet, table model : walnut-mahogany (5R11A).....
16E600157	Cabinet, table model: ivory (5R12A).....
16K600183	Cabinet, table model: maroon (5R13A).....
16K600184	Cabinet, table model: gray (5R14A).....
16K600185	Cabinet, table model: green (5R15A).....
16K600186	Cabinet, table model: yellow (5R16A).....
36B600485	Knob, tuning: ivory (5R11A, 5R13A, 5R14A, and 5R15A).....
36K600486	Knob, tuning: red (5R12A).....
36K600487	Knob, tuning: blue (5R16A).....
36B600544	Knob, volume control: walnut (5R11A).....
36K600545	Knob, volume control: ivory (5R12A).....
36K600546	Knob, volume control: maroon (5R13A).....
36K600547	Knob, volume control: gray (5R14A).....
36K600548	Knob, volume control: green (5R15A).....
36K600549	Knob, volume control: yellow (5R16A).....
3S476083	Screw, machine: 6-32 x 5/16; slotted hex head; stl; cad pl; locking type (chassis mtg)....
38A25507	Plug, split (back mtg to cabinet
11M488253	Tape; aluminum foil: 2 1/2" wide

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna.



RECEIVER MODELS -

Model	Color
5R11AU	Walnut-Mahogany
5R12AU	Ivory
5R13AU	Maroon
5R14AU	Gray
5R15AU	Green
5R16AU	Yellow

TUBE COMPLEMENT -

Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
Rectifier	Selenium Type

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

POWER SUPPLY - 117 volts AC or DC; 35 watts

INSTALLATION & OPERATING INSTRUTIONS

ON-OFF SWITCH & VOLUME. Operated with the small lower knob. NOTE: To operate from DC, the line plug must be inserted in the electrical outlet for correct polarity. If the receiver does not function, reverse the plug. When operating from AC, reversal of the line plug may improve reception.

TUNING. Stations are tuned in with the large upper knob.

ANTENNA. The built-in loop antenna provides satisfactory reception in most locations. When receiving a distant or weak station, rotate the receiver slightly to get maximum signal pick-up. If additional pick-up is necessary, connect an external antenna by following the instructions printed on the rear panel. CAUTION: Never connect the chassis to a water pipe, radiator or other ground.

SERVICE NOTES

The chassis of this receiver is isolated from the power line by a capacitor to eliminate the shock hazard, when handling the chassis outside the cabinet. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the receiver.

TO REMOVE CHASSIS FROM CABINET:

1. Pull off the two control knobs from the front of the receiver.

2. Remove the two split plugs which hold the loop to the cabinet.

3. Remove the two hex head screws at the rear edge of the chassis.

4. Slide the chassis from the cabinet.

MODELS 5R11AU, 5R12AU, 5R13AU, 5R14AU, 5R15AU, 5R16AU, Ch. HS-281

ALIGNMENT

NOTE: If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 1 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
3.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

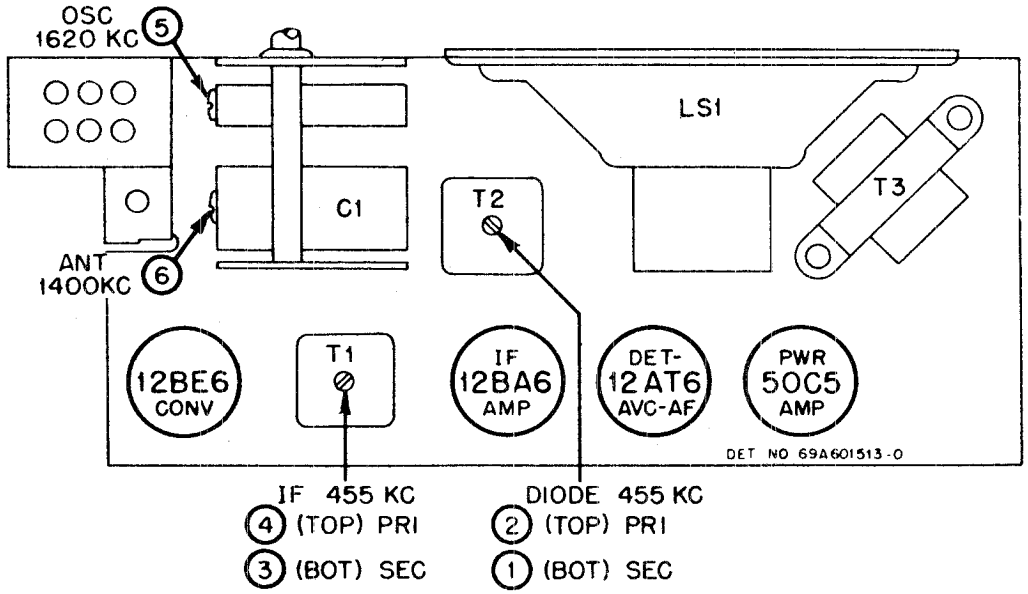


FIGURE 1. TUBE AND TRIMMER LOCATIONS

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

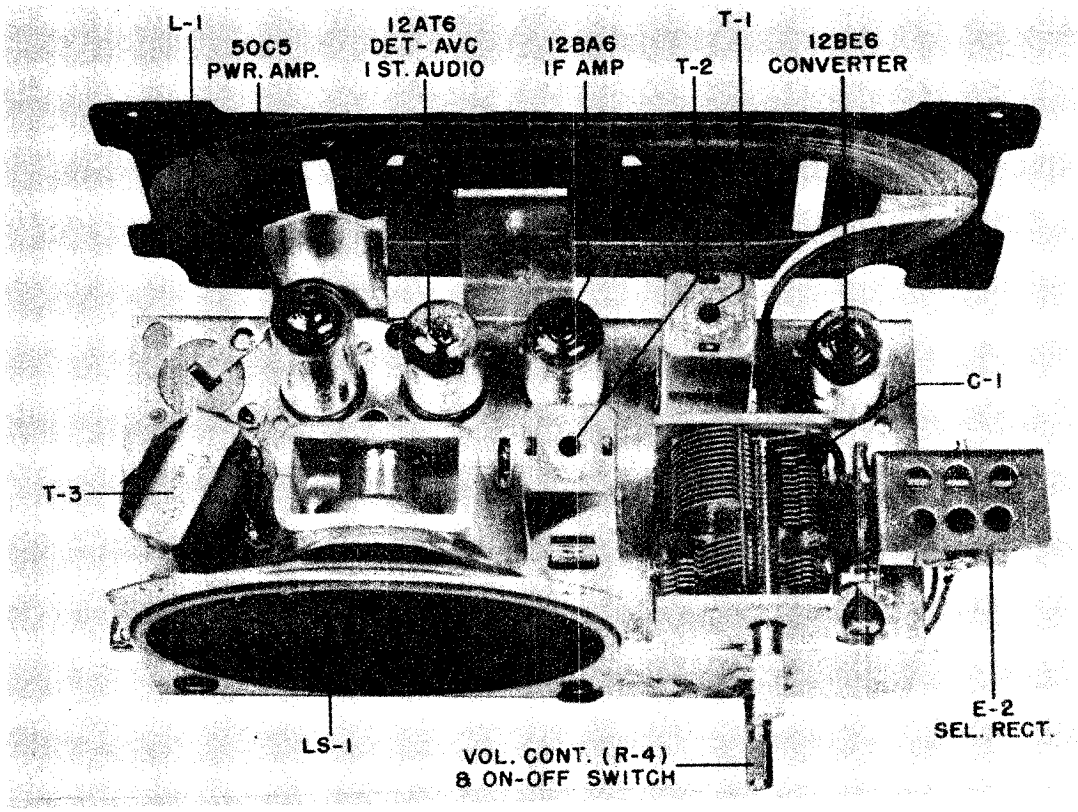


FIGURE 2. TOP VIEW OF CHASSIS

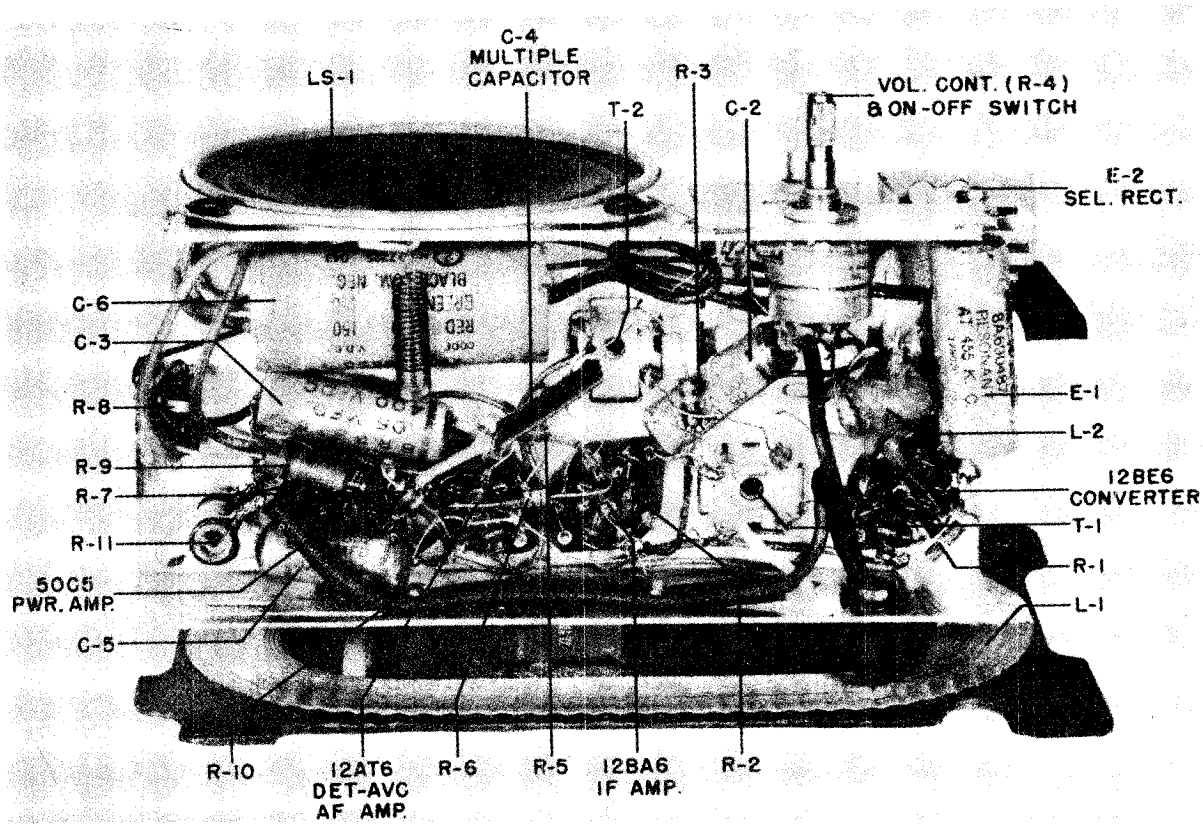


FIGURE 3. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

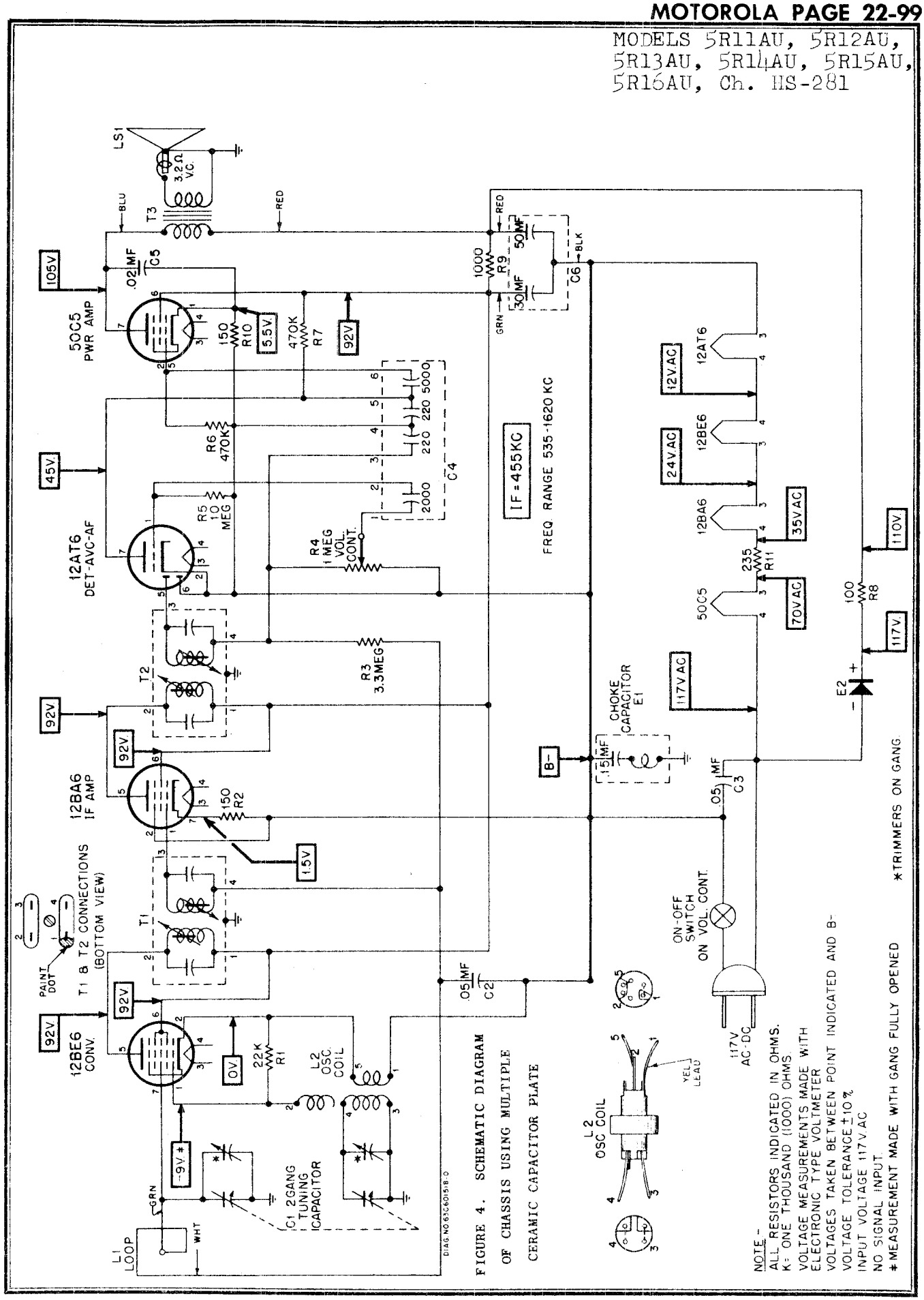


FIGURE 4. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

NOTE -
ALL RESISTORS INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER
VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
VOLTAGE TOLERANCE ±10%
INPUT VOLTAGE 117V AC
NO SIGNAL INPUT
* MEASUREMENT MADE WITH GANG FULLY OPENED

*TRIMMERS ON GANG

MODELS 5R11AU, 5R12AU,
5R13AU, 5R14AU, 5R15AU,
5R16AU, Ch. HS-281

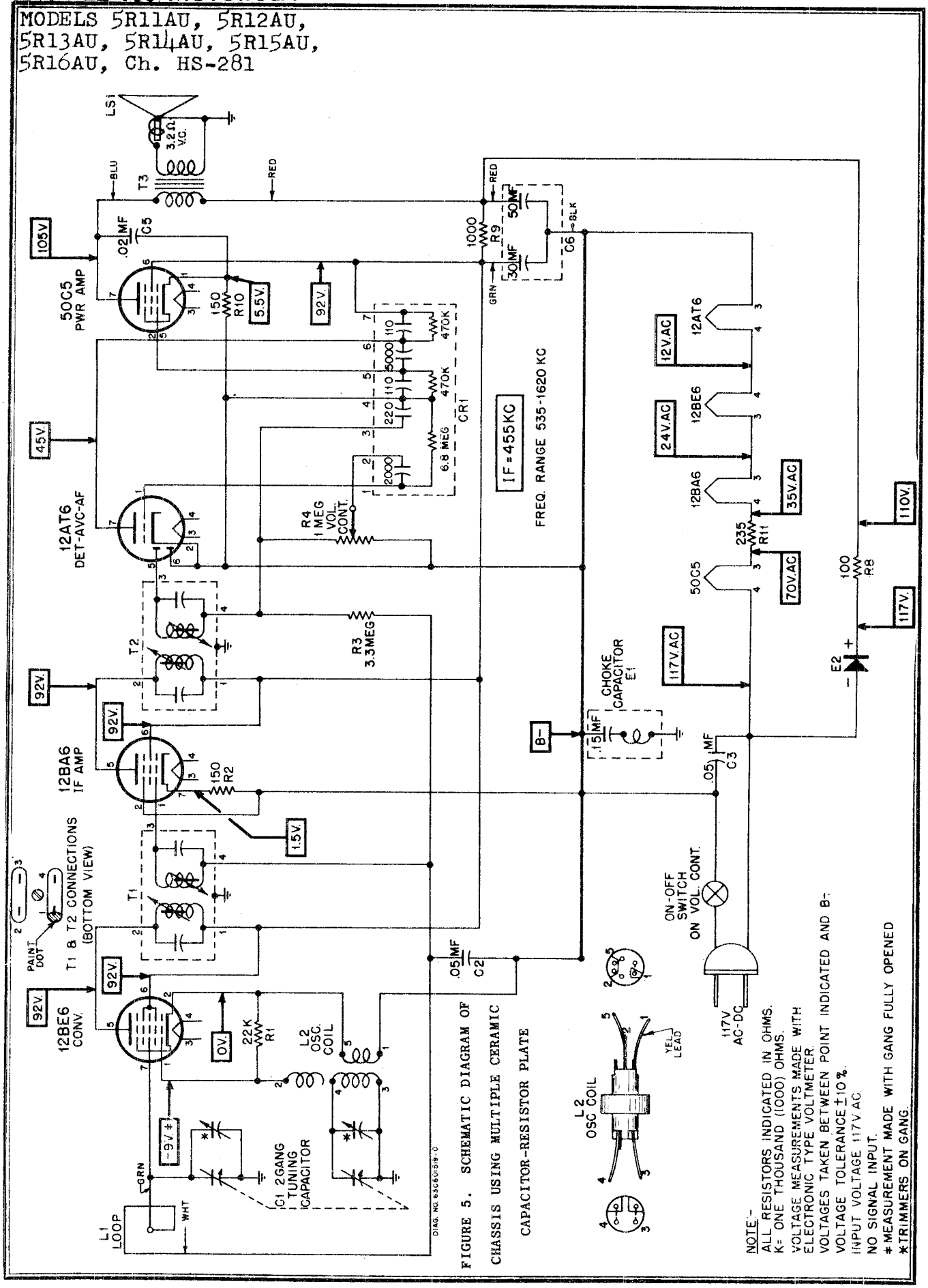


FIGURE 5. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

NOTE -
ALL RESISTORS INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
VOLTAGE TOLERANCE ±10%.
INPUT VOLTAGE 117 V.AC.
NO SIGNAL INPUT.
MEASUREMENT MADE WITH GANG FULLY OPENED
* TRIMMERS ON GANG.

REPLACEMENT PARTS LIST

MODELS 5R11AU, 5R12AU, 5R13AU, 5R14AU, 5R15AU, 5R16AU, Ch. HS-281

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
C-1	19B600458	Variable, 2 gang: with pulley .....
C-2	8R9821	Paper: .05 mf 200V .....
C-3	8R9816	Paper: .05 mf 400V .....
C-4	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf..
C-5	8R9802	Paper: .02 mf 400V .....
C-6	23B600855	Electrolytic: 50-30 mf/150V..
CAPACITOR-RESISTOR		
CR-1	21B601007	Capacitor-Resistor: 7 lead; 2000 mmf, 220 mmf, 5000 mmf, 110 mmf, 110 mmf, 6.8 meg, 470,000 ohms, 470,000 ohms..
CHOKE & CAPACITOR		
E-1	8A690487	Choke & .15 mf paper capacitor
RECTIFIER		
E-2	48B791092	Rectifier, selenium .....
COILS		
L-1	24K601662	Antenna Loop and Panel Assem.
L-2	24B680364	Oscillator coil .....
SPEAKER		
LS-1	50B690661	Speaker: 4" PM; 3.2 ohm VC...
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% 1/2W .....
R-2	6R3992	150 20% 1/2W .....
R-3	6R2118	3.3 meg 20% 1/2W .....
R-4	18K600449	Volume control: 1 meg; with switch .....
R-5	6R2109	10 meg 20% 1/2W .....
R-6	6R6032	470,000 20% 1/2W .....
R-7	6R6032	470,000 20% 1/2W .....
R-8	6R6415	100 10% 1W .....
R-9	6R3953	1000 20% 1W .....
R-10	6R3992	150 20% 1/2W .....
R-11	17A601647	Wirewound: 235 10% 5W...
TRANSFORMERS		
T-1,2	24B485553	IF and Diode, 455 Kc: complete with capacitors, cores and shield .....
T-3	25K680345	Output Transformer .....

Part Number	Description
CHASSIS PARTS - MECHANICAL	
7A478118	Bracket, loop mtg .....
7B601649	Bracket, rectifier mtg .....
43A692012	Bushing, strain relief (line cord)
43K692013	Bushing, retainer: strain relief (line cord) .....
42A485548	Clip, coil can mtg (for T-1 & T-2) .....
30K680352	Cord, line and plug: 6 ft long ..
5A484268	Grommet, rubber (spkr mtg).....
14A478119	Insulator, fibre (loop bracket mtg).....
2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (volume control mtg).....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans and shield mtg).
5S7703	Rivet: .122 x 7/32; stl; nkl pl (loop bracket and speaker mtg)
3S490507	Screw, sheet metal: #6 x 1; plain hex head; stl; cad pl (rectifier mtg) .....
3S7247	Screw, machine: 6-32 x 3/16 slotted hex head; locking type; stl; cad pl (gang mtg) .....
26A478117	Shield, electrostatic (on rear of chassis) .....
9A472534	Socket, tube: 7-prong .....
41A73996	Spring, tension (electrolytic mtg)
46A478145	Stud, tri-mount (back mtg to chassis) .....
14A11493	Washer, shoulder: fibre (loop brkt mtg) .....
CABINET PARTS	
16K600181	Cabinet, table model: molded; walnut-mahogany finish (5R11AU).....
16E600157	Cabinet, table model: molded; ivory finish (5R12AU) .....
16K600183	Cabinet, table model: molded; maroon finish (5R13AU) .....
16K600184	Cabinet, table model: molded; gray finish (5R14AU) .....
16K600185	Cabinet, table model: molded; green finish (5R15AU) .....
16K600186	Cabinet, table model: molded; yellow finish (5R16AU) .....
36B600485	Knob, tuning: ivory (5R11AU, 5R13AU, 5R14AU, and 5R15AU) .....
36K600486	Knob, tuning: red (5R12AU).....
36K600487	Knob, tuning: blue (5R16AU).....
36B600544	Knob, volume control: walnut (5R11AU) .....
36K600545	Knob, volume control: ivory (5R12AU)
36K600546	Knob, volume control: maroon (5R13AU)
36K600547	Knob, volume control: gray (5R14AU).
36K600548	Knob, volume control: green (5R15AU)
36K600549	Knob, volume control: yellow(5R16AU)
3S476083	Screw, machine: 6-32 x 5/16; slotted hex head; stl; cad pl; locking type (chassis mtg) .....
38A25507	Plug, split (back mtg to cabinet)
11M488253	Tape, aluminum foil: 2-1/2" wide.

MODELS 6L1, 6L2
Rev.; 61L1, 61L2,
Ch. HS-226

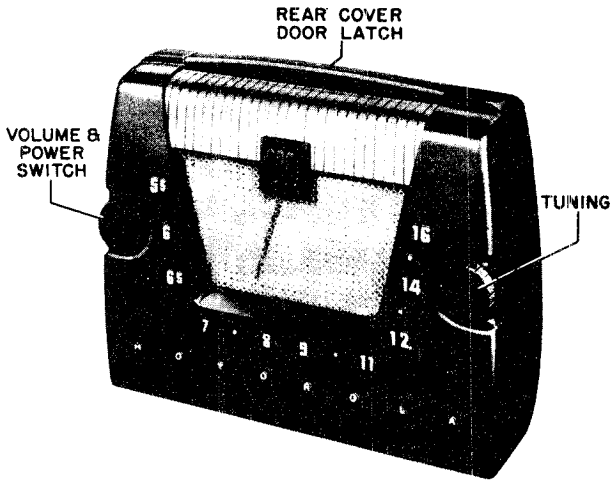
GENERAL INFORMATION

TYPE - Five tube, three-power (AC/DC, Battery) portable, with a selenium rectifier. A loop antenna is housed in the back cover.

MODEL	COLOR
6L1	Green plastic
6L2	Brown plastic
61L1	Green plastic
61L2	Maroon plastic

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1U4 - RF Amplifier
1R5 - Converter
1U4 - IF Amplifier
1U5 - Det, AVC & 1st AF Amp
3V4 - Power Amplifier
Rectifier - Selenium type



POWER SUPPLY - Operates from 117 volts AC or DC (15 watts), or self-contained battery pack. Use an Eveready #753, A General #60A-6F6-5, or equivalent battery pack.

OPERATING INSTRUCTIONS

CONTROLS. The volume control and power switch are combined and are operated with the left-hand knob. Select stations with the right-hand knob.

TO OPEN BACK COVER. With your finger, press down on the latch button located at the top of the cabinet and pull the cover open: to close, press the latch button down and snap the cover shut.

CAUTION: When closing the cover, be careful not to pinch the line cord or other leads between the cover and cabinet.

HOUSE CURRENT OPERATION. The power cord is located inside the cabinet and can be reached by opening the back cover. Pass the cord through the slot in the side of the cabinet before closing the cover. Insert the power plug into any 117 volt AC or DC outlet. If the receiver does not operate from DC power, reverse the line cord plug in the power outlet.

BATTERY OPERATION. Open the back cover and install the battery pack, following the instructions in Figure 1. Insert the line cord plug into the receptacle on the receiver chassis or the receiver will not operate from its battery. If the receiver is to be operated for a long period of time from AC or DC, or is to be placed in storage, remove the battery and store it in a cool place. Replace the battery when low volume or fuzzy tone is noticed. The condition of the battery will not affect the operation of the receiver from AC or DC. Never leave a low or run-down battery in the receiver because it will leak or swell and damage the receiver.

ANTENNA. A loop antenna is built into the rear cover of this receiver. Because of the slightly directional characteristics of the loop antenna, reception from some stations may be improved by rotating the receiver. In extremely noisy locations, rotate the entire receiver until minimum noise and maximum signal pickup are obtained.

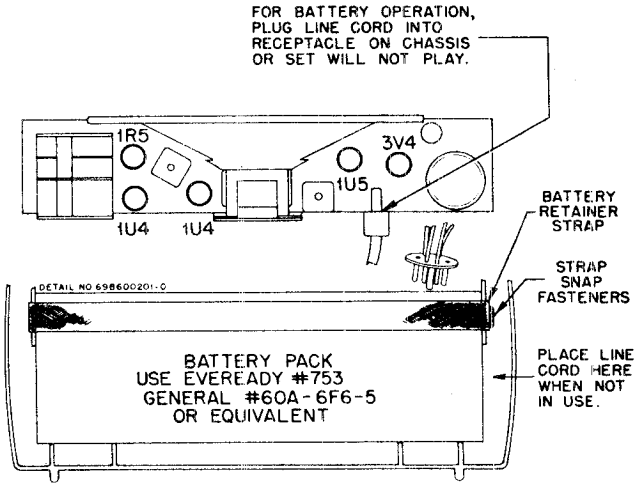


FIGURE 1. BATTERY REPLACEMENT & TUBE LOCATIONS

ALIGNMENT

NOTE: The receiver may be operated either from a battery or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

PROCEDURE:-

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator input to keep the output of the receiver at approximately .05 watts (.05 watt - .40 volts on the output meter) to avoid overloading the receiver.

7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 6, 1R5)	455 Kc	Fully open	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	Pointer	Set pointer as shown in Figure 3.
3.	.1mf	Grid of RF Amp (pin 6, 1U4)	1620 Kc	Fully open	5	Adjust for maximum.
4.	.1 mf	"	1400 Kc	Tune for maximum	6	Adjust for maximum.
5.	-	Radiation loop*	"	"	7	With chassis installed in cabinet and output meter connected to speaker, open rear cover slightly and adjust for maximum. NOTE: Battery pack should be in cabinet.

*Connect generator output across 5" diameter, 5-turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

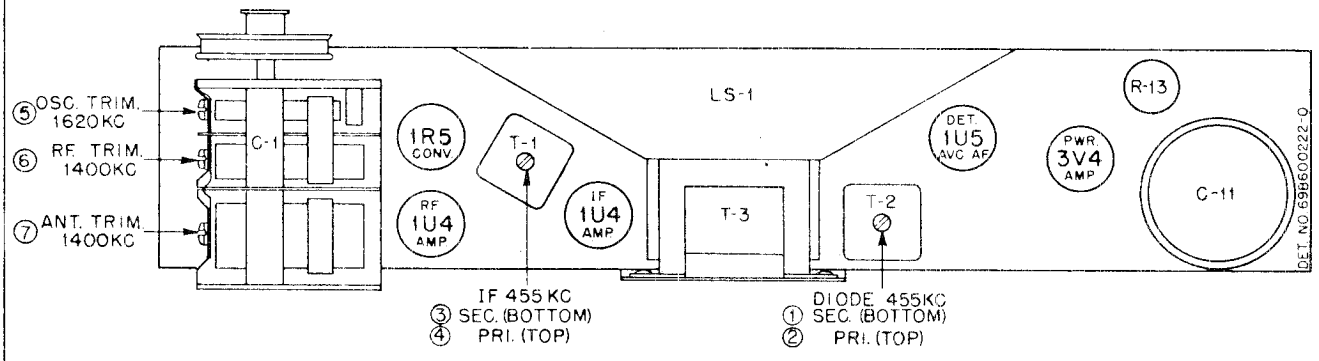


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODELS 6L1, 6L2 Rev.;
61L1, 61L2, Ch. HS-226

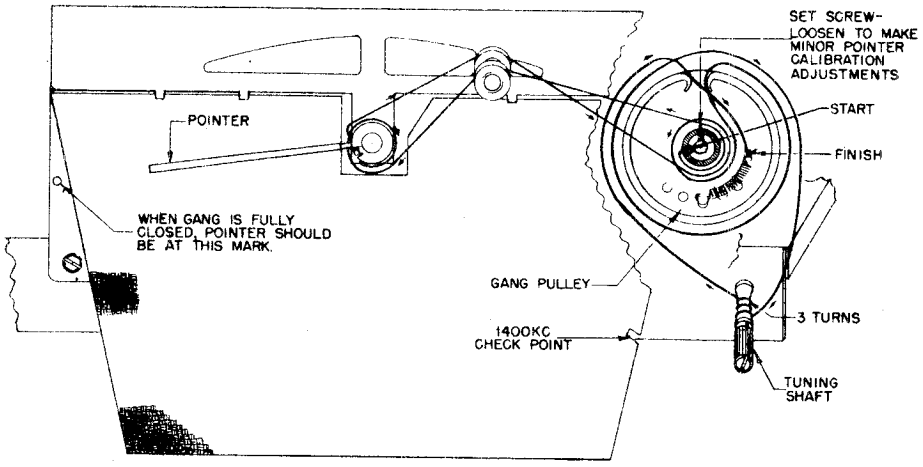


FIGURE 3. DIAL CORD RESTRINGING DETAIL

SERVICE NOTES

The chassis of this receiver is isolated from the AC power line circuit by a capacitor to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Open the rear cover and remove the battery pack.
2. Disconnect the two leads from the chassis to the loop antenna.
3. Remove screw holding stop cord to chassis.
CAUTION: With stop cord removed back cover may be seriously damaged if it is allowed to fall back.
4. Pull off the two control knobs on the front of the cabinet.
5. Remove the two hex head screws located under the knobs.
6. Slide the chassis out of the cabinet.

PRODUCTION REVISIONS (6L1 & 6L2)

REAR COVER LATCH ASSEMBLY

The rear cover latch was revised to provide better locking and to eliminate breakage of the projecting studs on the cover.

The new latch may be added to early cabinets by referring to Figure 5 and following the instructions below:

1. Remove the locking clips from the cabinet (optional).
2. File away the tongue in the top center of the back cover.
3. Drill a .136" hole in the top of the cabinet.
4. Drill a 5/16" hole in the top of the back cover.
5. Rivet the spring and stud assembly to the cabinet.

REAR COVER STOP CORD

A cord, fastened to the chassis and to the rear cover, was added to prevent the cover from opening too far and becoming damaged.

REAR COVER HINGE INSTALLATION

The proper method for installing a new hinge is shown in Figure 4. Note that the under side of the cabinet should rest on an iron block during the heating process to prevent the formation of a heat bubble on the bottom of the cabinet.

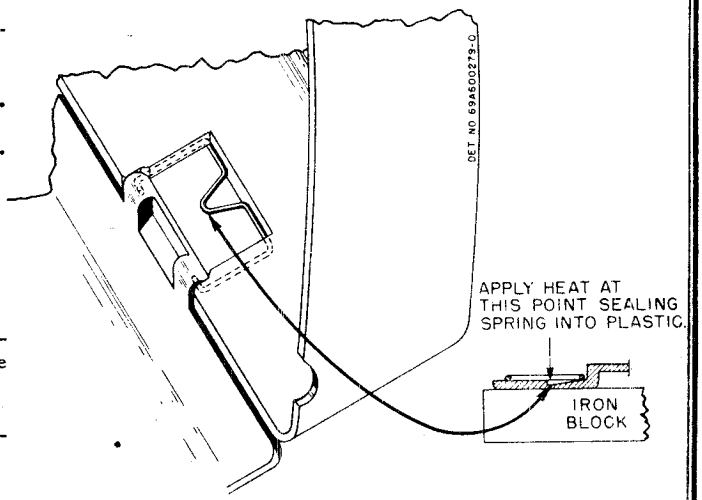


FIGURE 4. REAR COVER HINGE INSTALLATION

MODELS 6L1, 6L2
Rev.; 61L1, 61L2,
Ch. HS-226

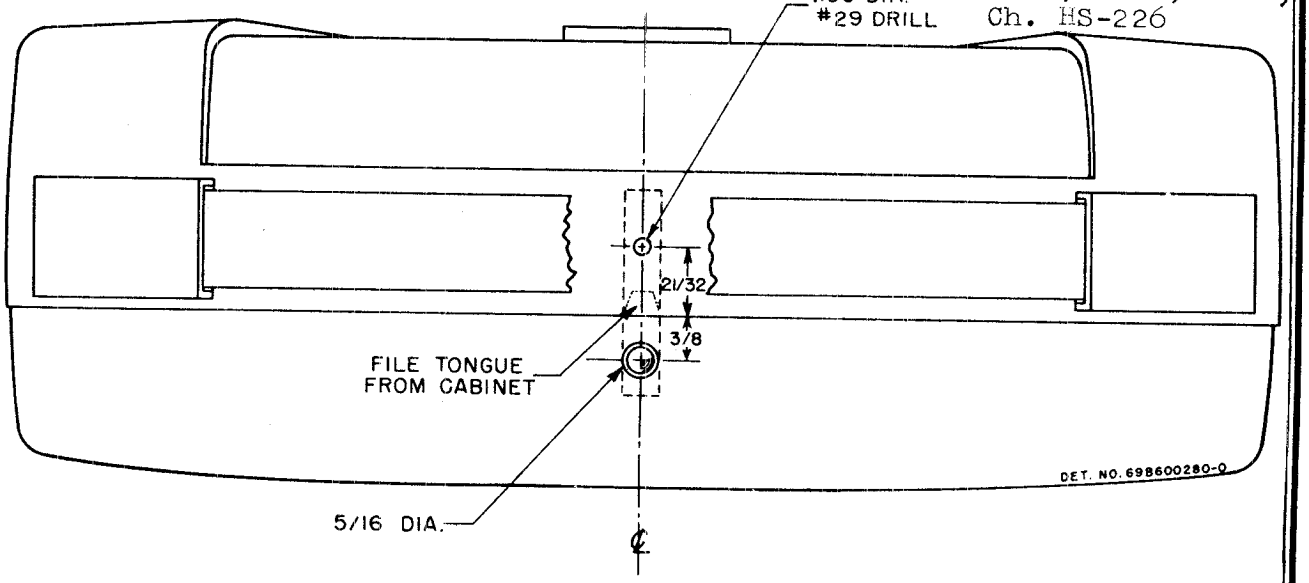


FIGURE 5. REAR COVER LATCH INSTALLATION

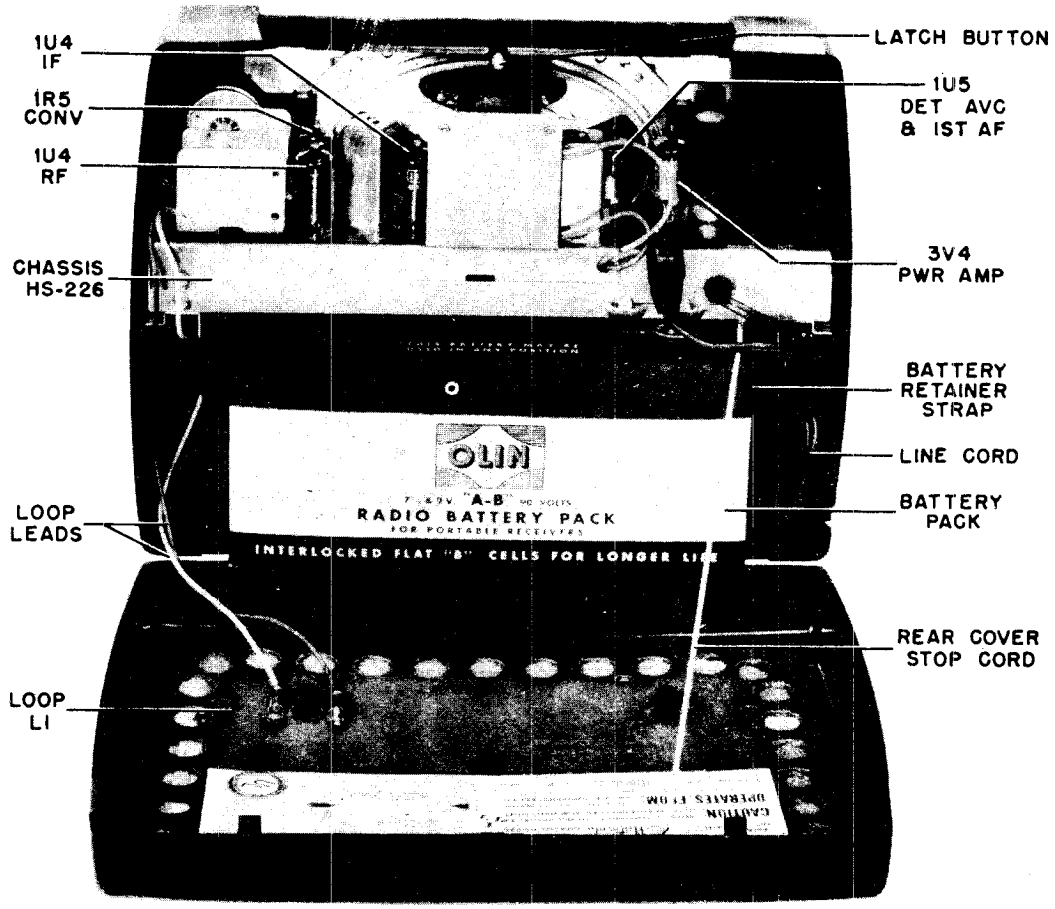


FIGURE 6. REAR VIEW OF CABINET

MODELS 6L1, 6L2 Rev.; 61L1, 61L2, Ch. HS-226

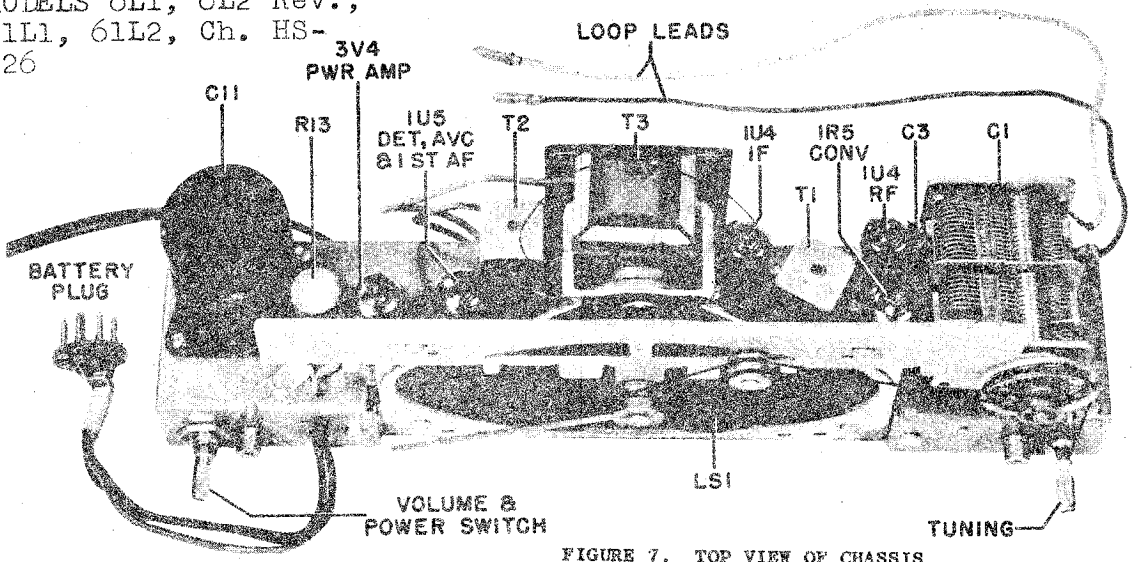


FIGURE 7. TOP VIEW OF CHASSIS

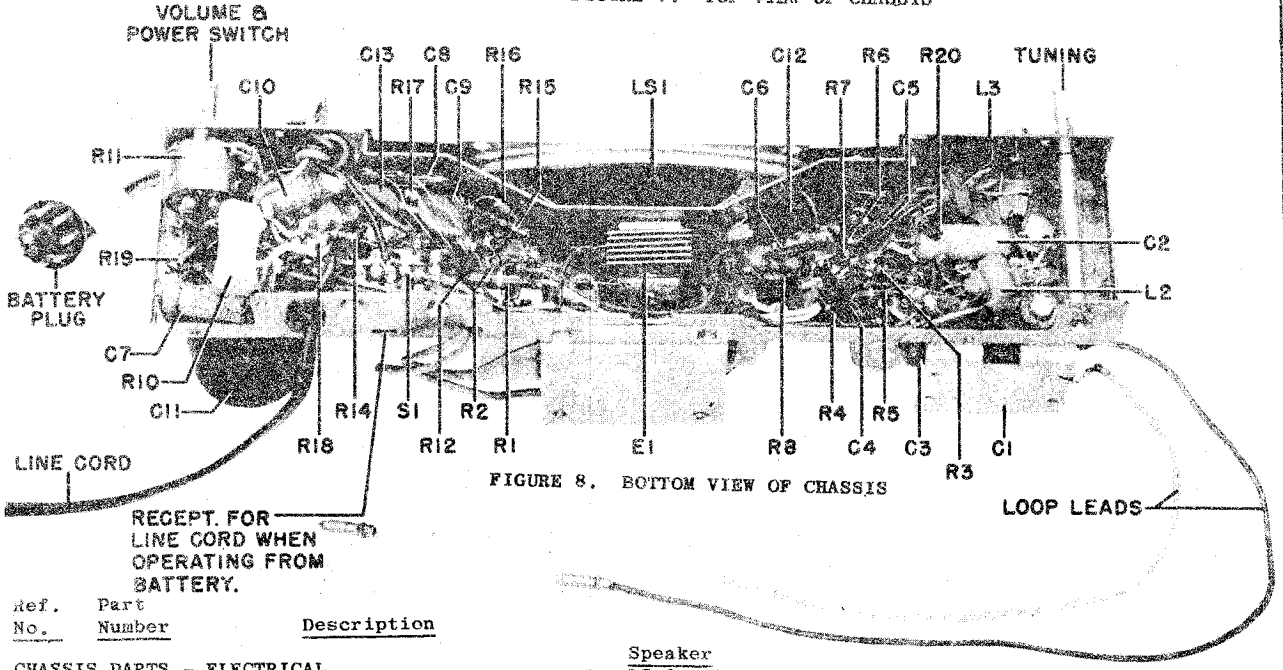


FIGURE 8. BOTTOM VIEW OF CHASSIS

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B692045	Variable: 3-gang.....
C-2	8K71213	Paper: .05 mf 100V.....
C-3	21B77286	Ceramic: 100 mmf 500V.....
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-5	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-6	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-7	8K471635	Paper: .05 mf 400V.....
C-8A, B,C,D	21B482847	Ceramic, multiple: 2000 mmf, 220 mmf, 220 mmf, 5000 mmf
C-9	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-10	8K71213	Paper: .05 mf 100V.....
C-11	23K76985	Electrolytic: 40-40-20 mf/ 150V, 80 mf/25V; includes cover.....
C-12	8R490210	Molded: .01 mf (100,000 mmf) 200V.....
C-13	21A470789	Ceramic, disc type: 5000 mmf 450V.....
Speaker		
LS-1	50C692044	Speaker: 4" x 6" PM; 3.2 ohm VC.....
Rectifier		
E-1	48K692077	Selenium Rectifier: half-wave; 75ma.....
Coils		
L-1	24C692074	Loop Antenna Assembly: includes panel.....
L-2	24B692115	RF Coil.....
L-3	24B692114	Oscillator Coil.....
Resistors		

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R3927	2.2 meg 20% ½W.....
R-2	6R3988	5.6 meg 10% ½W.....
R-3	6R2118	3.3 meg 20% ½W.....
R-4	6R3927	2.2 meg 20% ½W.....
R-5	6R6301	1000 20% ½W.....
R-6	6R6075	100,000 20% ½W.....
R-7	6R6012	33,000 20% ½W.....
R-8	6R5585	8.2 meg 10% ½W.....
R-9	6R6004	1 meg 20% ½W.....

MODELS 6L1, 6L2 Rev.;
61L1, 61L2, Ch. HS-226

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

R-10	17A76986	Wire wound: 150 10% 2-½W.
R-11	18K480039	Volume control: 1 meg; with sw.....
R-12	6R2109	10 meg 20% ½W.....
R-13	17B692047	Wire wound: 2000; center tapped.....
R-14	6R6269	820 10% ½W.....
R-15	6R3927	2.2 meg 20% ½W.....
R-16	6R6004	1 meg 20% ½W.....
R-17	6R2118	3.3 meg 20% ½W.....
R-18	6R3933	220 20% ½W.....
R-19	6R3949	470 20% ½W.....
R-20	6R6010	330 20% ½W.....

Switches

S-1	40A27114	Slider Switch: 3PDT.....
S-2	-	Power Switch: on volume control.....

Transformers

T-1,2	24K600013	IF & Diode Transformer, 455 Kc: includes capacitors; less shield.....
T-3	25B692076	Output Transformer.....

CHASSIS PARTS - MECHANICAL

16K692102	Baffle, speaker: includes cloth...
1X692121	Bottom Cover Assembly: includes brackets & battery strap.....
7B600711	Bracket, chassis front (sel rect mtg).....
43A692012	Bushing, line cord strain relief (use with 43K692013).....
1X692118	Cable Assembly, battery: includes 9-pin plug.....
42A485548	Clip, coil can mtg (IF coils)..
11M8944	Cord, dial: 18#; black.....
30K692049	Cord, line: with plug 6 ft long
5A19658	Eyelet, spacer (gang mtg).....
5A70404	Grommet, ruber (gang mtg).....
9A22056	Insulator, electrolytic mtg....
2S7051	Nut, hex (Palnut): 3/8-32 x 9/16; cad pl (vol cont mtg).....
29K5401	Pin, loop lead.....
64A692072	Plate, output trans mtg.....
28K77272	Plug, 9-pin (on battery cable).
1X601811	Pointer, dial: red.....
49A21741	Pulley, cord.....
49A692078	Pulley, pointer drive.....
1A692119	Pulley Assembly (on gang).....
1X692120	Pulley and Plate Assembly: pointer drive: includes mtg plate and 3 pullies.....
43K692013	Retainer, strain relief bushing (use with 43A692012).....
5K74560	Rivet, shoulder (drive cord pulley mtg).....
5A692104	Rivet, shoulder (pointer drive pulley mtg).....
3S9700	Setscrew: 6-32 x 3/16 Allen head; cad pl (gang pulley mtg).....
47A692106	Shaft, tuning.....
9A690129	Socket, tube: miniature; 7-prong.
41A14244	Spring, tension (dial drive)..
35K692125	Strap, battery: with button.....
31K692075	Strip, terminal: 1 insulated lug; end mtg; 3/8" spacing.....
46A600011	Stud, chassis mtg (on front of chassis).....
4A70015	Washer, "C" (on tuning shaft) .....
4S8253	Washer, flat: 5/8 x .390 x .020 brass (vol cont mtg).....
4K71133	Washer, spring (on tuning shaft)

CABINET PARTS

16E691796	Cabinet, front section: green plastic; less grille, handle and hardware (6L1 & 61L1).....
16K600109	Cabinet, front section: brown plastic; less grille, handle and hardware (6L2).....
16K610027	Cabinet, front section: maroon plastic; less grille, handle and hardware (61L2).....
16D691797	Cabinet, rear section: green plastic; less antenna loop and hardware (6L1 & 61L1).....
16K600110	Cabinet, rear section: brown plastic; less antenna loop and hardware (6L2).....
16K601710	Cabinet, rear section: maroon plastic; less antenna loop and hardware (61L2).....
35A692073	Channel, rubber (inside cabinet front).....
42K891863	Clip, cabinet locking (inside cabinet front) (early models).
42A480078	Clip, cabinet locking (inside cabinet back) (early models).
42A600010	Clip, retainer (speaker grille)..
1X600798	Cord, cover stop: complete.....
55A692127	Cover, handle mtg (over ends of carrying handle).....
13B691958	Grille, speaker: plastic.....
55A691943	Handle, carrying: green plastic; less spring (6L1 & 61L1).....
55K600111	Handle, carrying: brown plastic; less spring (6L2).....
55K601711	Handle, carrying: maroon plastic (61L2).....
14A600096	Insulator: fibre (on carrying handle).....
36B691956	Knob, control: green plastic (6L1 & 61L1).....
36K600112	Knob, control: brown plastic (6L2).
36K601713	Knob, control: maroon plastic (61L2)
4S7650	Lockwasher, internal: #6; cad pl (handle mtg).....
13K691929	Medallion (on front of cabinet).
64A692129	Plate, handle mtg: cad pl (under ends of carrying handle).....
64A691941	Plate, medallion (under Medallion)
5S400302	Rivet: .122 x 7/32; stl; brs pl (mts back cover latch).....
3S2949	Screw, machine: 6-32 x 5/16 plain hex head; cad pl (handle mtg)
3S476083	Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (chassis mtg).....
3S488008	Screw, thread cutting: #4 x ¼ Phillips round head; cad pl (cover stop cord mtg).....
2S490840	Speednut: for 1/16" stud (medallion mtg).....
2S400170	Speednut: for .156" stud (spkr grille and ant loop mtg) (replaces 2S476112).....
1X600686	Spring & Stud Assembly: rear cover latch.....
41A692126	Spring, handle (inside carrying handle).....
41A691939	Spring, hinge (on bottom of cabinet).....
4K780040	Washer, felt (under knobs).....
4S7610	Washer, flat: 3/8 x 5/32 x .015 stl; cad pl (chassis mtg)..
4S490841	Washer, flat: 3/4 x .156 x .032; cad pl (handle mtg).....

Ch. HS-226

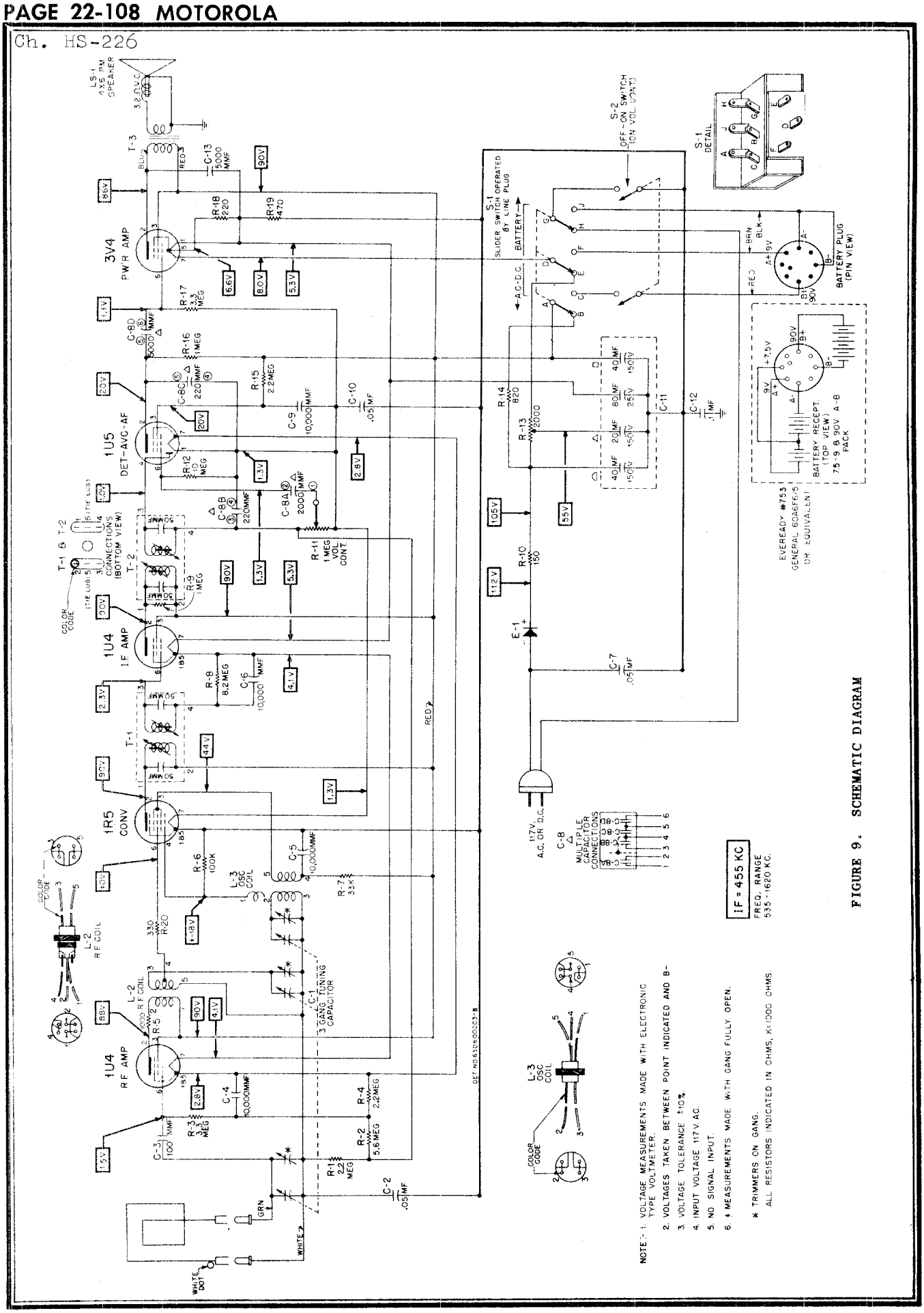


FIGURE 9. SCHEMATIC DIAGRAM

NOTE:- 1. VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER.
2. VOLTAGES TAKEN BETWEEN POINT INDICATED AND B-
3. VOLTAGE TOLERANCE ±10%.
4. INPUT VOLTAGE 117 V AC.
5. NO SIGNAL INPUT.
6. ± MEASUREMENTS MADE WITH GANG FULLY OPEN.

* TRIMMERS ON GANG.
ALL RESISTORS INDICATED IN OHMS, K=1000 OHMS.

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

GENERAL INFORMATION

TYPE - AC table model superheterodyne with appliance outlet and self-contained electric clock for controlling automatically the operation of the radio and the outlet.

RECEIVER MODELS -

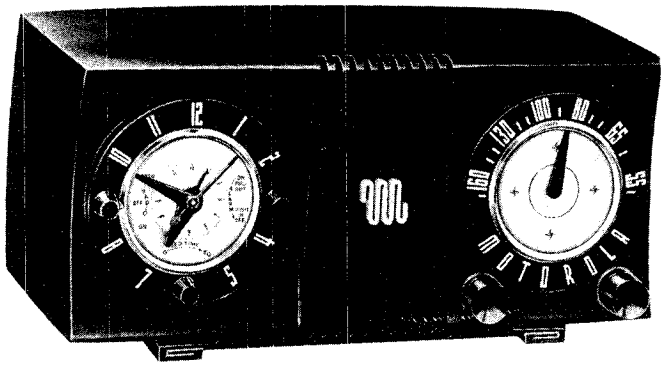
Model	Color
51C1	Walnut
51C2	Ivory
51C3	Tan
51C4	Green

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
12BE6	Converter
12BA6	IF Amplifier
12AT6	Det, AVC & AF Amp
50C5	Power Amplifier
35W4	Rectifier

POWER SUPPLY - Operates from 117 volts, 60 cycle, alternating current only. Power consumption 37 watts.



APPLIANCE OUTLET - For use with 117 volt AC appliances only, rated at 1100 watts or less.

CLOCK - Telechron self-starting electric clock (Telechron basic movement No. C-57, with Motorola face, hands, and escutcheon).

OPERATING INSTRUCTIONS

The locations and functions of the clock and radio controls are shown in Figure 1.

NORMAL RADIO OPERATION

Knob "A" on the clock turns the radio on or off. Select stations with the TUNING knob, and adjust volume with the VOLUME control.

A built-in loop antenna eliminates the need for an outside antenna in most locations. When receiving a weak station, rotate the receiver slightly for best signal strength. If additional pick-up is necessary, connect an external antenna to the radio by following the instructions printed on the rear panel. CAUTION: Never connect the radio chassis to a water pipe, radiator, or other ground.

CLOCK OPERATION

The clock will start as soon as the receiver is plugged into an electrical outlet. To set the hands to the correct time, rotate the TIME SET knob (on the rear of the radio) in a clockwise direction only.

ALARM OPERATION

To set the alarm, pull out knob "C" and rotate it in a counterclockwise direction to the desired time on the alarm dial scale. The alarm will ring for one hour, or until knob "C" is pushed in. The alarm function is completely independent of the other controls on the clock.

APPLIANCE OUTLET

To control an electrical appliance automatically, plug it into the receptacle on the back of the radio. See Figure 2. It will then be turned on or off simultaneously with the radio. CAUTION: Note that the rating of the outlet is 1100 watts or less.

If radio reception is not desired when operating the appliance, rotate the radio volume control to the minimum volume position.

BEDTIME CONTROL

The BEDTIME control will turn the radio and appliance off after any pre-set interval of time up to one hour.

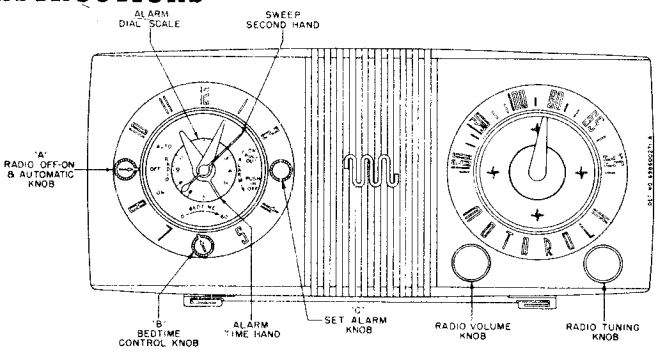


FIGURE 1. OPERATING CONTROLS

Turn knob "A" to the "OFF" position and rotate knob "B" to any period of time between 0 and 60 minutes. The radio and appliance will be turned off automatically after the proper time has elapsed, and they will remain off until turned on again manually.

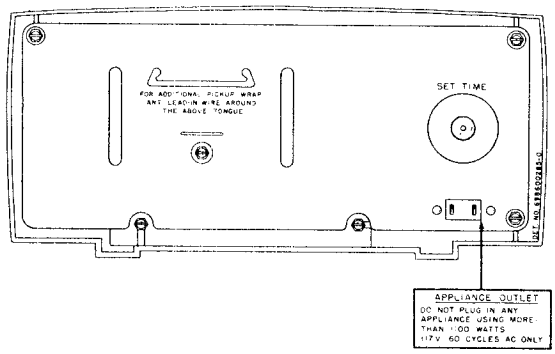


FIGURE 2. REAR VIEW

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

AUTOMATIC RADIO OPERATION

The clock controls may be pre-set to turn the radio on automatically at any time up to twelve hours in advance.

If an appliance is plugged into the receptacle on the back of the receiver, it will be turned on automatically, along with the radio.

Pull out knob "C", rotate it counterclockwise to the desired time on the alarm dial scale, and push the knob back in. Rotate knob "A" first to the "OFF" and then to the "AUTO" position. At the pre-set time, the radio will come on and will continue to play until turned off manually. The alarm will ring also if the knob "C" is left pulled out. The radio will come on first and, after an interval of about ten minutes, the alarm will ring.

BEDTIME AND AUTOMATIC OPERATIONS COMBINED

By combining the operations in the two sections above the radio may be turned off automatically and on again automatically.

When setting the BEDTIME control, rotate knob "A" to the "AUTO" position instead of "OFF". IMPORTANT: It is necessary to turn knob "A" first to the "OFF" position before proceeding to "AUTO", otherwise the radio may not shut off.

ALIGNMENT

NOTE: It is recommended that an isolation transformer be placed between the power line and the receiver to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator output to a level which produces less than .40 volts (.05 watt) across the voice coil to avoid overloading the receiver.

7. See Figure 3 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. (pin 7, 12BE6)	455 Kc	Fully open	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	-	-	-	Fully closed	-	Set pointer to horizontal position.
3.	.1 mf	Grid of conv. (pin 7, 12BE6)	1620 Kc	Fully open	5 (Osc)	Adjust for maximum.
4.	-	Radiation loop*	1400 Kc	Tune for max	6 (Ant)	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

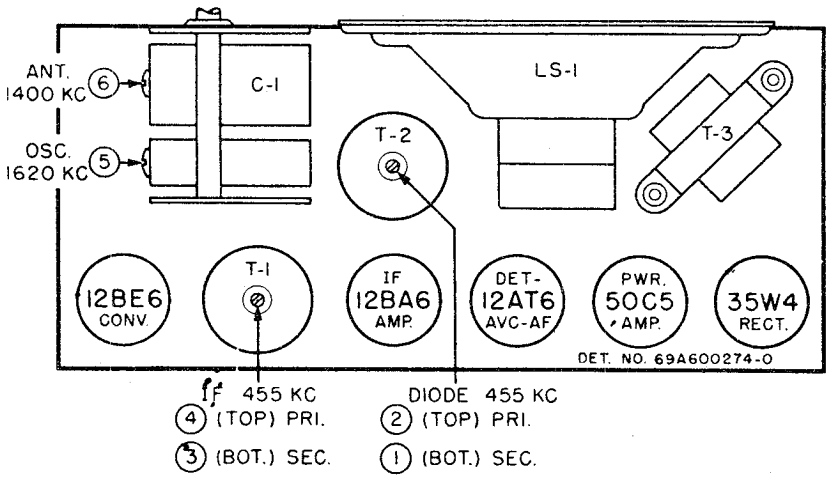


FIGURE 3. TUBE & TRIMMER LOCATIONS

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

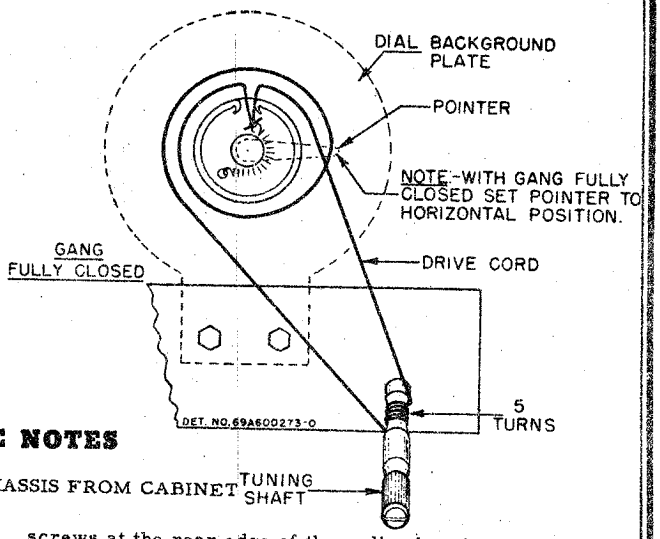


FIGURE 4. STRING DRIVE DETAIL

SERVICE NOTES

TO REMOVE RADIO CHASSIS FROM CABINET

1. Pull off the two radio control knobs.
2. Remove the three hex head screws which hold the loop to the cabinet.
3. From the back of the cabinet, remove the two hex head screws at the rear edge of the radio chassis.
4. Slide the radio chassis and loop from the cabinet.
5. Disconnect the power leads to the radio chassis and to the appliance receptacle.

TO REMOVE CLOCK FROM CABINET

1. Remove radio chassis as above.
2. Remove the three nuts and lockwashers holding the shield behind the clock.
3. Slide the shield from the cabinet.
4. Turn the BEDTIME control knob to "60".
5. Pull out the ALARM set knob.
6. Turn the RADIO control knob to "AUTO".
7. While observing the clock from the back to avoid bending or breaking any parts, gently push the clock forward, at the same time twisting it slightly to eliminate binding.

TO REPLACE CLOCK DIAL FACE

1. Remove the clock from the cabinet as above.
2. Pull off the RADIO control and BEDTIME knobs.
3. Remove the ALARM set knob.
4. Remove the escutcheon and crystal.
5. Carefully pull off the three hands.
6. Remove the alarm dial and clock face.
7. Turn the radio control shaft to "AUTO" position.
8. Slowly rotate the time set shaft clockwise until the switch contacts behind the radio control shaft close.
9. Reassemble the clock face, alarm dial and three hands. Set all the hands to indicate 12 o'clock. Set the figure "12" on the alarm dial to index with the small pointer on the hour hand.
10. Replace the crystal, the escutcheon, and the knobs.
11. Check the automatic operation to be sure the switch contacts close at the time indicated on the alarm dial.

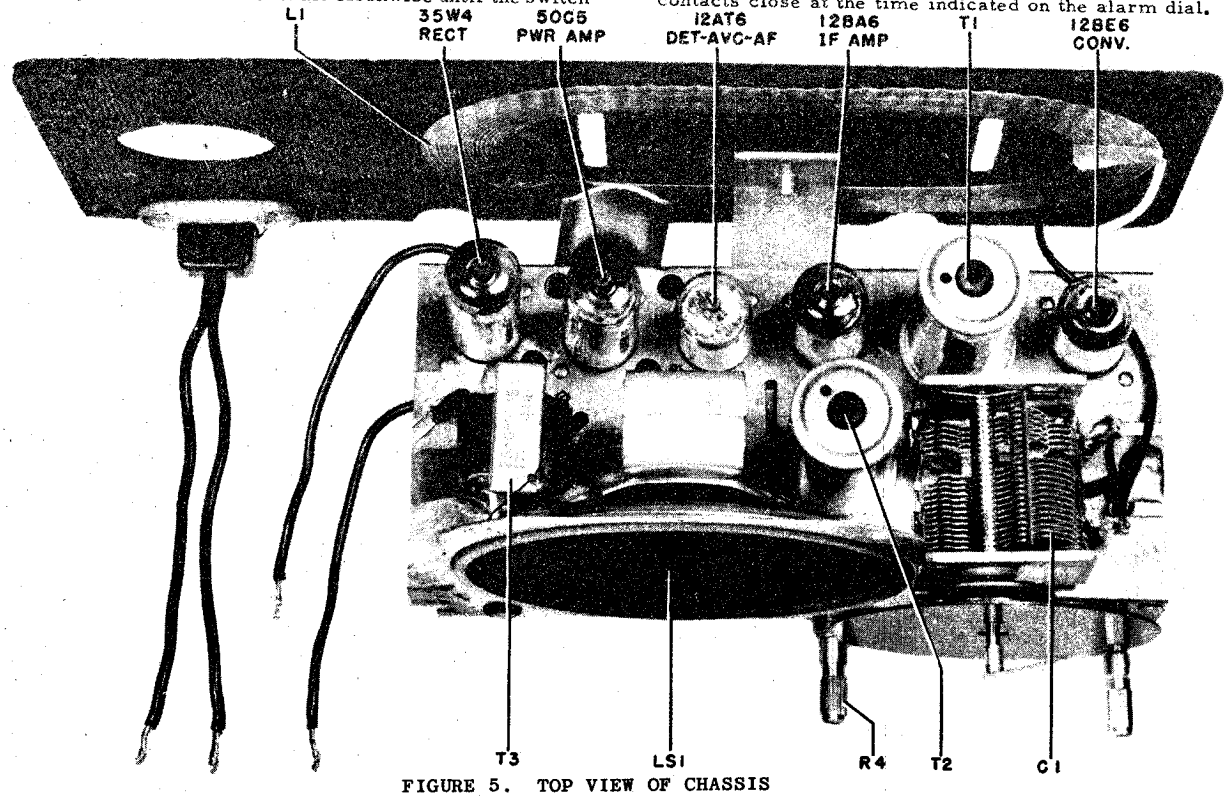


FIGURE 5. TOP VIEW OF CHASSIS

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

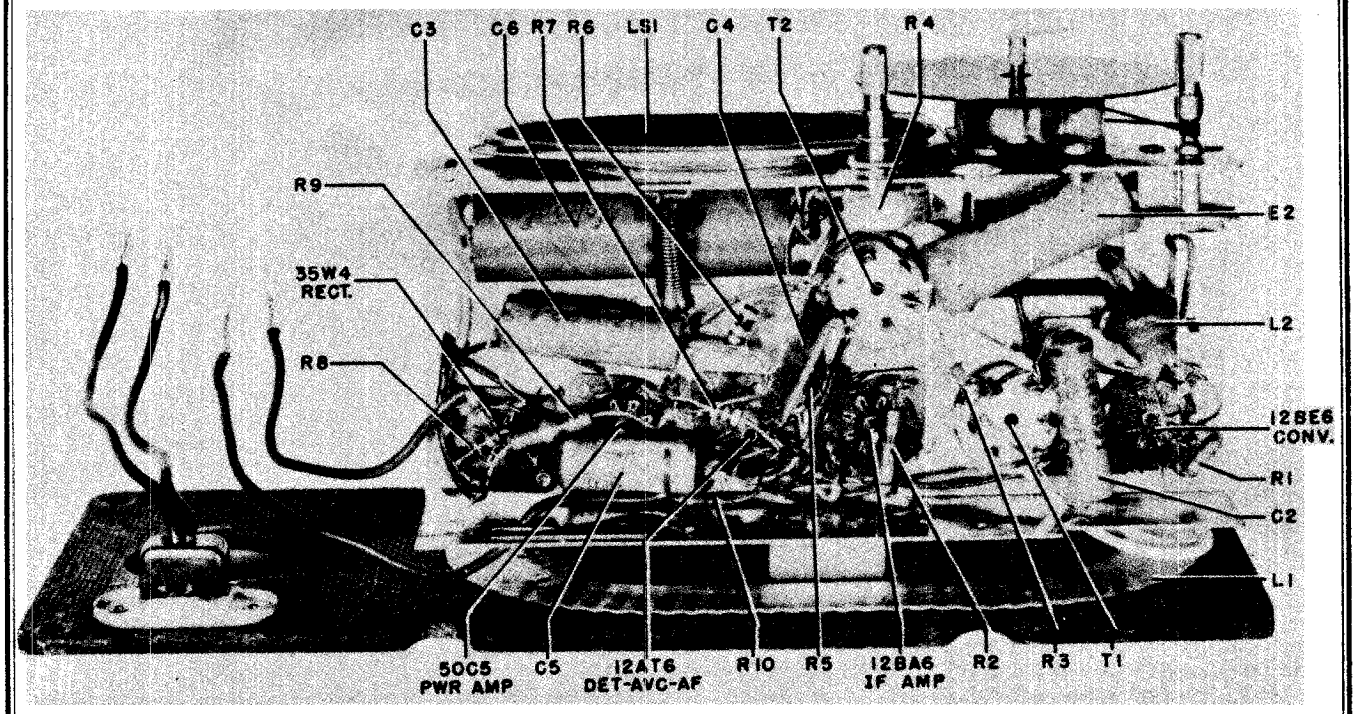


FIGURE 6. BOTTOM VIEW OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	19B600021	Variable: 2 gang; with pulley
C-2	8R9821	Paper: .05 mf 200V.....
C-3	8R490232	Paper: .047 mf 400V.....
C-4	21B482847	Ceramic, multiple: 2000-220-220-5000 mmf/400V.....
C-5	8R9802	Paper: .02 mf 400V.....
C-6	23B600855	Electrolytic: 50-30 mf/150V
Capacitor-Resistor		
CR-1	21B601007	Capacitor-Resistor: 2000-220 110-5000-110 mmf; 6.8 meg-470,000-470,000 ohms.....
Clock		
E-1	59K610068	
or	1X610107	Electric Clock Assembly: Telechron movement No. C-57 with Motorola face, hands, crystal, escutcheon and knobs (for walnut cabinet) (51C1).....
	59K610067	
or	1X610109	Same as above except color (for ivory cabinet) (51C2).
	59K610064	
or	1X610105	Same as above except color (for tan cabinet) (51C3)...
	59K610059	
or	1X610103	Same as above except color (for green cabinet) (51C4).
Choke-Capacitor		
E-2	8A690487	Choke and .15 mf paper capacitor.....
Coils		
L-1	1X610073	Antenna Loop, Panel and Receptacle Assembly: complete.....
	24K610072	Antenna Loop and Panel Assembly: less receptacle..
L-2	24B680364	Oscillator coil.....
Speaker		
LS-1	50C600017	
or	50B610052	
or	50C600857	Speaker: 4" PM; 3.2 ohm VC.
Resistors		
Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6R6028	22,000 20% ½W.....
R-2	6R6018	100 20% ½W.....
R-3	6R2118	3.3 meg 20% ½W.....
R-4	18A600018	Volume control: 1 meg...
R-5	6R2109	10 meg 20% ½W.....
R-6	6R6032	470,000 20% ½W.....
R-7	6R6032	470,000 20% ½W.....

MODELS 51C1, 51C2, 51C3, 51C4, Ch. HS-228

Part Number		Description
R-8	6R3992	150 20% ½W.....
R-9	6R5683	27 10% ½W.....
R-10	6R3953	1000 20% 1W.....
Transformers		
T-1	24B482863	IF Transformer (brown dot): 455 Kc: complete with capacitor and cores; less shield.....
T-2	24B482865	Diode Transformer (red dot): 455 Kc: complete with capacitors and cores; less shield.....
T-3	25K680345	Output Transformer.....
CHASSIS PARTS - MECHANICAL		
7A478118		Bracket, loop mtg.....
7A77337		Bracket, tuning shaft.....
42B482867		Clip, spring: blued finish (holds IF transformers).....
5A484268		Grommet, speaker mtg: rubber....
14A478119		Insulator, loop brkt mtg: fibre.
4S7691		Lockwasher, internal: 3/8; cad pl (vol control mtg).....
2A780465		Nut, knurled (vol control mtg).....
64B610056		Plate, dial background: ivory.....
52K610055		Pointer, dial (black).....
9A601018		Receptacle, appliance (on loop panel).....
3S7506		Screw, sheet metal: #6 x ¼ PKZ plain hex head; cad pl (dial background plate mtg).....
47A600022		Shaft, tuning.....
26K485936		Shield, coil (for IF transformers).
26A478117		Shield, electrostatic (on rear of chassis).....
43A600095		Sleeve, paper (on pointer shaft)
9A472534		Socket, tube: miniature; 7-prong...
41A73996		Spring, tension (electrolytic mtg).
41A73619		Spring, tension (gang drive cord) .....
4A70015		Washer, "C" (tuning shaft mtg)
4S7633		Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (loop mtg).....
14A11493		Washer, shoulder: fibre (loop bracket mtg).....
CABINET PARTS		
16K600791		Cabinet, table model: plastic; walnut (51C1).....
16K600199		Cabinet, table model: plastic; ivory (51C2).....
16K610069		Cabinet, table model: plastic; tan (51C3).....
16E600005		Cabinet, table model: plastic; green (51C4).....
28A600064		Connector, wire (connects clock & radio power leads).....
61A600001		Crystal, plastic (radio dial cover)
13K600790		Escutcheon, radio dial: walnut (51C1).....
13K600197		Escutcheon, radio dial: ivory (51C2).....
13K610058		Escutcheon, radio dial: tan (51C3)
13K600003		Escutcheon, radio dial: green (51C4).....
14A16304		Grommet, fibre (on clock shield)...
36K600787		Knob, radio control: brown plastic (51C1).....
36K600192		Knob, radio control: ivory plastic (51C2).....
36K610054		Knob, radio control: tan plastic (51C3).....
36A600065		Knob, radio control: green plastic (51C4).....
13A792195		Medallion: brass (on front of speaker grille).....
2S7019		Nut, hex: 4-40 x ¼ stl; cad pl (clock shield mtg).....
3S476083		Screw, machine: 6-32 x 5/16 slotted locking hex head; cad pl (radio chassis mtg).....
3S2991		Screw, machine: 6-32 x ½ plain hex head; cad pl (mounts loop to cabinet).....
1X600799		Shield, clock: with grommet (covers rear of clock).....
2S490840		Speednut: for 1/16" stud (medallion mtg).....
11M488253		Tape, aluminum foil (inside top of cabinet).....per ft
4S7633		Washer, flat: 9/16 x 11/64 x .033 stl; cad pl (mounts loop to cabinet).....
CLOCK PARTS		

Note: The following Motorola parts are for use with the basic Telechron clock movement No. C-57.

34K610061	Alarm dial: ivory.....
30K600980	Cord, line: with plug; 6 ft long...
61A600001	Crystal, plastic (clock face cover)
34K610060	Dial face: ivory.....
13K600789	Escutcheon, clock: walnut (51C1)...
13K600196	Escutcheon, clock: ivory (51C2)....
13K610057	Escutcheon, clock: tan (51C3).....
13C600002	Escutcheon, clock: green (51C4)....
52K610062	Hand, hour: black.....
52K610063	Hand, minute: black.....
52K601001	Hand, second: brass.....
36K600989	Knob, clock control: plain; threaded type; walnut (51C1).....
36K600988	Knob, clock control: plain; threaded type; ivory (51C2).....
36K610066	Knob, clock control: plain; threaded type; tan (51C3).....
36K600987	Knob, clock control: plain; threaded type; green (51C4).....
36K600986	Knob, clock control: with arrow; push on type; walnut (51C1).....
36K600985	Knob, clock control: with arrow; push on type; ivory (51C2).....
36K610065	Knob, clock control: with arrow; push on type; tan (51C3).....
36K600984	Knob, clock control: with arrow; push on type; green (51C4).....
36K601002	Knob, time set.....

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

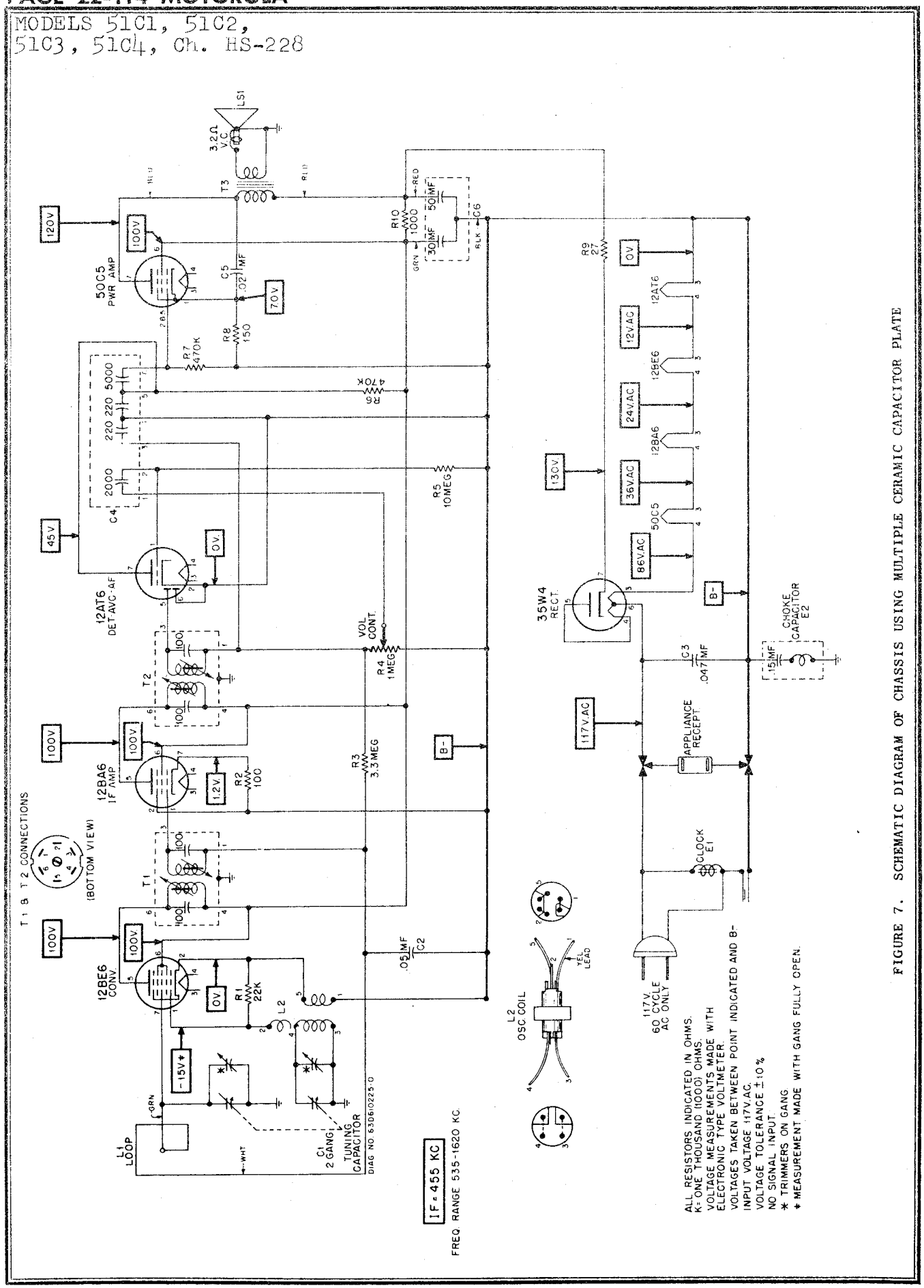


FIGURE 7. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 51C1, 51C2,
51C3, 51C4, Ch. HS-228

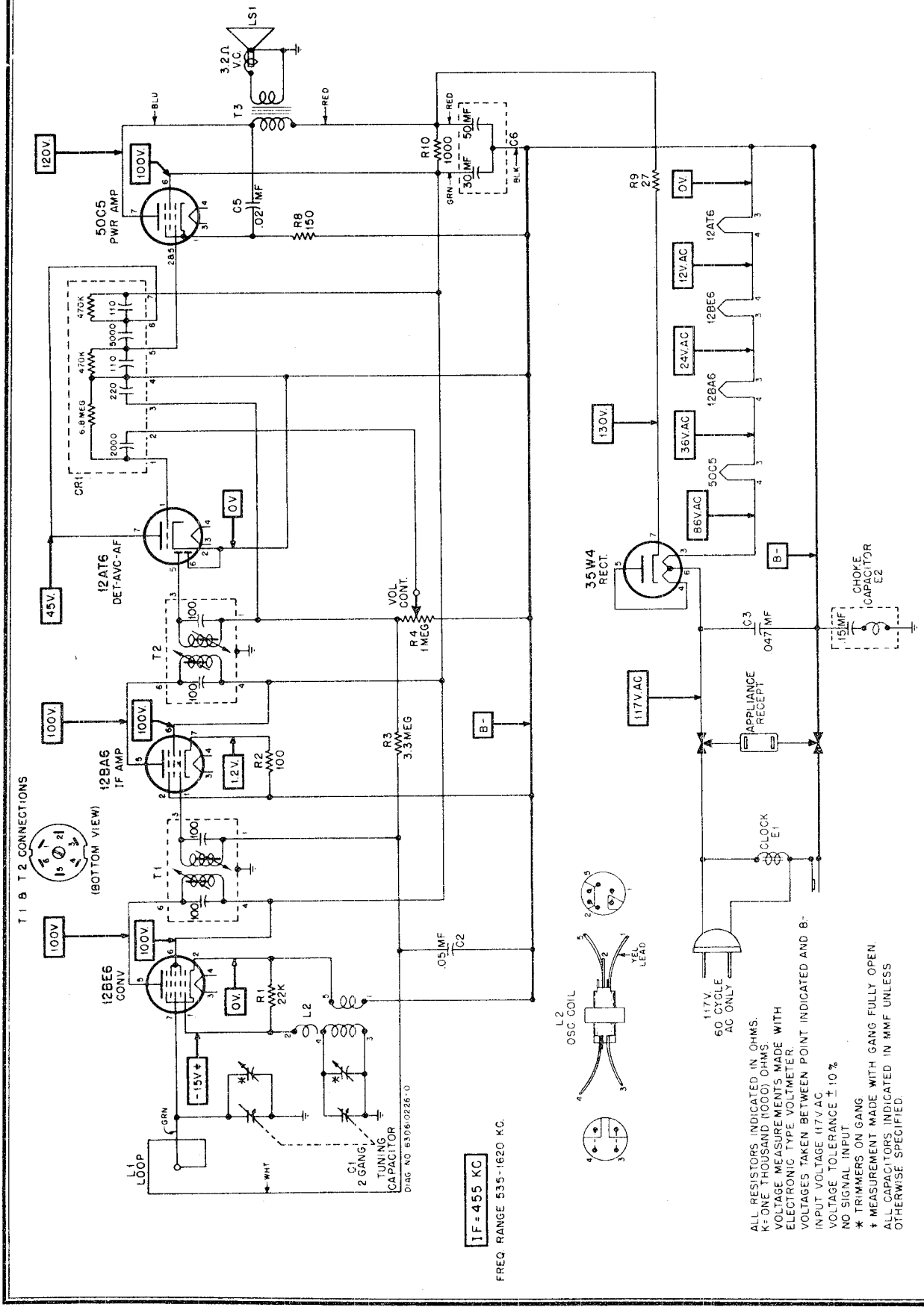
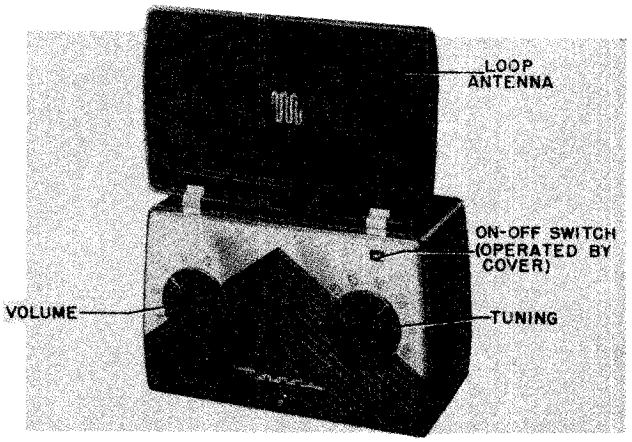


FIGURE 8. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 51M1U,
51M2U, Ch. HS-283

GENERAL INFORMATION



TYPE - Three-power (AC/DC, Battery) portable radio receiver. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

Model	Color
51M1U	Green
51M2U	Maroon

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT -

Type	Function
1R5	Converter
1U4	IF Amplifier
1U5	Det, AVC & 1st AF Amp
3S4	Power Amplifier
Rectifier	Selenium type -for AC/DC operation

POWER SUPPLY - Operates from 117V AC/DC (15 watts) or from the following batteries:

2 - 1-1/2V flashlight cells (Eveready #950 or equivalent)

1 - 67-1/2V "B" battery (Eveready #467 or equivalent)

OPERATING INSTRUCTIONS

TO OPEN FRONT COVER. The front cover is opened by pushing upward on the "M" bar located in the center of the cover. The receiver is automatically turned on when the front cover is opened and raised to a vertical position.

TO OPEN BACK COVER. The back cover may be opened by gently pulling it at the top. When closing the cover, be careful not to pinch the power line cord or other leads between the cover and the cabinet.

117 VOLT AC OR DC OPERATION. The power cord is located inside the cabinet and may be reached by opening the back cover. Pass the line cord through the slot on the side of the receiver, and plug it into any 117 volt AC or DC power outlet. If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet. It is not necessary that batteries be installed if the receiver is to be operated only from house power lines.

BATTERY OPERATION. Open the back cover and install the batteries, following the instructions on the label inside the back cover (or see Figure 1). Insert the line cord plug into the receptacle on the chassis, or the receiver will not play from batteries. If the receiver is to be operated for a long period of time from 117 volts AC or DC, or is to be placed in storage, remove the batteries and store them in a cool place. IMPORTANT: Never leave low or run-down batteries in the receiver, as they will leak or swell and damage it.

TUNING CONTROL. Stations are tuned in with the right-hand knob. The markings around the tuning knob may be read in kilocycles by adding one zero to the figures.

VOLUME CONTROL. The left-hand knob controls volume.

TO TURN OFF. Closing the front cover will automatically turn off the receiver.

ANTENNA. A loop antenna is built into the front cover. Because of the slightly directional characteristics of the loop antenna, reception from some stations may be improved by rotating the entire receiver. In extremely noisy locations, rotate the receiver until minimum noise and maximum signal pick-up are obtained.

BATTERY REPLACEMENT. If low volume or fuzzy tone is noticed when operating from batteries, replace the flashlight cells. Normally, the 67-1/2V "B" battery will last for 3 or 4 changes of the flashlight cells. The condition of the batteries will not affect the operation of the receiver from 117 volts AC or DC. Complete battery replacement instructions will be found inside the cabinet back cover (or see Figure 1).

MODELS 51M1U,
51M2U, Ch. HS-283

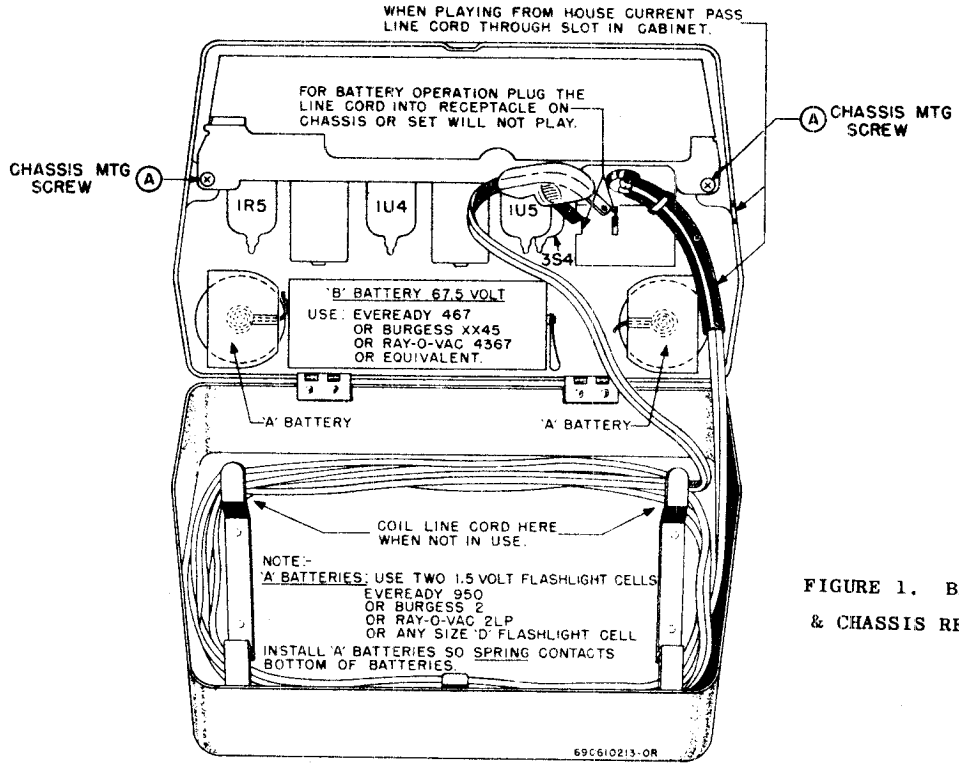


FIGURE 1. BATTERY INSTALLATION & CHASSIS REMOVAL INSTRUCTIONS

ALIGNMENT

NOTE: The receiver may be operated either from batteries or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.

2. Connect the low side of the signal generator to B-.

3. Set the signal generator for 400 cycle, 30% modulation.

4. Turn the receiver volume control to maximum.

5. Use a small fibre screwdriver for aligning the IF and diode transformers.

6. As stages are brought into alignment, reduce the signal generator input to keep the output of the receiver at approximately .05 watt (.05 watt = .40 volts on the output meter) to avoid overloading the receiver.

7. See Figure 2 for adjusting locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv (pin 6, 1R5)	455 Kc	Fully open	1, 2 & 3 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv (pin 6, 1R5)	1620 Kc	Fully open	4 (Osc)	Adjust for maximum.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	-	Radiation loop*	1400 Kc	Tune for max.	5 (Ant)	Adjust for maximum. Trimmer is reached through hole under plug button on side of cabinet.

* Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

MODELS 51M1U,
51M2U, Ch. HS-283

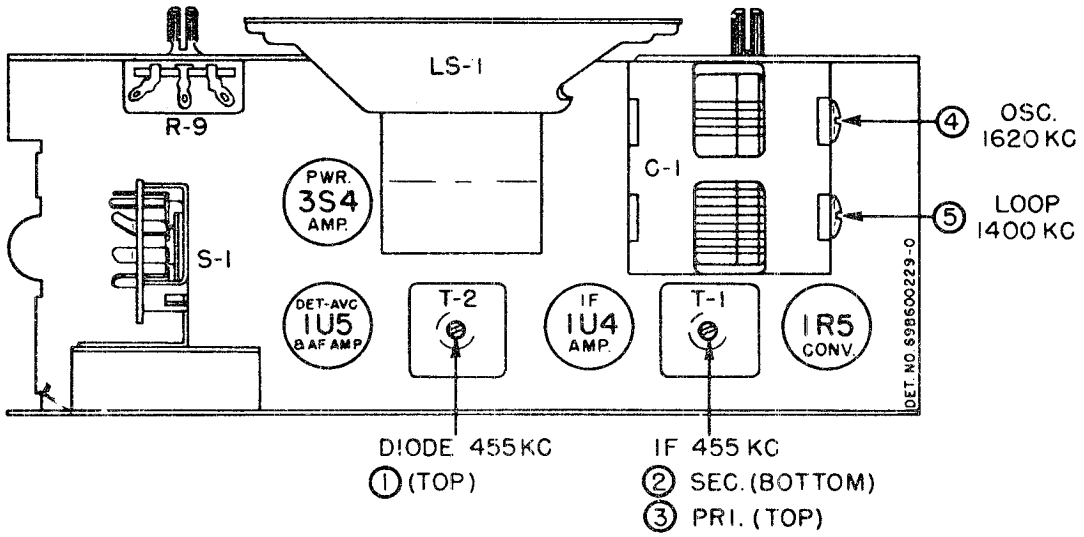


FIGURE 2. TUBE & TRIMMER LOCATIONS

SERVICE NOTES

The chassis of this receiver is isolated from the AC power line circuit by a capacitor-choke assembly to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

TO REMOVE THE CHASSIS FROM THE CABINET:

1. Pull off the two control knobs on the front of the cabinet.
2. Open the rear cover and remove the batteries.
3. Remove the two Phillips head screws holding the chassis to the cabinet ("A" - "A" in Figure 1).
4. Slide the chassis out of the cabinet.
5. Disconnect the two leads from the chassis to the loop antenna hinges.

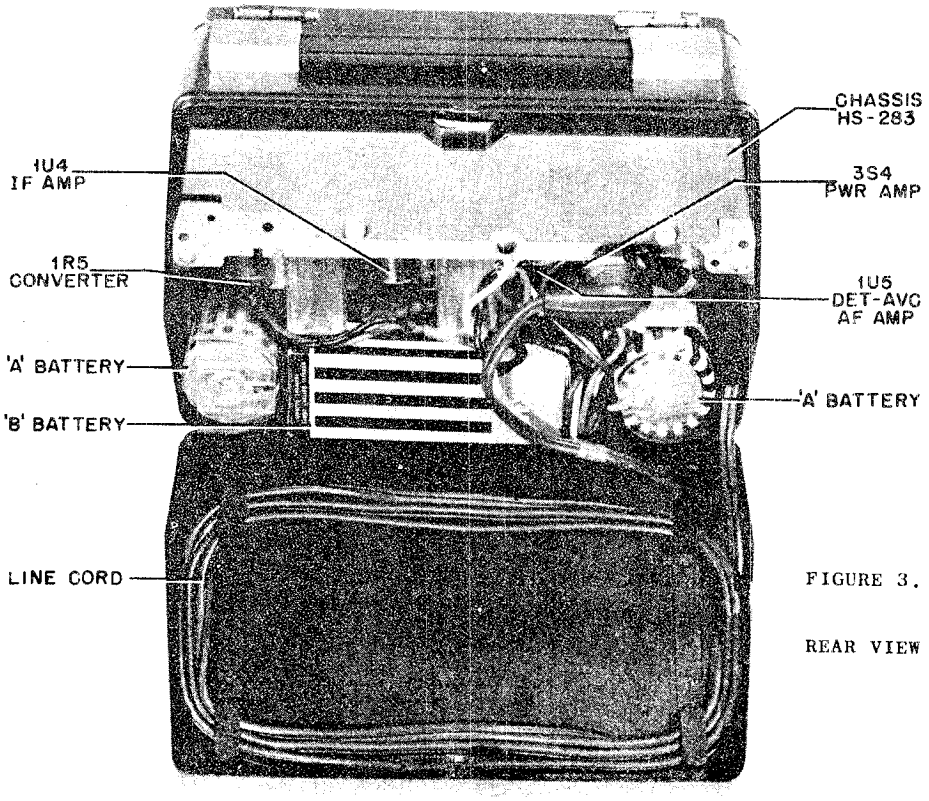


FIGURE 3.

REAR VIEW OF RECEIVER

MODELS 51M1U,
51M2U, Ch. HS-283

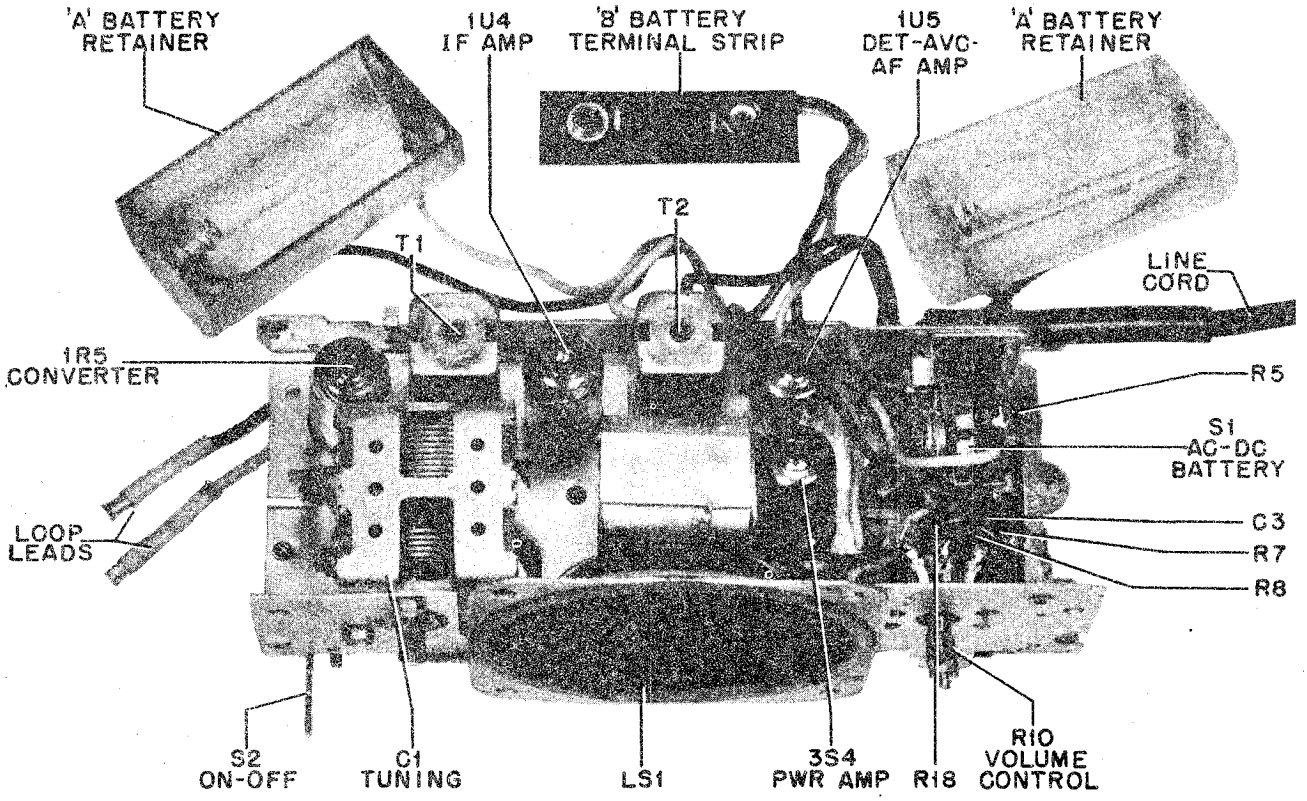


FIGURE 4. TOP VIEW OF CHASSIS

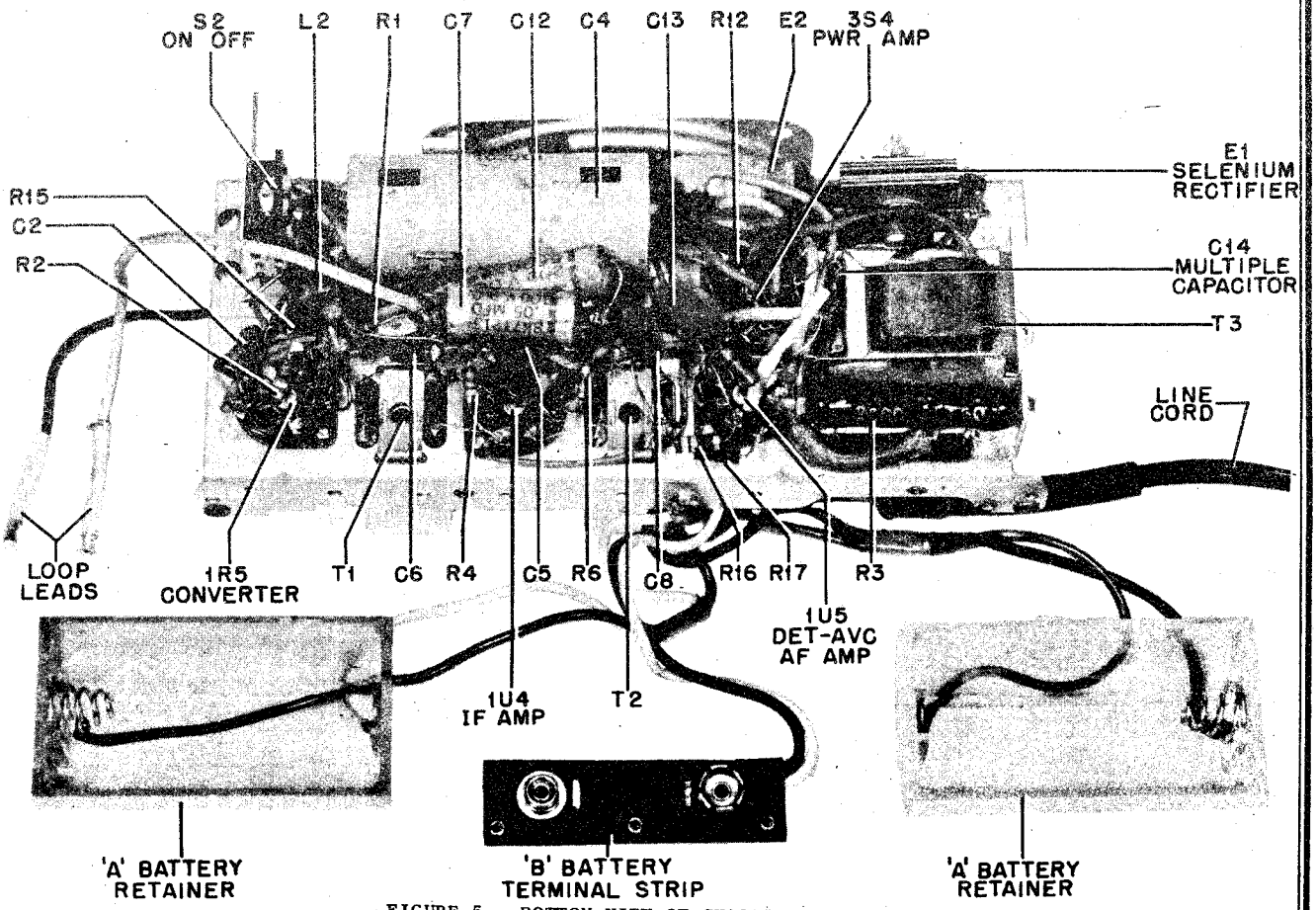


FIGURE 5. BOTTOM VIEW OF CHASSIS

MODELS 51M1U,
51M2U, Ch. HS-283

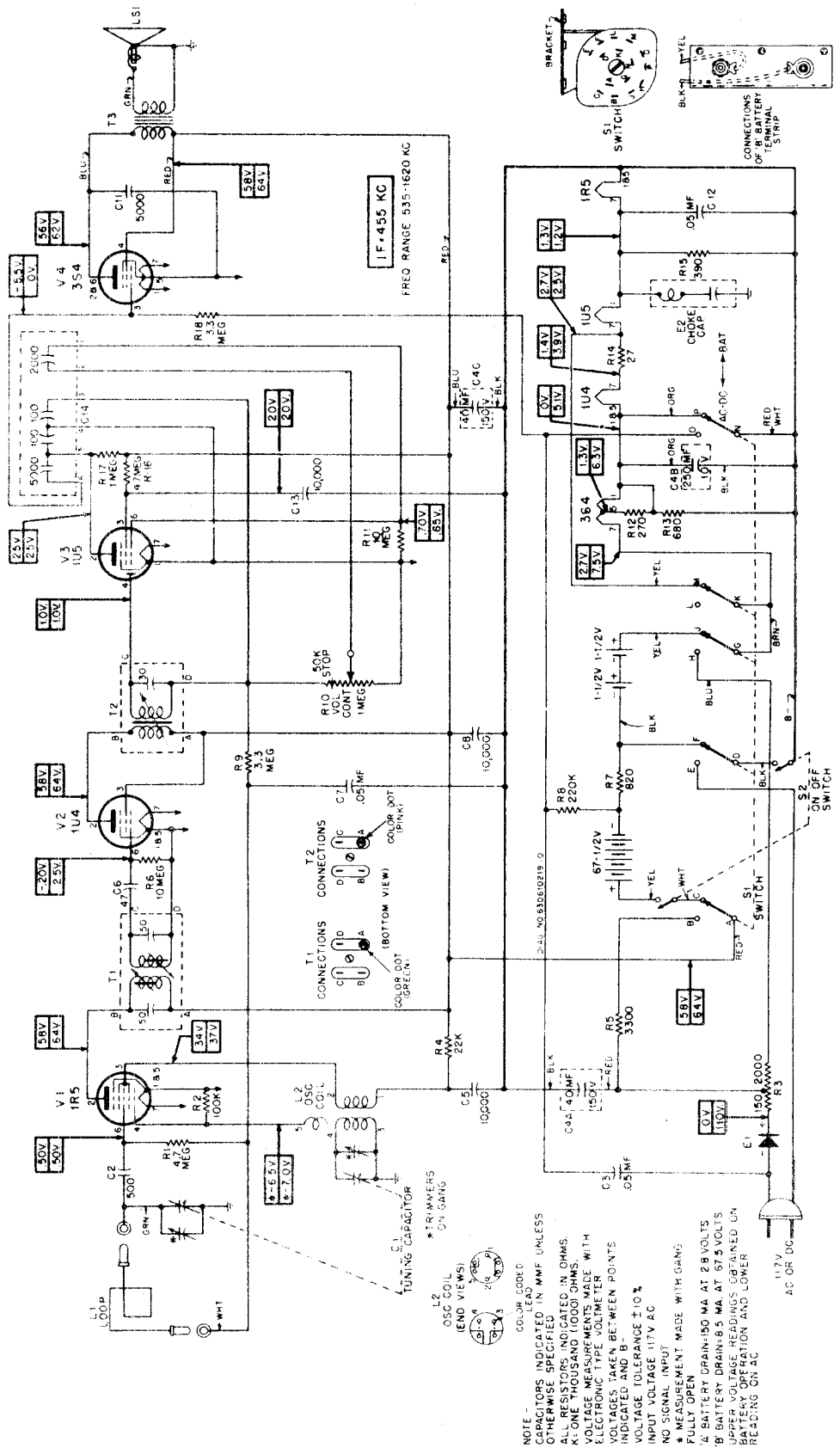


FIGURE 6. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR PLATE

MODELS 51M1U,
51M2U, Ch. HS-283

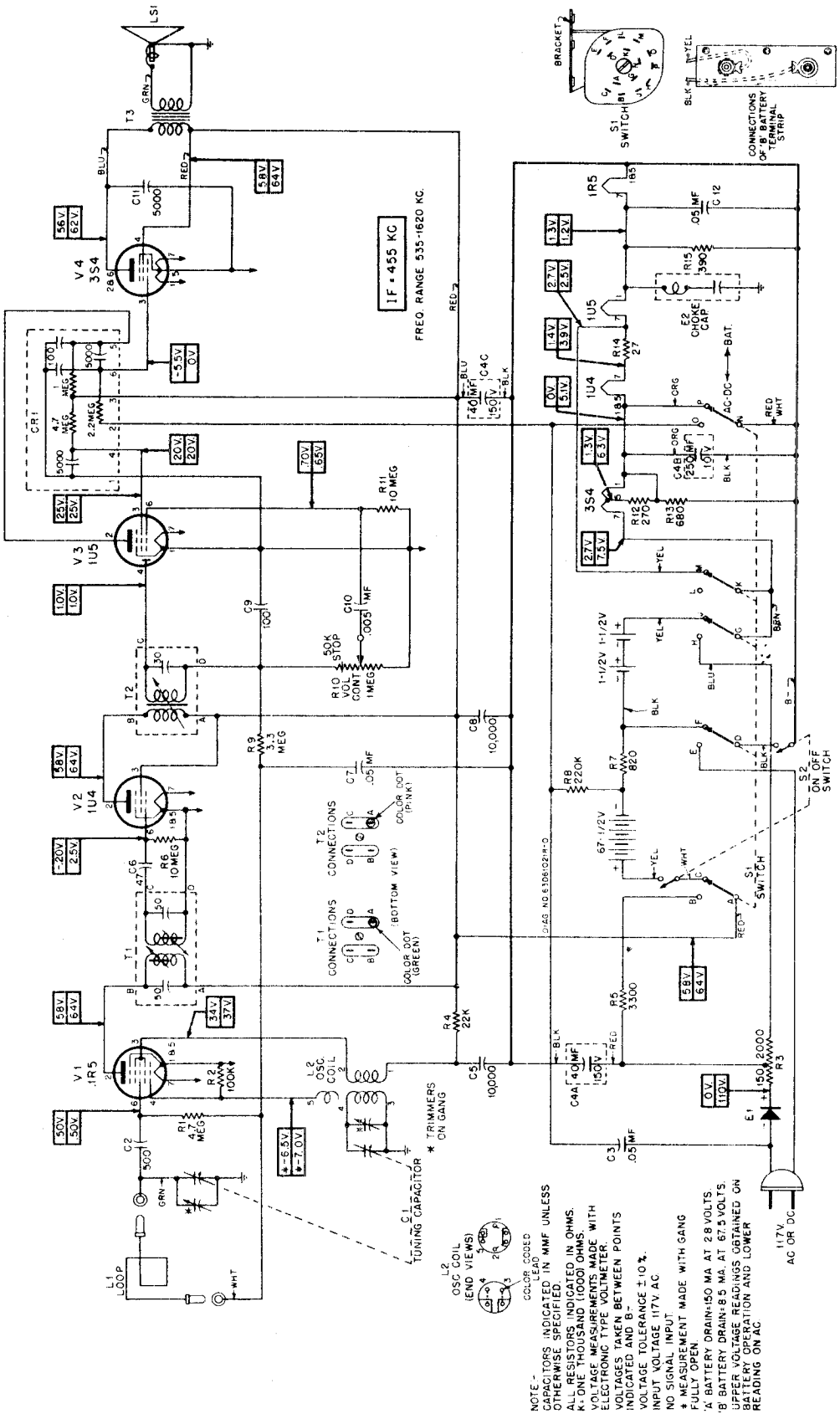


FIGURE 7. SCHEMATIC DIAGRAM OF CHASSIS USING MULTIPLE CERAMIC CAPACITOR-RESISTOR PLATE

MODELS 51M1U,
51M2U, Ch. HS-283

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
C-1	19K692007	Variable, 2-gang.....
C-2	21K481377	Ceramic: 500 mmf 500V.....
C-3	8K471635	Paper: .05 mf 400V.....
C-4	23B691995	Electrolytic 40-40 mf 150V/ 250 mf 10V.....
C-5	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-6	21K77373	Ceramic: 47 mmf 500V.....
C-7	8K71213	Paper: .05 mf 100V.....
C-8	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-9	21B77286	Ceramic, disc type: 100 mmf 100V.....
C-10	8K24966	Ceramic, disc type: .005 mf 100V.....
C-11	21A470789	Ceramic, disc type: 5000 mmf 450V.....
C-12	8K71213	Paper: .05 mf 100V.....
C-13	21K482726	Ceramic, disc type: 10,000 mmf 450V.....
C-14	21K691992	Ceramic, multiple: 2000 mmf, 100 mmf, 100 mmf, 5000 mmf
Capacitor-Resistor		
CR-1	21B601036	Capacitor-Resistor: 5000 mmf, 5000 mmf; 100 mmf, 100 mmf, 4.7 meg, 2.2 meg, 1 meg.....
Choke Capacitor		
E-2	24K691986	Choke & .05 mf 200V paper capacitor.....
Rectifier		
E-1	48B791092	Selenium Rectifier: half-wave.....
Coils		
L-1	1X692159	Antenna Loop & Front Cover Assembly: complete; green plastic (51M1U).....
	1X692160	Antenna Loop, Panel & Hinge Assembly: less front cover; green plastic (51M1U).....
	24B692200	Antenna Loop & Panel Assembly: less hinges: green plastic (51M1U).....
	1X600129	Antenna Loop & Front Cover Assembly: complete: maroon plastic (51M2U).....
	1X600130	Antenna Loop, Panel & Hinge Assembly: less front cover; maroon plastic (51M2U).....
	24K600132	Antenna Loop & Panel Assembly: less hinges; maroon plastic (51M2U).....
L-2	24K600097	Oscillator Coil (yellow code)

Ref. No.	Part Number	Description
Resistors		
Note:		All resistors are insulated, carbon type unless otherwise specified.
R-1	6R2122	4.7 meg 20% ½W.....
R-2	6R6031	100,000 10% ½W.....
R-3	17K692009	Wire wound: 2150 5% 10W; tapped.....
R-4	6R6397	22,000 10% ½W.....
R-5	6R5581	3300 10% ½W.....
R-6	6R2109	10 meg 20% ½W.....
R-7	6R6269	820 10% ½W.....
R-8	6R6015	220,000 20% ½W.....
R-9	6R2118	3.3 meg 20% ½W.....
R-10	18A691993	Volume control: 1 meg...
R-11	6R2109	10 meg 20% ½W.....
R-12	6R6432	270 10% ½W.....
R-13	6R6040	680 10% ½W.....
R-14	6R5683	27 10% ½W.....
R-15	6R5554	390 10% ½W.....
R-16	6R2122	4.7 meg 20% ½W.....
R-17	6R6004	1 meg 20% ½W.....
R-18	6R2118	3.3 meg 20% ½W.....
Switches		
S-1	40B471927	Rotary Switch, 5 PDT (AC/DC-Battery selector).....
S-2	40A691999	Slide Switch (on-off).....
Transformers		
T-1	24K600824	IF Transformer, 455 Kc: complete with capacitors..
T-2	24K600825	Diode Transformer, 455 Kc: complete with capacitor...
T-3	25K692006	Output transformer.....
CHASSIS PARTS - MECHANICAL		
	43A692011	Bushing, insulator: fibre (chassis mtg screw insulators).....
	43A692012	Bushing, strain relief: line cord (use with 43K692013).....
	42K75826	Clip, electrolytic mtg.....
	42A485584	Clip, IF transformer mtg.....
	30K601777	Cord, line: with plug; 6 ft long..
	29R3020	Lug, soldering: battery contact (in "A" battery retainer).....
	9A470980	Receptacle, loop (on loop leads)
	15B481896	Retainer, "A" battery: plastic....
	43K692013	Retainer, strain relief (on line cord bushing).....
	26B692001	Shield, back (on rear of chassis)
	26A692005	Shield heat (around R-3).....
	26B691996	Shield, switch (over AC/DC-Battery switch).....
	9A690129	Socket, tube: miniature; 7-prong..
	41K680029	Spring, battery contact (in "A" battery retainer).....

MODELS 51M1U, 51M2U, Ch. HS-283

Part Number	Description
31K470880	Strip, "B" battery terminal: with leads
31K37504	Strip, terminal: 1 insulated lug, #1 mtg
31K470746	Strip, terminal: 3 insulated lugs, #2 mtg
4K470939	Washer, fibre (R-3 mtg)

MODEL 51M1U CABINET PARTS

Part Number	Description
7A600092	Bracket, escutcheon support (cabinet front support)
38K692050	Button, plug: green finish (loop trimmer adj hole cover)
1X601812	Cabinet: complete; less handle, grille and antenna loop and front cover assembly; green plastic
42A600094	Clip, grille retainer (holds grille to cabinet)
55A692058	Cover, handle mtg (over ends of handle)
13D691949	Escutcheon, dial & volume (on front of cabinet)
55A27113	Foot, cabinet bottom: felt
1X692162	Front Cover Assembly: complete; less loop; green plastic
1X692158	Grille Assembly: complete with escutcheon: green plastic
55K692166	Handle, carrying: green plastic; less spring
55C692202	Hinge, front cover: complete; left-hand
55K600087	Hinge, front cover: complete; right hand
55K30198	Hinge, rear cover
36B691899	Knob, control: green plastic
1X692163	Latch and Plate Assembly (inside front cover)
4S8406	Lockwasher, int: #2 (loop)
4S7695	Lockwasher, int: #5 (handle mtg)
29R5399	Lug, soldering (under front hinge, for loop connection)
13B691901	Medallion (on front cover)
28A692198	Pin, loop connector (on front hinge)
64K601618	Plate, handle mtg (under handle mtg covers)
5S8487	Rivet: .088 x 3/32; stl; blk nkl (rear cover hinges latch spring mtg)
5S8490	Rivet: .088 x 5/32; stl; blk nkl; (front hinge mtg)
5S7786	Rivet: .088 x 3/16; stl; blk nkl (front hinge mtg)
3S1512	Screw, machine: 4-40 x 3/8; Phillips round head (mounts front hinges to cabinet)
3S400335	Screw, sheet metal: #2 x 5/16; Phillips flat head; blk nkl (mounts loop to front cover)
3S490739	Screw, sheet metal: #4 x ¼ PKZ; Phillips binder head (chassis mtg)
3S2995	Screw, machine: 5-40 x 5/16 pl hex head; cad pl (handle mtg)
41A470909	Spring, door latch (inside front cover)
41K692167	Spring, handle (inside plastic handle)
41K601712	Spring, rear cover latch
42A692189	Strap, door latch retainer (inside front cover)
46A692151	Stud, latch retainer (front cover latch on grille)
46K690079	Stud, trimount: blk nkl (on loop panel - for operating on-off switch)

MODEL 51M2U CABINET PARTS-Same as Model 51M1U Except:

Part Number	Description
38K600106	Button, plug: maroon finish (loop trimmer adj hole cover)
1X601816	Cabinet: complete, less handle, grille and antenna loop and front cover assembly; maroon plastic
13K600956	Escutcheon, dial & volume (on front of cabinet)
1X600131	Front Cover Assembly: complete, less loop; maroon plastic
1X600128	Grille Assembly: complete with escutcheon; maroon plastic
55K600107	Handle, carrying: maroon plastic; less spring
36K600105	Knob, control: maroon plastic
5S2827	Rivet: .088 x 5/32; stl; statuary bronze (front hinge mtg)
5S2828	Rivet: .088 x 3/16; stl; statuary bronze (front cover hinge mtg)
3S400336	Screw, sheet metal: #2 x 5/16; Phillips flat head; statuary bronze (mounts loop to front cover)
46K680035	Stud, trimount: statuary bronze (on loop panel - for operating on-off switch)

Speaker		
LS-1	50K600141	
	or 50K600142	
	or 50B610070	Speaker: 3½" PM; 3.2 ohm VC

MODELS 59X11,
59X12I, Ch. HS-180

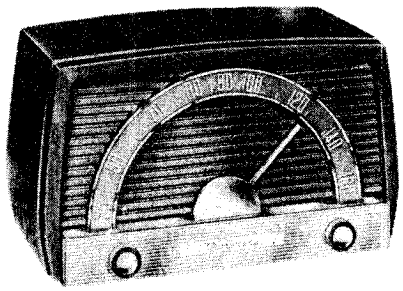
GENERAL INFORMATION

TYPE - AC-DC table model superheterodyne receiver with loop antenna

TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 12BE6 Converter
12BA6 IF Amplifier
12AT6 Detector, AVC & 1st AF Amp
50C5 Power Amplifier
35W4 Rectifier

POWER SUPPLY - 117 volts AC or DC, 35 watts



MODEL 59X11 (Mahogany Plastic Cabinet)

MODEL 59X12I (Ivory Plastic Cabinet)

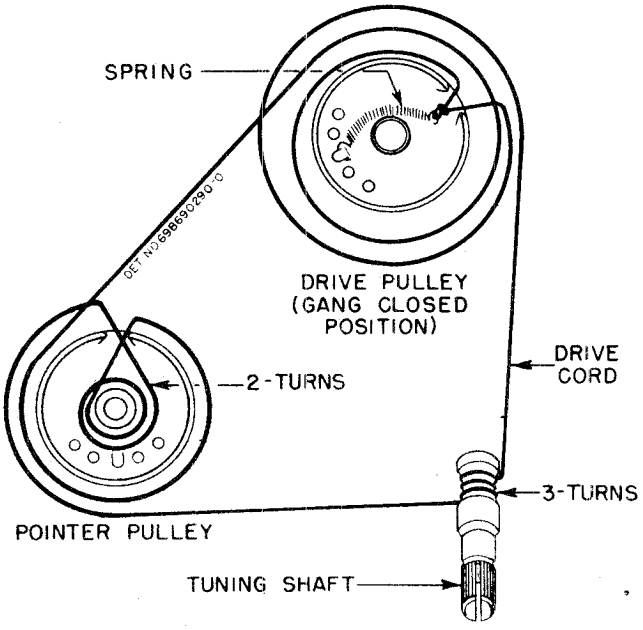


FIGURE 1. STRING DRIVE

INSTALLATION & OPERATING INSTRUCTIONS

POWER SWITCH AND VOLUME CONTROL. Operated with the left-hand knob. NOTE: Reverse the line cord plug in the wall outlet if radio does not operate from DC. When operating from AC, reversing the line cord plug in the wall outlet may sometimes improve reception and reduce hum.

TUNING. Tune stations with right-hand knob.

ANTENNA. A loop antenna is built into this receiver, eliminating the need for an external antenna. Reception from some stations may be improved by rotating the whole receiver; this is due to the slight directional characteristic of the loop antenna. In extremely noisy locations, rotate the entire receiver till minimum noise and maximum signal pickup are obtained. For additional pickup, an external antenna may be connected by winding lead-in wire in slots on radio back panel.

GROUND. Never connect antenna or chassis to water pipe, radiator or other ground, as one side of the power line is connected directly to chassis.

MODELS 59X11,
59X12I, Ch. HS-180

SERVICE NOTES

The chassis of this receiver is connected directly to the power line. When operating chassis (from AC line) outside of its cabinet, use an isolation transformer between power line and receiver to reduce possibility of electrical shock. If isolation transformer is not available, check the AC voltage between chassis and bench ground; if there is any indication of voltage, reverse the line plug before handling set.

ALIGNMENT

If AC power is used, use an isolation transformer between power line and receiver. If isolation transformer is not available, connect low side of signal generator to chassis through .1 mf capacitor.

Connect low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver for aligning IF & diode transformers.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Rear stator of tuning capacitor	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	-	Radiation loop*	1620 Kc	Gang fully opened	5	Adjust for maximum
3.	-	Radiation loop*	1400 Kc	Tune for maximum	6	Adjust for maximum

*Connect generator output to 5" diameter, 3 turn loop and couple to receiver loop. Keep loops at least 12" apart.

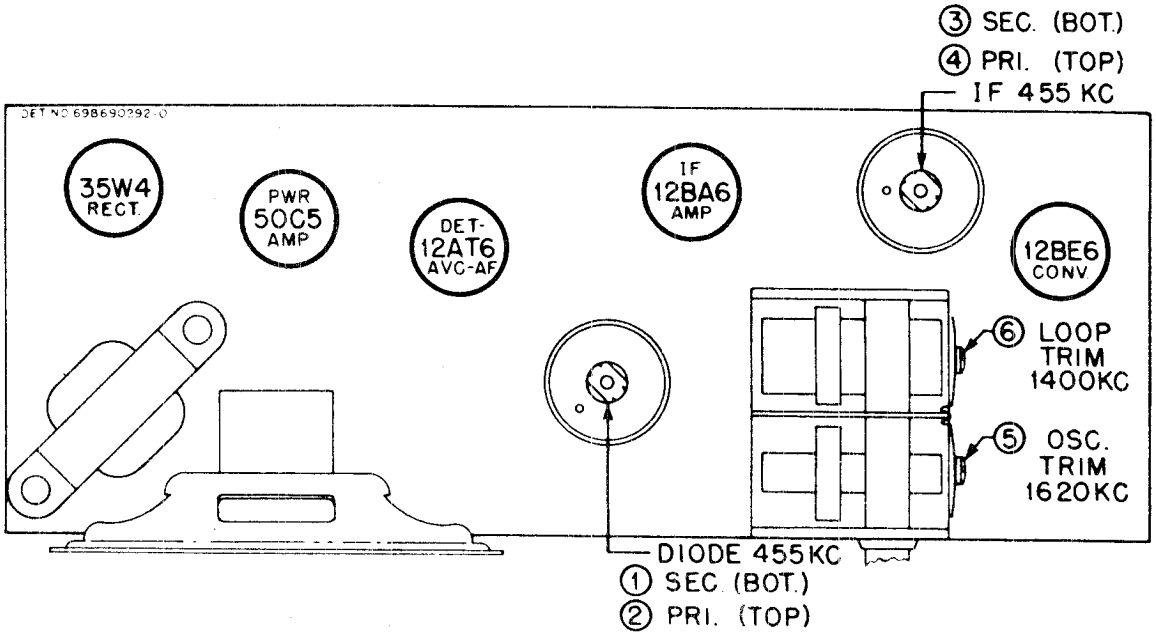


FIGURE 2. TUBE & TRIMMER LOCATIONS

MODELS 59X11,
59X12I, Ch. HS-180

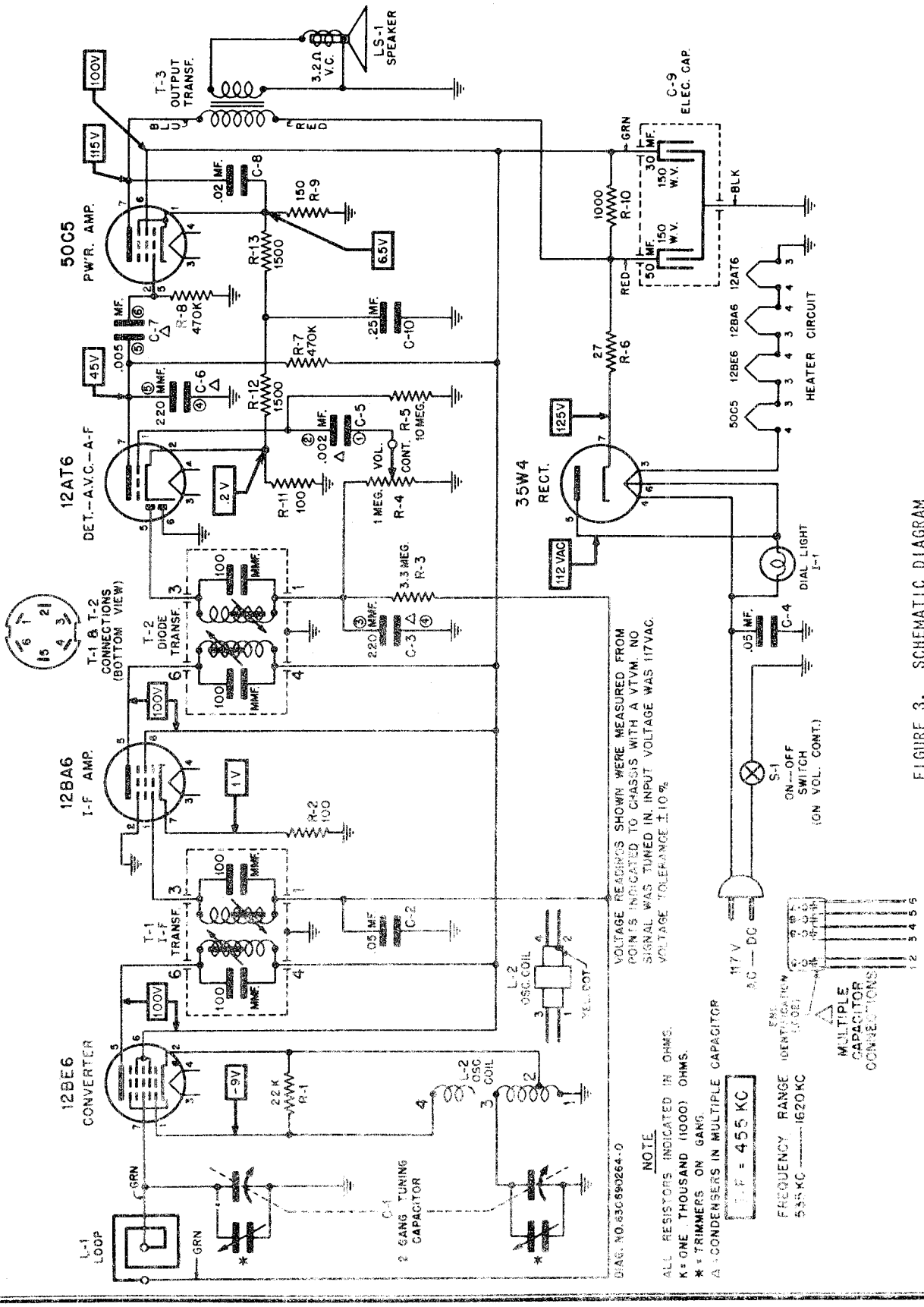


FIGURE 3. SCHEMATIC DIAGRAM

MODELS 59X11,
59X12I, Ch. HS-180

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	1X690759	Variable: 2 gang; with pulley
C-2	8S9821	Paper: .05 mf 200V .....
C-3,5, 6,7	21B482847	Ceramic, multiple: includes 220 mmf (C-3), .002 mf (C-5) 220 mmf (C-6) & .005 mf (C-7)
C-4	8S9816	Paper: .05 mf 400V .....
C-8	8S9802	Paper: .02 mf 400V .....
C-9	23K482857	Electrolytic: 50-30 mf 150V..
C-10	8A470504	Paper: .25 mf 50V .....
PILOT LIGHT		
I-1	65K11854	Bulb: 6.3V-.15 amp; tubular, clear, #47 .....
COILS		
L-1	24K690657	Loop Antenna: includes back panel
L-2	24K482855	BC Oscillator coil .....
SPEAKER		
LS-1	50C478138	Speaker: 4" PM; 3.2 ohm voice coil .....
RESISTORS		
Note:	All resistors are insulated carbon type, 20%, unless otherwise specified.	
R-1	6R6028	22,000 1/2 watt .....
R-2	6R6018	100 1/2 watt .....
R-3	6R2118	3.3 meg 1/2 watt .....
R-4	18A70032	Volume Control: 1 meg with SPST switch .....
R-5	6R2109	10 meg 1/2 watt .....
R-6	6R5683	27 10% 1/2 watt .....
R-7	6R6032	470,000 1/2 watt .....
R-8	6R6032	470,000 1/2 watt .....
R-9	6R3992	150 1/2 watt .....
R-10	6R3953	1000 1 watt .....
R-11	6R6028	100 1/2 watt .....
R-12	6R6161	1500 1/2 watt .....
R-13	6R6161	1500 1/2 watt .....
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores & padding capacitors but less shield .....
T-2	24B482865	Diode, 455 Kc: complete with tuning cores & padding capacitors but less shield .....
T-3	25K485973	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
	7K485971	Bracket, loop mtg .....
	7A77337	Bracket, tuning shaft mtg ....
	1X690679	Bracket and Insulator Assembly, pointer shaft mtg .....
	46K680318	Core, iron (for T-1 & T-2) ...
	11M8944	Cord, dial: 18#; blk .....
	30K482856	Cord, line & plug: 6 ft long..
	5A19658	Eyelet, spacer (gang mtg).....
	5A70404	Grommet, spacer (gang mtg)....
	14A482844	Insulator, cord outlet .....
	29R3010	Lug, soldering: #6 hot-tinned.
	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl; Palnut (volume control mtg) .....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans and tube shield mtg) .....
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (tuning shaft bracket and pointer bracket assembly mtg)
	3S7477	Screw, machine: 8-32 x 1/4; plain hex head; stl; cad pl (loop panel mtg) .....
	3S2294	Screw, machine: 6-32 x 1/2; plain hex head locking type; stl; cad pl (gang mtg) .....
	3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (speaker mtg) .....
	3S3398	Screw, sheet metal: #6 x 3/8; PKZ plain hex head; stl; cad pl (loop brkt and cord insulator mtg) .....
	1X690775	Shaft and Pulley Assembly, pointer .....
	1X690774	Shaft and Pulley Assembly, tuning .....
	26K485936	Shield, coil .....
	26A470013	Shield, light .....
	26A481521	Shield, tube: spring .....
	9K690673	Socket, pilot light .....
	9A472534	Socket, tube .....
	41A14244	Spring, pointer cord (tension) .....
	41A73996	Spring, tension (electrolytic mounting) .....
	4A70015	Washer, 'C' (tuning shaft and pointer shaft retainer).....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (loop panel mtg) .....
	4k482859	Washer, shoulder (loop bracket and cord insulator mtg).....
CABINET PARTS		
	16E690504	Cabinet, table model: molded; mahogany (59X11) .....
or	16K690659	Cabinet, table model: molded; ivory (59X12I) .....
	36K690668	Knob, control: mahogany (59X11)
or	36K690669	Knob, control: ivory (59X12I)
	64B690666	Plate, trim .....
	38A25507	Plug, split (antenna panel to cabinet mtg) .....
	52K690744	Pointer and Hub .....
	34C690662	Scale, dial .....
	3S7148	Setscrew: 6-32 x 1/8 Allen head; stl; cad pl (pointer and hub mtg) .....
	3S490381	Screw, drive: #00 x 1/4 PKU plain round head; brass (dial scale mtg) .....
	3S488098	Screw, sheet metal: #8 x 3/8 type 25; plain hex head; stl; cad pl (chassis mtg) .....
	46K690772	Stud, trimount (trim plate mtg) .....

MODELS 59X21U,
59X22IU, Ch. HS-192

GENERAL INFORMATION

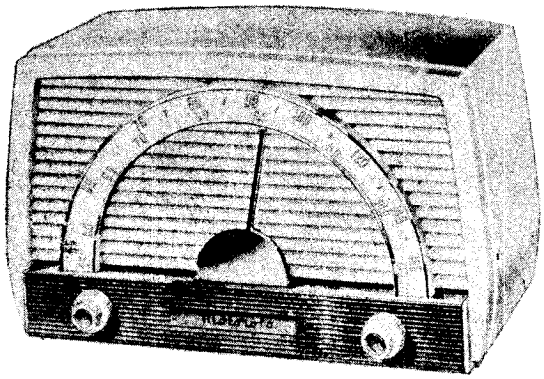
TYPE - A combination standard broadcast and short wave table model receiver.

TUNING RANGE - Standard broadcast - 535 to 1620 Kc
Shortwave - 5.85 Mc to 18.1 Mc

IF - 455 Kc

TUBE COMPLEMENT - 12BE6 - Converter
12BA6 - IF Amplifier
12AT6 - Detector, AVC & 1st Audio Amp
50C5 - Power Amplifier
35W4 - Rectifier

POWER SUPPLY - 117V AC/DC 35 watts



INSTALLATION & OPERATING INSTRUCTIONS

ANTENNAS. For short wave reception, it is necessary to connect a length of wire (at least 10 feet long) to the screw terminal located on the radio rear panel. A commercial short wave antenna is recommended for best results.

No outside antenna is normally required for standard broadcast station reception. A loop antenna for receiving broadcast stations is built into the radio. If radio is located at a considerable distance from broadcast stations, it may be necessary to secure additional signal pickup by using an external antenna. The same antenna that is used for short wave reception can be used for additional pickup of standard broadcast stations by leaving it connected to the short wave terminal screw and winding two turns of the same wire in the slots located at the top of the radio rear panel.

CAUTION: Do not connect antenna or chassis to water pipe, radiator or other ground.

POWER SWITCH & VOLUME CONTROL. The power switch and volume control are combined and operated by the left-hand knob. If radio does not play from a DC power line after being turned on for a few minutes, reverse the power cord plug in the power outlet. When operating from AC power lines, reception can sometimes be improved by reversing the power cord in the power outlet.

BANDSWITCH. The small (inner) right-hand knob selects standard broadcast or short wave reception, as desired. Rotate this knob to the left for standard broadcast or to the right for short wave reception.

TUNING. The large (outer) right-hand knob is used for tuning both standard broadcast and short wave stations.

TO REMOVE CHASSIS FROM CABINET

1. Set pointer to extreme low frequency end to expose pointer setscrew. Loosen pointer setscrew through hole in bottom of cabinet.

2. Remove the knobs; they pull off.

3. Remove the two split plugs that hold the top of loop panel to cabinet.

4. Remove the two screws that hold the chassis to the cabinet. These screws are accessible through slots in the loop panel.

PART NO. 54P691601

MODELS 59X21U,
59X22IU, Ch. HS-192

ALIGNMENT

Use an isolation transformer between power line and receiver. If isolation transformer is not available, connect low side of signal generator to B- through .1 mf capacitor.

Connect low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver for aligning IF & diode transformers.

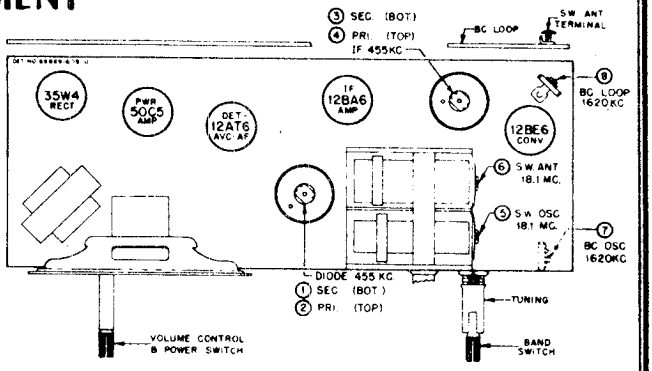


FIGURE 1. TUBE & TRIMMER LOCATION

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	BAND SWITCH	GANG SET TO	ADJUST	REMARKS
IF ALIGNMENT							
1.	.1 mf	Rear stator of tuning capacitor	455 Kc	-	Gang opened	1, 2, 3 & 4	Adjust for maximum.
SW BAND RF ALIGNMENT							
2.	400 ohms	SW Ant terminal	18.1 Mc	SW	Fully opened	5 & 6	Adjust for maximum.
BC BAND RF ALIGNMENT							
3.	.1 mf	Rear stator of tuning capacitor	1620 Kc	BC	Fully opened	7	Adjust for maximum.
4.	None	Radiation loop*	1400 Kc	BC	Tune for maximum	8	Adjust for maximum.

* Connect generator output to 5" diameter, 3 turn loop and couple to receiver loop. Keep loops at least 12" apart.

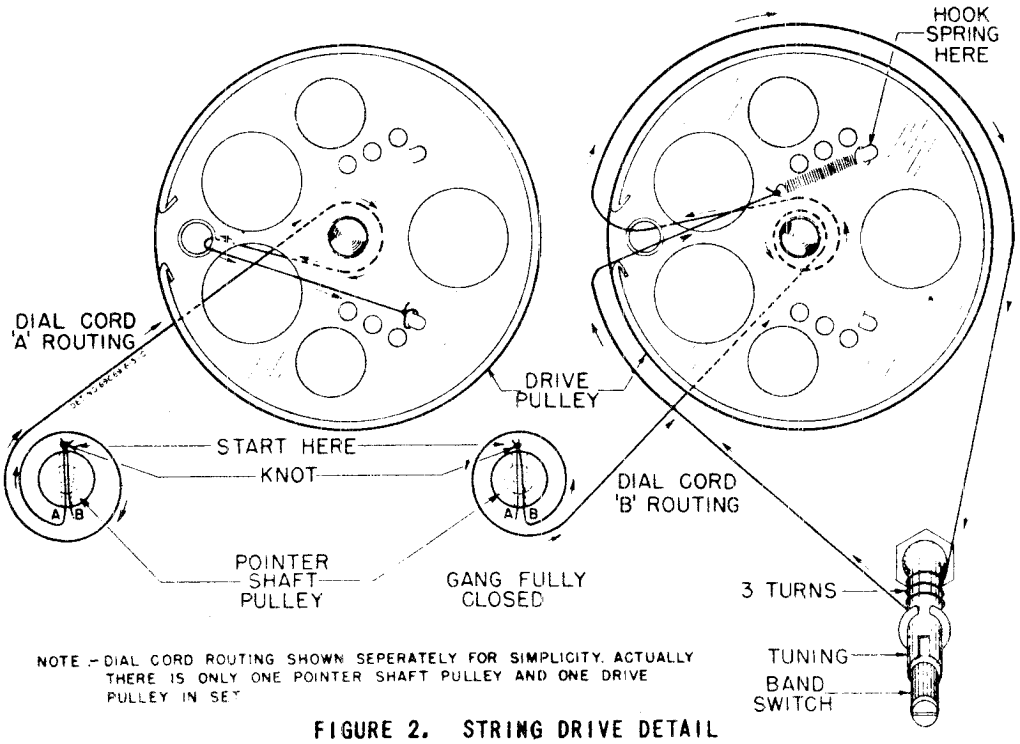


FIGURE 2. STRING DRIVE DETAIL

MODELS 59X21U,
59X22IU, Ch. HS-192

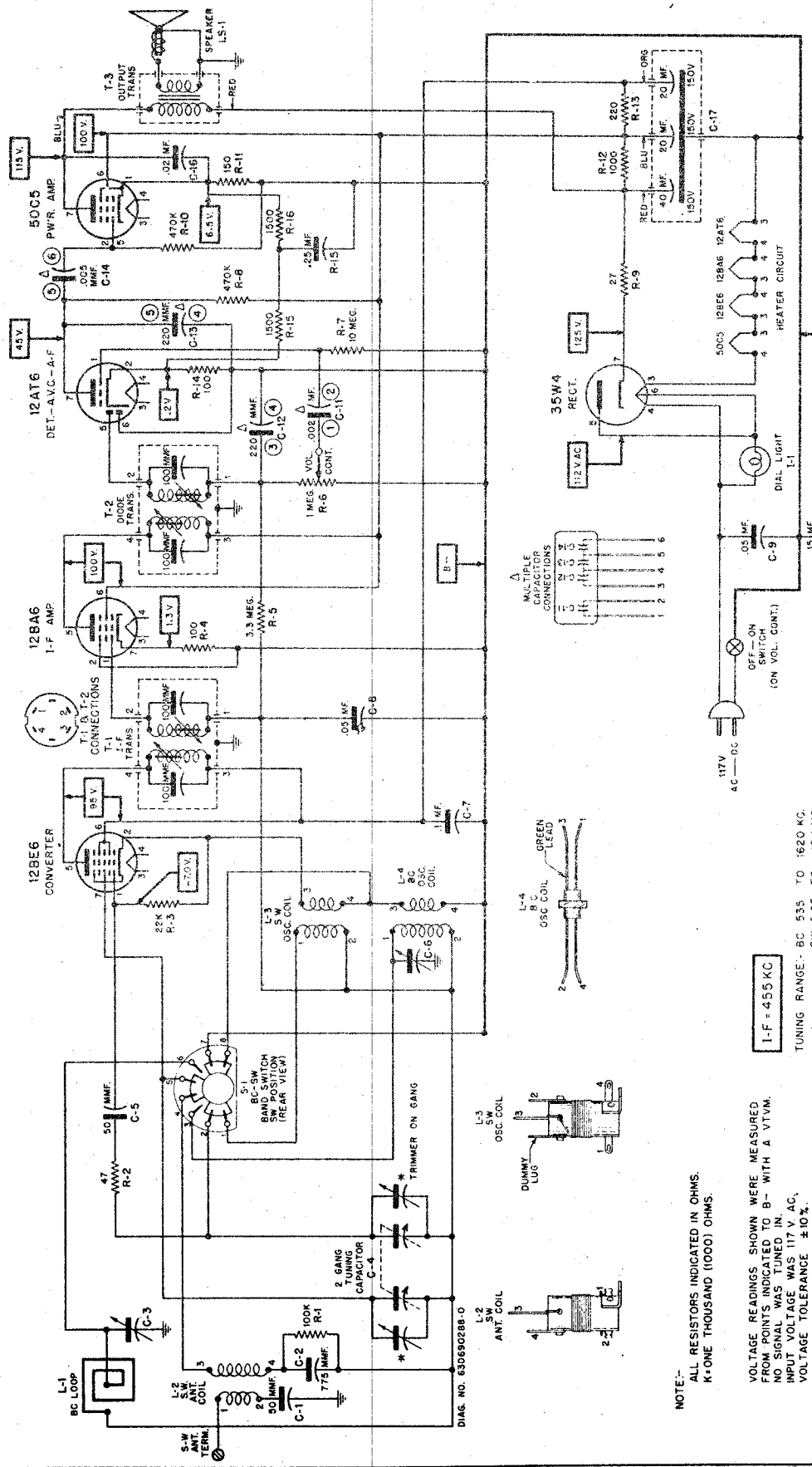


FIGURE 3. SCHEMATIC DIAGRAM

NOTE:-
ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINTS INDICATED TO B— WITH A VTVM. NO SIGNAL WAS TUNED IN. INPUT VOLTAGE WAS 117 V AC, VOLTAGE TOLERANCE ±10%.

MODELS 59X21U,
59X22IU, Ch. HS-192

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21K77373	Ceramic: 50 mmf 500V .....
C-2	21A690643	Mica: 775 mmf 3% 300V .....
C-3	20K690655	Mica, variable: 3 to 20 mmf .....
C-4	1X690682	Variable: 2 gang & pulley .....
C-5	21K77373	Ceramic: 50 mmf 500V .....
C-6	20A680362	Mica, variable: 10 to 50 mmf .....
C-7	8S9807	Paper: .1 mf 400V .....
C-8	8S9821	Paper: .05 mf 200V .....
C-9	8S9816	Paper: .05 mf 400V .....
C-10	8A72686	Paper: .15 mf 200V .....
C-11,12, 13,14	21B482847	Ceramic, multiple: .002 mf, 220 mmf, 220 mmf & .005 mf .....
C-15	8A470504	Paper: .25 mf 50V .....
C-16	8S9802	Paper: .02 mf 400 V .....
C-17	23K690671	Electrolytic: 40-20-20 mf/150V .....
DIAL LIGHT		
I-1	65X11854	Bulb: 6.3V .15 amp; tubular bayonet base .....
COILS		
L-1	24K690656	Loop Antenna Assembly: includes back panel .....
L-2	24B690641	Coil, short wave antenna .....
L-3	24B690651	Coil, short wave oscillator .....
L-4	24A690652	Coil, BC oscillator .....
SPEAKER		
LS-1	50C478138	Speaker, PM: 4"; 3.2 ohm VC ....
RESISTORS		
	Note:	All resistors are insulated carbon type unless otherwise specified.
R-1	6R6075	100,000 20% 1/2W .....
R-2	6R2108	47 20% 1/2W .....
R-3	6R6028	22,000 20% 1/2W .....
R-4	6R6326	100 10% 1/2W .....
R-5	6R2118	3.3 meg 20% 1/2W .....
R-6	18A70032	Volume Control: 1 meg; includes ON-OFF switch .....
R-7	6R2109	10 meg 20% 1/2W .....
R-8	6R6032	470,000 20% 1/2W .....
R-9	6R5683	27 10% 1/2W .....
R-10	6R6032	470,000 20% 1/2W .....
R-11	6R3992	150 20% 1/2W .....
R-12	6R3953	1000 20% 1W .....
R-13	6R3933	220 20% 1/2W .....
R-14	6R6326	100 10% 1/2W .....
R-15	6R6038	1500 10% 1/2W .....
R-16	6R6038	1500 10% 1/2W .....
SWITCH		
S-1	40K690672	Switch, band: 2-position .....
TRANSFORMERS		
T-1	24B482863	IF, 455 Kc: complete with tuning cores and padding capacitors but less shield .....
T-2	24B482865	Diode, 455 Kc: complete with tuning cores and padding capacitors but less shield .....
T-3	25K471947	Transformer, output .....
CHASSIS PARTS - MECHANICAL		
	1X690679	Bracket and Insulator Assembly, pointer shaft mtg .....
	7K485971	Bracket, loop mtg .....
	11M8944	Cord, dial: 18# black .....
	30A470651	Cord, line & plug: 6 ft lg .....
	46K680318	Core, iron: threaded (for T-1 & T-2) .....
	5A19658	Eyelet, spacer .....
	5A70404	Grommet, rubber (gang mtg).....
	29R3010	Lug, soldering .....
	14A482844	Insulator, cord outlet .....
	2S7051	Nut, hex: 3/8-32 x 9/16; stl; cad pl (band switch and volume control mtg) .....
	4S7019	Nut, hex: 4-40 x 1/4; stl; cad pl (coil and trimmer mtg).....
	5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (pointer bracket & insulator assembly and spring mtg) ....
	4S2950	Screw, machine: 4-40 x 1/4 slotted binderhead; locking type; stl; cad pl (coil and trimmer mtg) .....
	3S2294	Screw, machine: 6-32 x 1/2 plain hex head; locking type; stl; cad pl (gang mtg) .....
	3S7477	Screw, machine: 8-32 x 1/4; type 1; plain hex head; stl; cad pl (loop back mtg) .....
	3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (bracket and insulator mtg)..
	3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (spkr mtg and diode shield mtg) .....
	47A690645	Shaft, pointer .....
	47K690573	Shaft, tuning .....
	24K485936	Shield, coil (for T-1 & T-2) ..
	26A690748	Shield, diode .....
	26A470013	Shield, light .....
	26A481521	Shield, tube: spring .....
	9K690673	Socket, pilot light: includes leads.
	9A472534	Socket, tube .....
	41A14111	Spring, cord tension .....
	41A73996	Spring, tension (electrolytic mtg).
	4A70015	Washer 'C' (pointer shaft retainer) .....
	4A73639	Washer 'C' (tuning shaft retainer) .....
	4S7633	Washer, flat: 9/16 x 11/64 x .033 thick; stl; cad pl (loop back mtg) .....
	4K482859	Washer, shoulder: insulated (loop bracket and insulator mtg).....
CABINET PARTS		
	16E690504	Cabinet, table model: molded; mahogany (59X21U) .....
	16K690659	Cabinet, table model: molded; ivory (59X22IU) .....
	36K482767	Knob, band control: mahogany (59X21U)
	36K482788	Knob, band control: ivory (59X22IU).
	36K690668	Knob, tuning control: mahogany(59X21U
	36K690669	Knob, tuning control: ivory (59X22IU)
	36B690664	Knob, volume & ON-OFF control: mahogany (59X21U) .....
	36K690665	Knob, volume & ON-OFF control: ivory (59X22IU) .....
	64B690666	Plate, trim .....
	38A25507	Plug, split (loop back to cabinet mtg) .....
	52K690744	Pointer and hub .....
	34K690663	Scale, dial .....
	3S490502	Screw, drive: #00 x 1/4 PKU plain round head; brass (dial scale mtg) .....[
	3S488098	Screw, sheet metal: #8 x 3/8; type 25; plain hex head; stl; cad pl (chassis mtg) .....
	3S7148	Setscrew: 6-32 x 1/8; Allen head; stl; cad pl (pointer & hub mtg)
	46K690772	Stud, trimount: brass pl (trim plate mtg) .....

MODEL 401

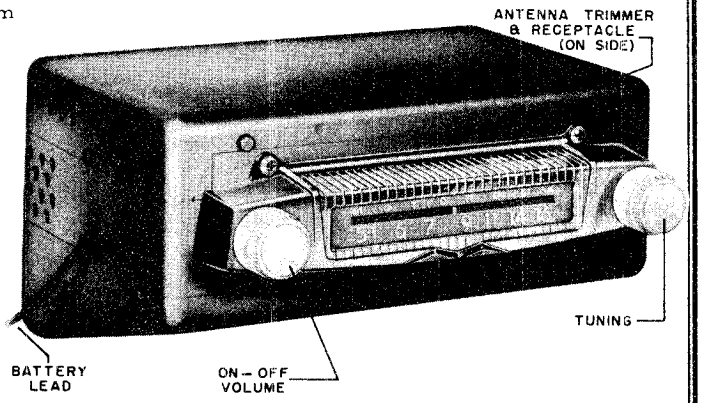
GENERAL INFORMATION

TYPE - Universal automotive type superheterodyne receiver with self-contained speaker. Designed for underdash mounting. Receiver may be mounted behind instrument panel of some cars by using Trim Plate AK-38.

TUNING RANGE - 535 to 1605 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



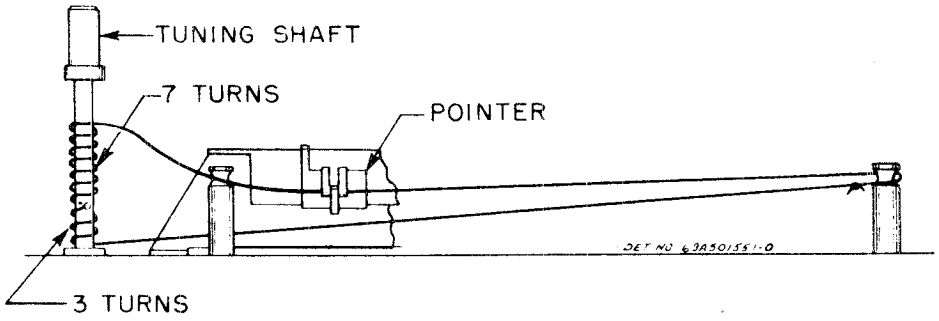


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3 .)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: Keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7)	455 Kc	High frequency end of dial (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy	1605 Kc	"	5	Peak for maximum.
3.	"	"	1400 Kc	Tune for max.	6 & 7	"
TUNER ALIGNMENT						
NOTE: The tuner cores have been correctly aligned at the factory. Field alignment of the tuner is not recommended unless components have been replaced or tampered with. Construct two core alignment tools as shown in Figure 4. Refer to Figure 4 for proper use of tools, and proceed to align as follows:						
4.	See Fig. 3	Antenna receptacle through dummy	1610 Kc	High frequency end of dial; cores should project 1-1/32" from end of coil form - screw out if necessary	5, 6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	1400 Kc-per Figure 2	8, 9 & 10	

6. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust antenna trimmer (7) for maximum signal of a weak station or noise between stations.

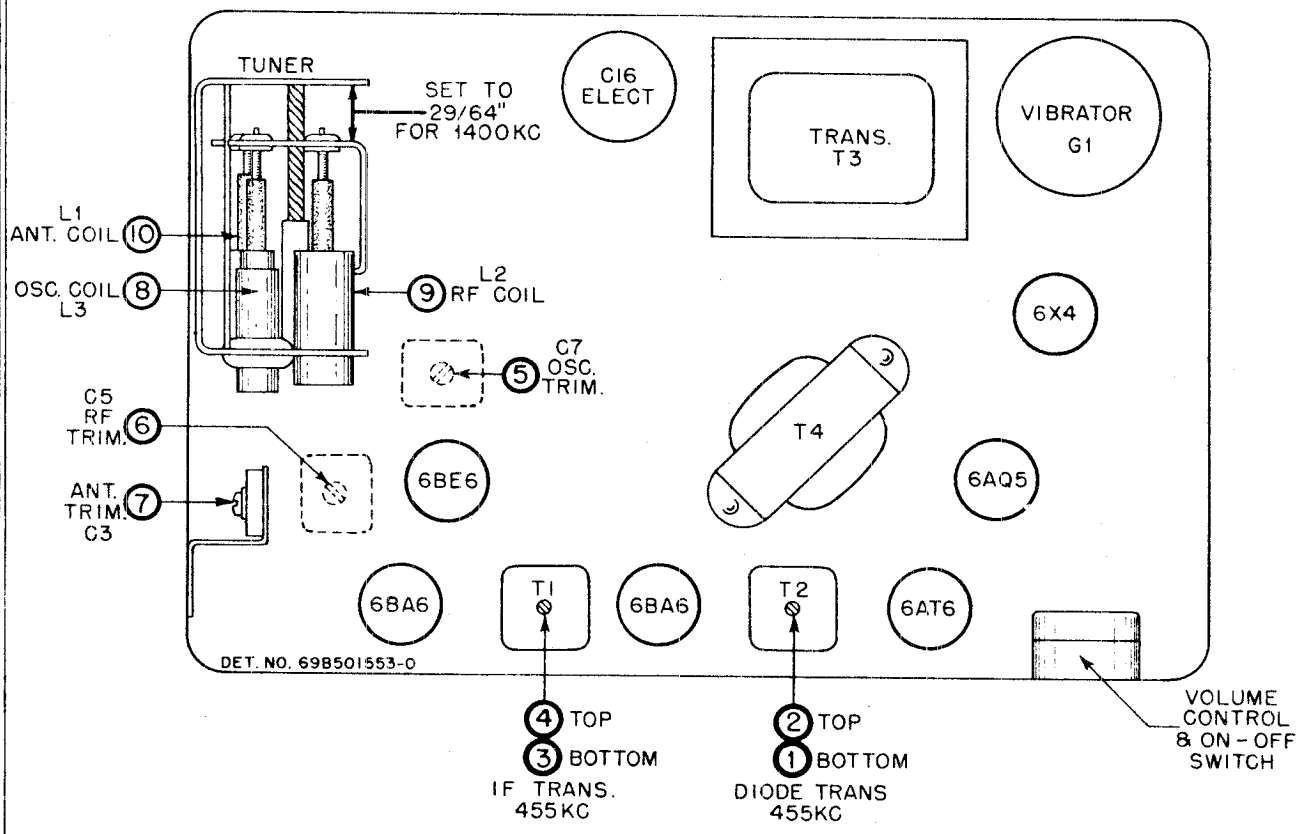


FIGURE 2. TUBE & TRIMMER LOCATIONS

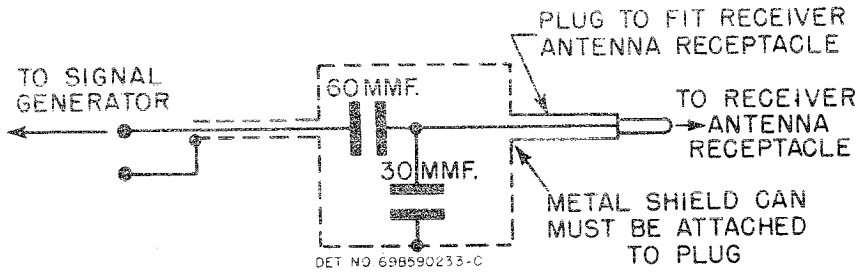


FIGURE 3. DUMMY ANTENNA

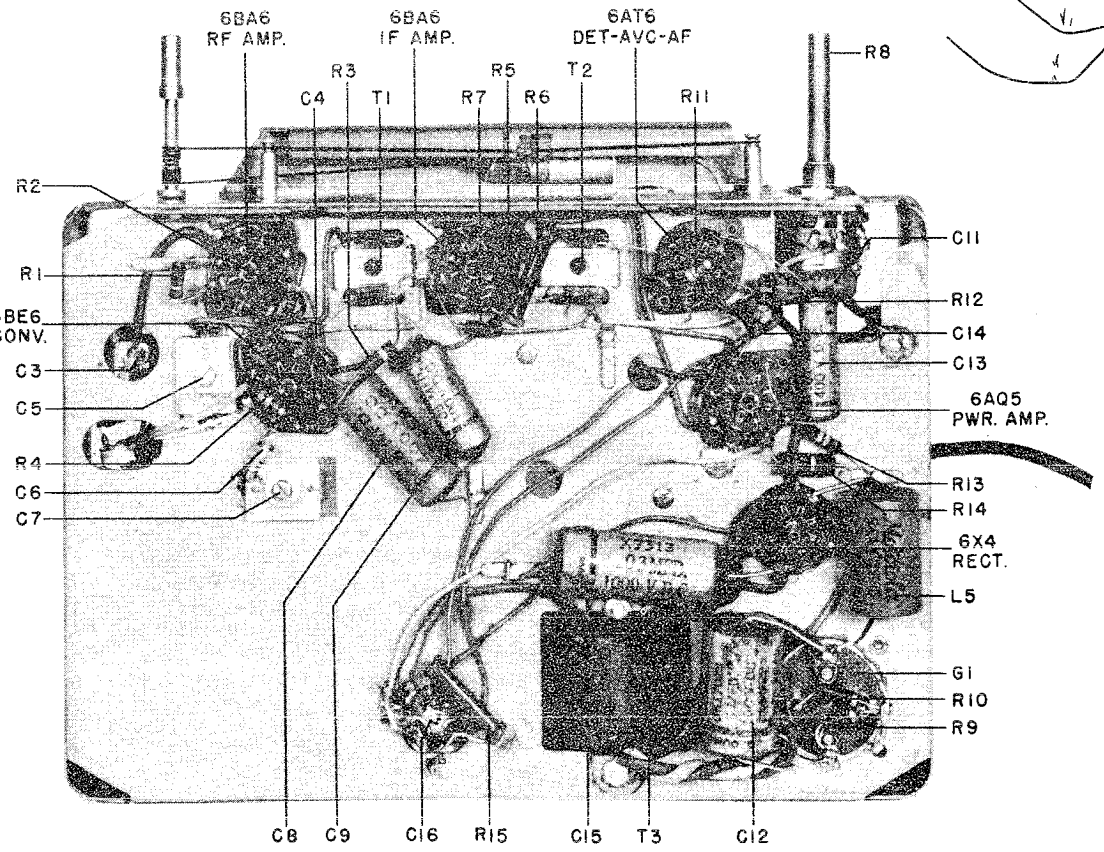


FIGURE 5. PARTS LOCATION

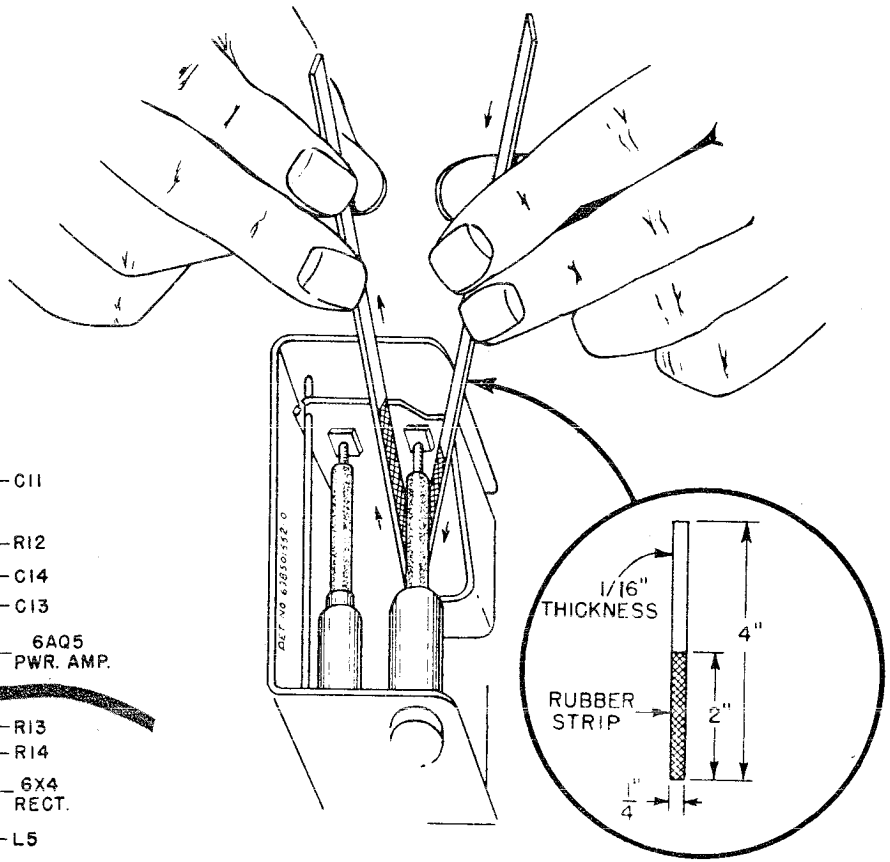


FIGURE 4. CORE ALIGNMENT DETAIL

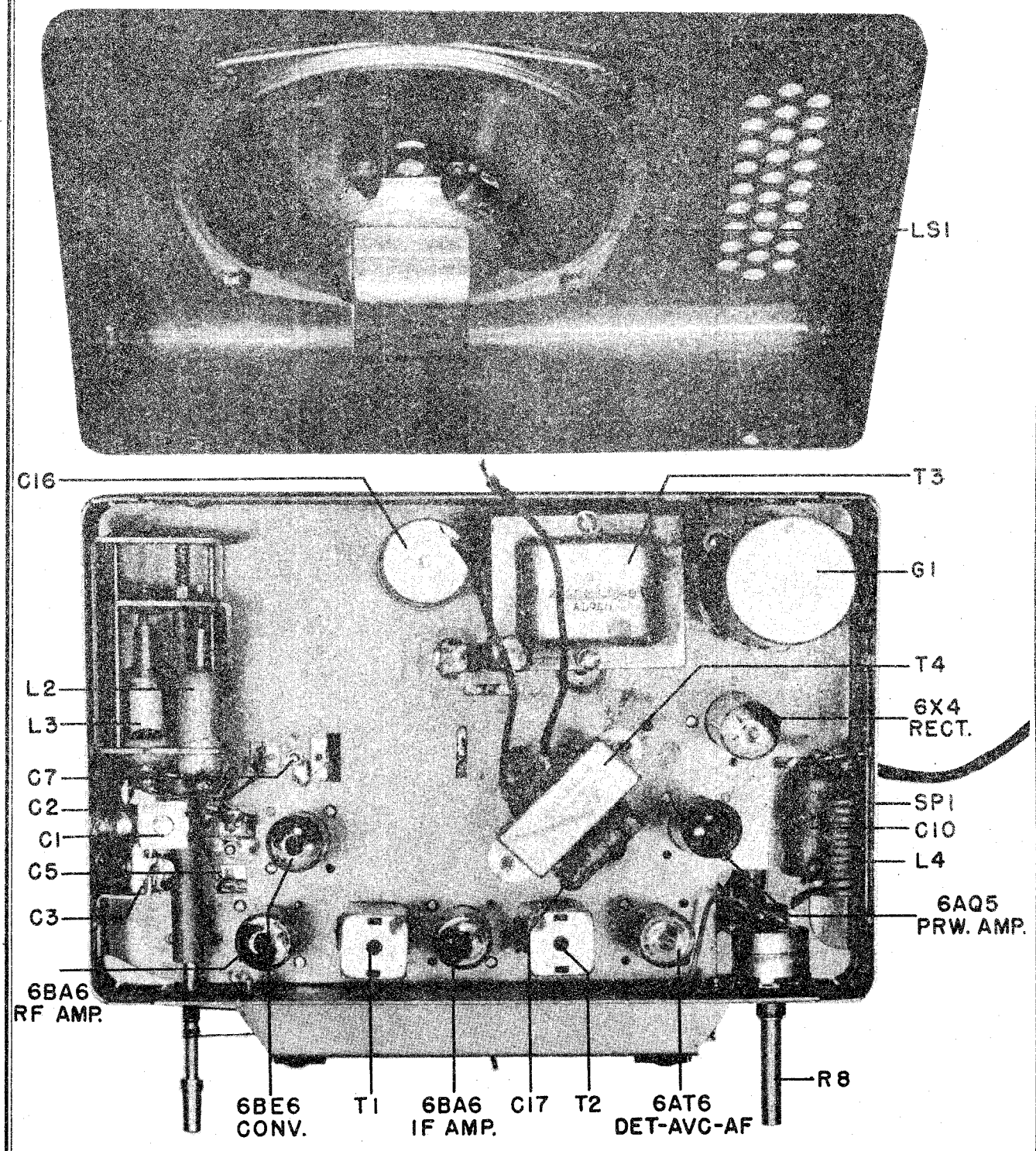
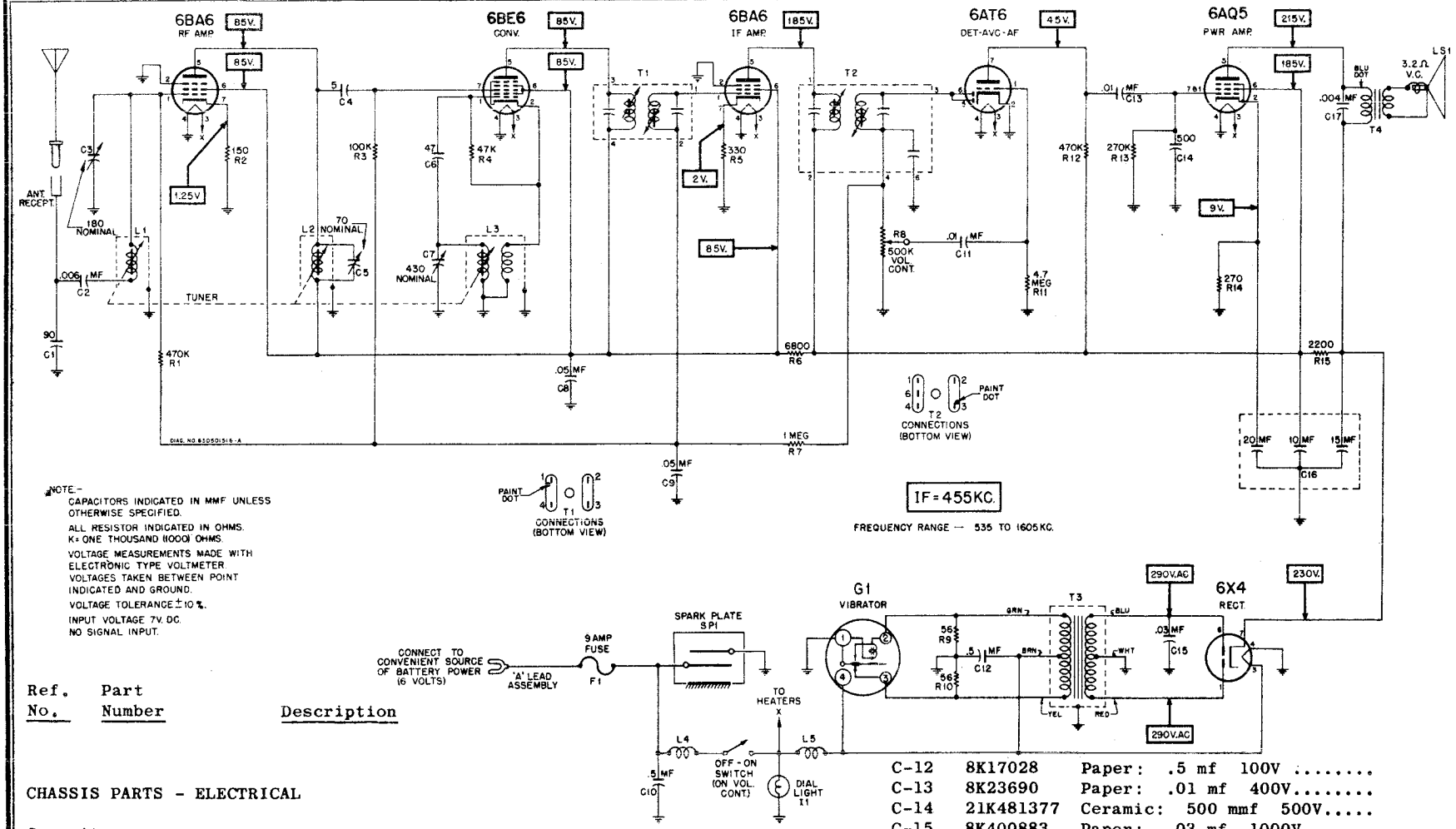


FIGURE 6. PARTS LOCATION



NOTE.—
CAPACITORS INDICATED IN MMF UNLESS OTHERWISE SPECIFIED.
ALL RESISTOR INDICATED IN OHMS. K= ONE THOUSAND (1000) OHMS.
VOLTAGE MEASUREMENTS MADE WITH ELECTRONIC TYPE VOLTMETER VOLTAGES TAKEN BETWEEN POINT INDICATED AND GROUND.
VOLTAGE TOLERANCE ±10 %.
INPUT VOLTAGE 7V. DC.
NO SIGNAL INPUT.

FIGURE 7. SCHEMATIC DIAGRAM

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20A502338	Trimmer, mica: 50 to 180 mmf; with bracket .....
C-4	21K70720	Molded: 5 mmf 500V .....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf.
C-6	21K77373	Ceramic: 47 mmf .....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf
C-8	8K14791	Paper: .05 mf 400V .....
C-9	8K13514	Paper: .05 mf 100V .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8K472754	Paper: .01 mf 100V.....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8K23690	Paper: .01 mf 400V.....
C-14	21K481377	Ceramic: 500 mmf 500V.....
C-15	8K400883	Paper: .03 mf 1000V .....
C-16	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V .....
Fuse		
F-1	65K16248	Fuse: 9 amp .....
Vibrator		
G-1	48B3333	Vibrator: 4-pin; non-sync...
Dial Light		
I-1	65X10867	Bulb: 6.3V; .25A; tubular; bayonet base; #44 .....

Coils

L-1	24B502472	Antenna Coil Assembly .....
L-2	24B502473	RF Coil Assembly .....
L-3	24B502474	Oscillator Coil Assembly....
L-4	24K580706	Choke, RF .....
L-5	24A472535	Choke, hash .....

Speaker

LS-1	50K500415	Speaker, PM: 5-1/4"; 3.2 ohm voice coil .....

Resistors

Note: All resistors are carbon insulated type unless otherwise specified.

R-1	6R6032	470,000 20% 1/2W .....
R-2	6R3992	150 20% 1/2W .....
R-3	6R6075	100,000 20% 1/2W .....
R-4	6R6056	47,000 20% 1/2W .....
R-5	6R6010	330 20% 1/2W .....
R-6	6R490001	6800 10% 1W N.I. ...
R-7	6R6004	1 meg 20% 1/2W .....
R-8	18K501294	Volume control: .5 meg; includes on-off switch ...
R-9	6R5614	56 10% 1/2W .....
R-10	6R5614	56 10% 1/2W .....
R-11	6R2122	4.7 meg 20% 1/2W .....
R-12	6R6032	470,000 20% 1/2W .....
R-13	6R6414	270,000 10% 1/2W .....
R-14	6R6336	270 10% 1W .....
R-15	6R488312	2200 10% 1W N.I. .....

Spark Plate

SP-1	64A501797	Spark Plate, top ground.....
	14K501292	Insulator, spark plate:fibre
	64A501289	Spark Plate, "A" lead .....
	4K51142	Washer, insulating (spark plate) .....

Transformer

T-1	24B485553	IF, 455 Kc: complete ..
T-2	24K485554	Diode, 455 Kc: complete
T-3	25C501303	Power Transformer.....
T-4	25B70171	Output Transformer .....

CHASSIS PARTS - MECHANICAL

7B501415	Bracket, dial background.....
42A485548	Clip, coil can mtg (T-1 & T-2).
42A4215	Clip, vibrator grounding.....
11M8877	Cord, dial: 20 lb; black.....
58A501296	Coupling, tuning shaft.....
4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg).....
2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control mtg) .....
1A501293	Pointer and Slider Assembly....
9A472148	Receptacle, antenna .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (min tube socket mtg).....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer & vibrator socket mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (spark plate assembly mtg)...
5K501365	Rivet, shoulder (dial cord guide) .....
3S7247	Screw, machine: 6-32 x 3/16; slotted locking head; stl; cad pl (tuner mtg) .....
3S7506	Screw, sheet metal: #6 x 1/4 plain hex head; stl; cad pl (dial background bracket mtg) .....
47B501362	Shaft, tuning .....
9K592354	Socket, dial light: includes mtg bracket .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 7-prong; with dummy lug .....
9A70208	Socket, tube: 4-prong (vibrator)...
41A485380	Spring, insert (inside tuning shaft coupling) .....
4K501364	Washer, "C" (tuning shaft retainer) .....

HOUSING PARTS

43A501295	Bushing, mounting (on control shafts) .....
15D501312	Cover, housing: bottom; less spkr
15D501305	Cover, housing top .....
13D501197	Escutcheon, dial: chrome pl .....
36B501297	Knob, control: includes setscrew.
4S7657	Lockwasher, ext: #8; stl; cad pl (speaker mtg) .....
2S7003	Nut, hex: 8-32 x 5/16; stl; cad pl (speaker mtg) .....
64B501445	Plate, dial scale retaining: dark green .....
34B501360	Scale, dial: glass .....
3S8114	Screw, sheet metal: #8 x 1/4; slotted acorn head; antique copper finish (housing screws) .....
3S490733	Screw, sheet metal: #8 x 1/4; Phillips head; chrome pl (escutcheon mtg) .....
3S7118	Setscrew (control knobs) .....
2S7087	Speednut (dial scale mtg) ...

MOUNTING PARTS AND ACCESSORIES

7B501298	Bracket, receiver mtg (recvr to instrument panel) .....
7A72256	Bracket, receiver mtg (on housing).
7A484424	Bracket and Stud Assembly (receiver mtg) .....
8A4491	Capacitor, noise suppression (generator cap) .....
9K592648 or 9K580705	Lead Assembly, fuse: complete with fuse .....
4S7688	Lockwasher, int-ext: 1/4; cad pl (receiver mtg) .....
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 slotted acorn head; cad pl (mtg brkt mtg-rear) .....
3S8109	Screw, sheet metal: #8 x 3/8; PKZ; slotted acorn head; cad pl (mtg brkt mtg -front) .....
3S7295	Screw, machine: 1/4-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap) .....
3S9694	Screw, machine: 1/4-20 x 1-1/2; plain hex head; stl; cad pl (receiver mtg to firewall) .....
42A485718	Strap, receiver mtg .....
6A4141	Suppressor, noise (distributor)..

TUNER - MODEL MT-87

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.

51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft) .....
42A502507	Clip, spring (manual drive shaft retainer) .....
46A502505	Core, iron (L-1, 2 & 3 tuning-specify color coding on old core when ordering) .....
5A502510	Grommet (L-1 & L-2 mtg) .....
5K502516	Grommet (L-3 mtg) .....
5A501503	Grommet (L-1, 2 & 3 core mtg)...
2A502508	Nut, tension drive (on tuner carriage) .....
47A502509	Shaft, manual drive .....
46A502506	Sleeve, iron (inside L-1 & L-2 shields) .....
4K502518	Washer, fibre (on manual drive shaft) .....
4A502517	Washer, paper (inside L-1 & L-2 shields) .....

MODEL 451

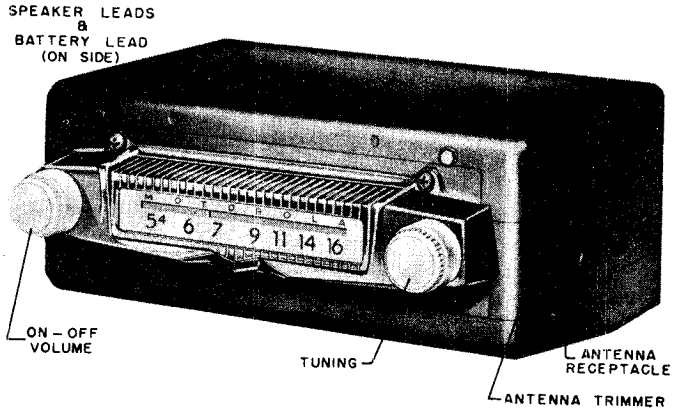
GENERAL INFORMATION

TYPE - Universal automotive type superheterodyne receiver. Designed for underdash mounting. Uses an external speaker. Receiver may be mounted behind instrument panel of some cars by using Trim Plate Kit AK-38.

TUNING RANGE - 535 to 1605 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Detector-AVC-AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.3 volts DC, 5 amperes



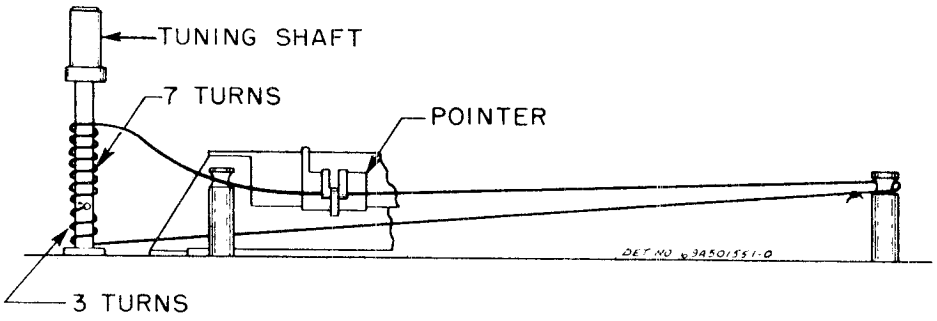


FIGURE 1. DIAL CORD RESTRINGING DETAIL

ALIGNMENT

Equipment Required:

1. A small fibre screwdriver for IF and RF adjustments.
2. An accurately calibrated AM signal generator.
3. A low range output meter.
4. A dummy antenna for RF and tuner alignment. (Construct dummy antenna as shown in Figure 3 .)

Procedure:

1. Remove top and bottom covers to expose alignment adjustments.
2. Connect output meter across voice coil of the speaker.
3. Connect a 6 volt DC source of power between "A" lead and receiver ground. Turn receiver on and permit it to warm up for a few minutes. Then proceed as per instructions in the alignment chart.

NOTE: Keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment.

MODEL 451

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7)	455 Kc	High frequency end of dial (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated.
RF ALIGNMENT						
2.	See Fig. 3	Antenna receptacle through dummy	1605 Kc	"	5	Peak for maximum.
3.	"	"	1400 Kc	Tune for max.	6 & 7	"
TUNER ALIGNMENT						
NOTE: The tuner cores have been correctly aligned at the factory. Field alignment of the tuner is not recommended unless components have been replaced or tampered with. Construct two core alignment tools as shown in Figure 4. Refer to Figure 4 for proper use of tools, and proceed to align as follows:						
4.	See Fig. 3	Antenna receptacle through dummy	1610 Kc	High frequency end of dial; cores should project 1-1/32" from end of coil form - screw out if necessary	5, 6 & 7	Peak for maximum in order in indicated.
5.	"	"	1400 Kc	1400 Kc-per Figure 2	8, 9 & 10	"

6. With receiver installed in car, the antenna fully extended and dial set to approximately 1400 Kc, adjust the antenna trimmer (7) for maximum signal of a weak station or noise between stations.

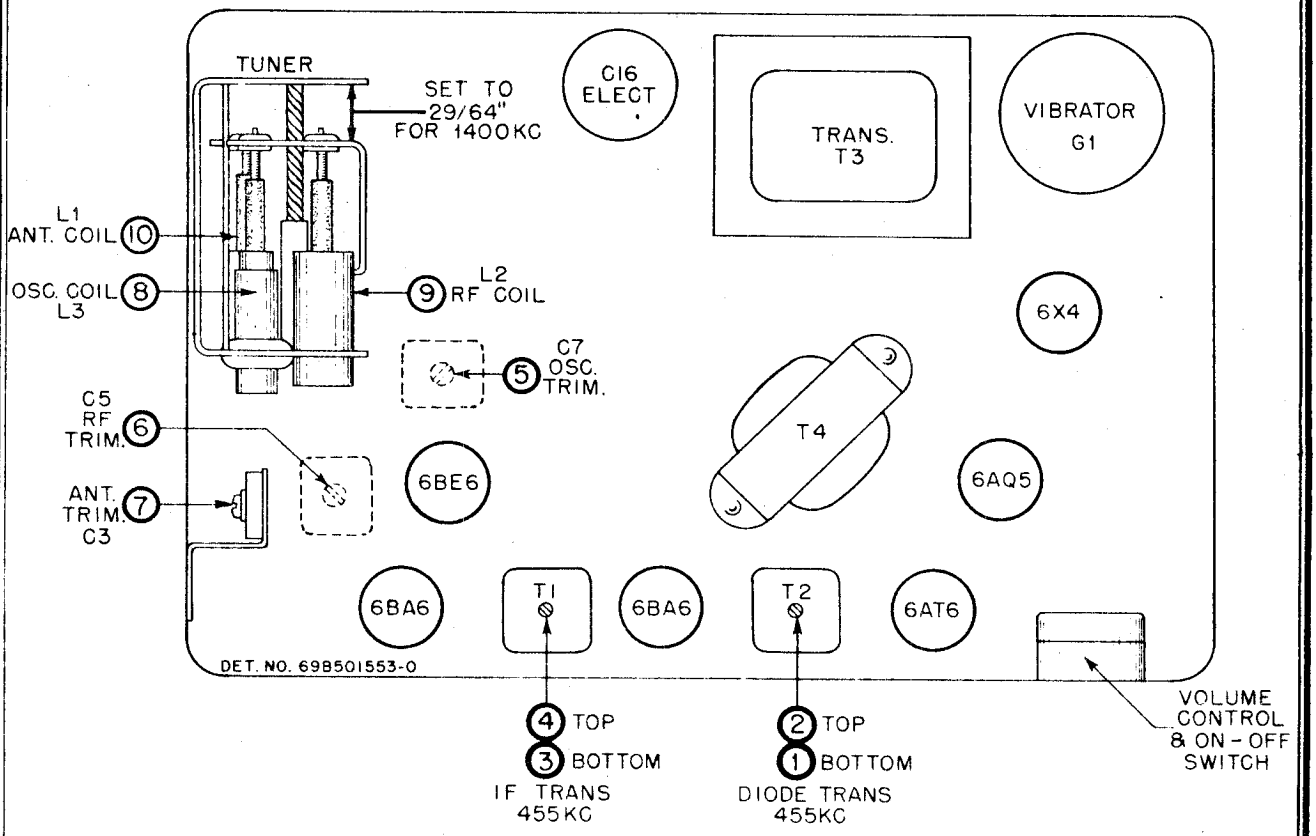


FIGURE 2. TUBE & TRIMMER LOCATIONS

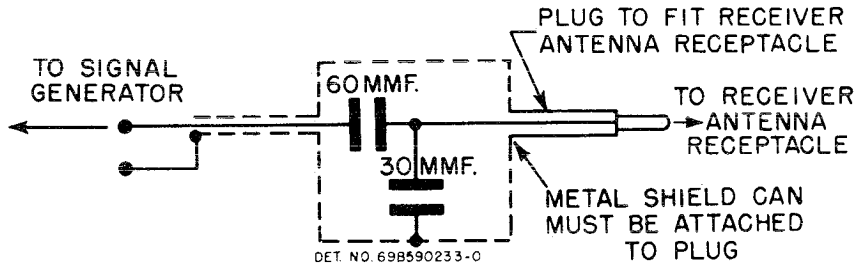


FIGURE 3. DUMMY ANTENNA

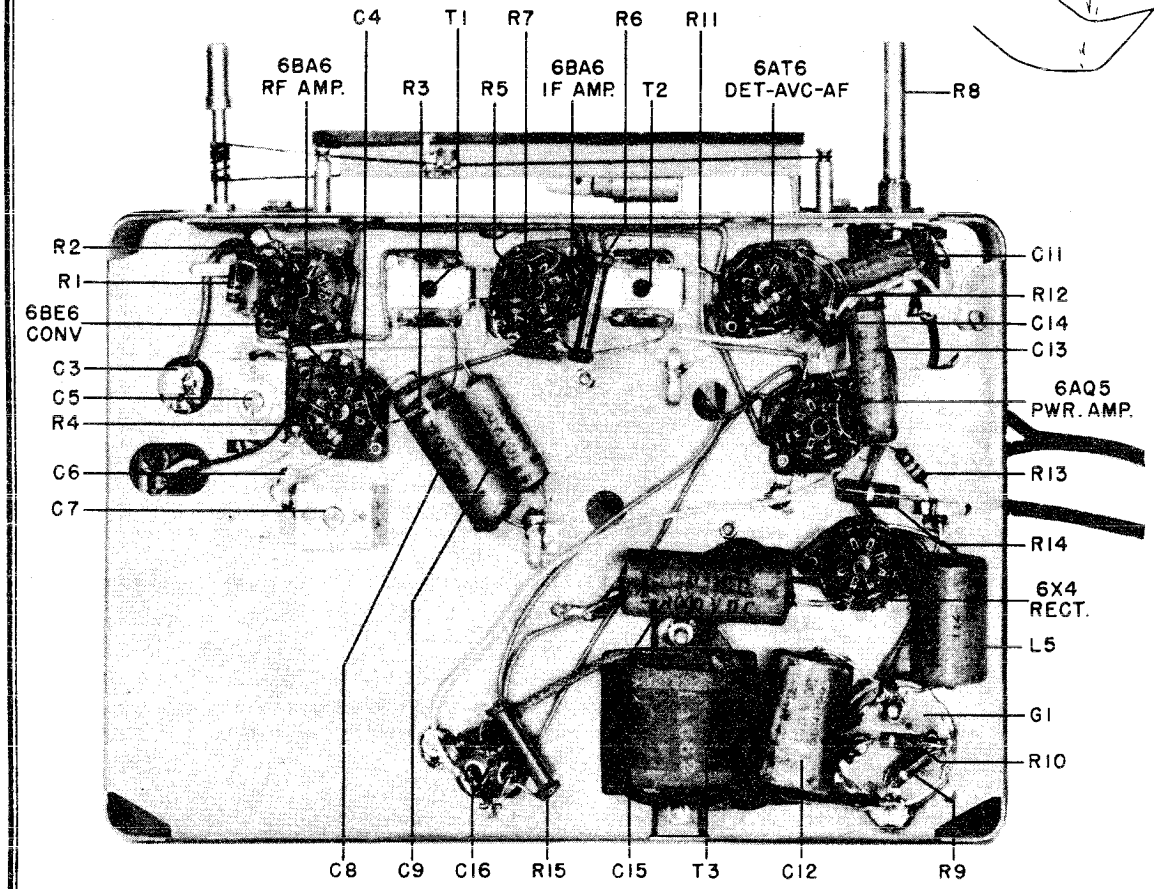


FIGURE 5. PARTS LOCATION

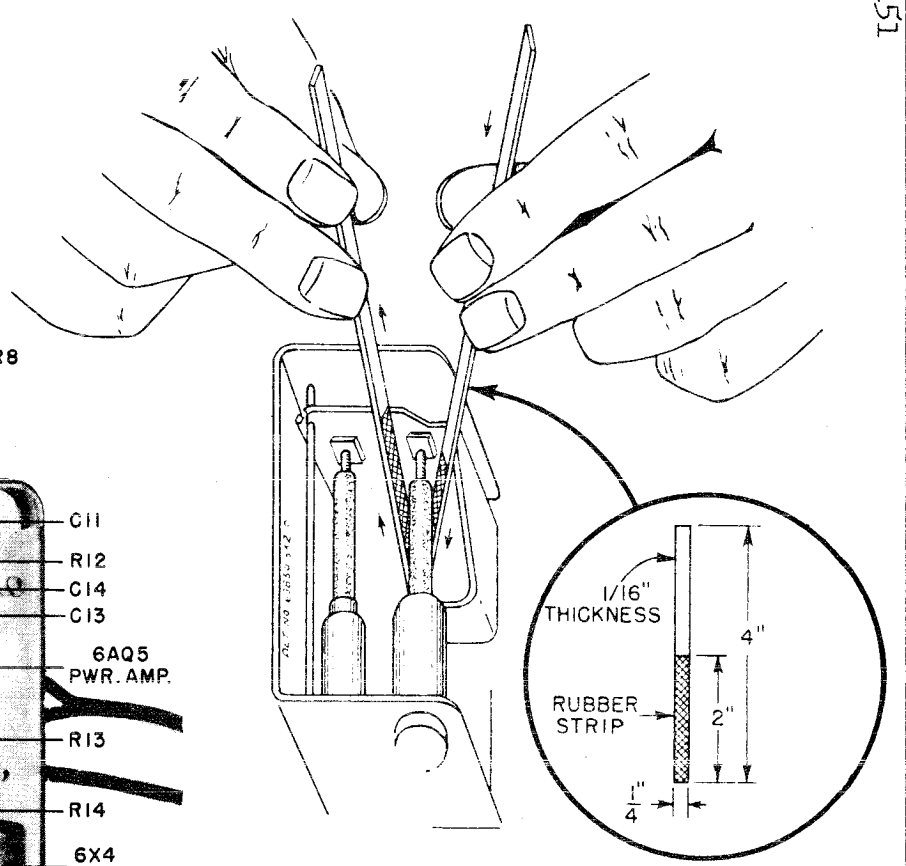


FIGURE 4. CORE ALIGNMENT DETAIL

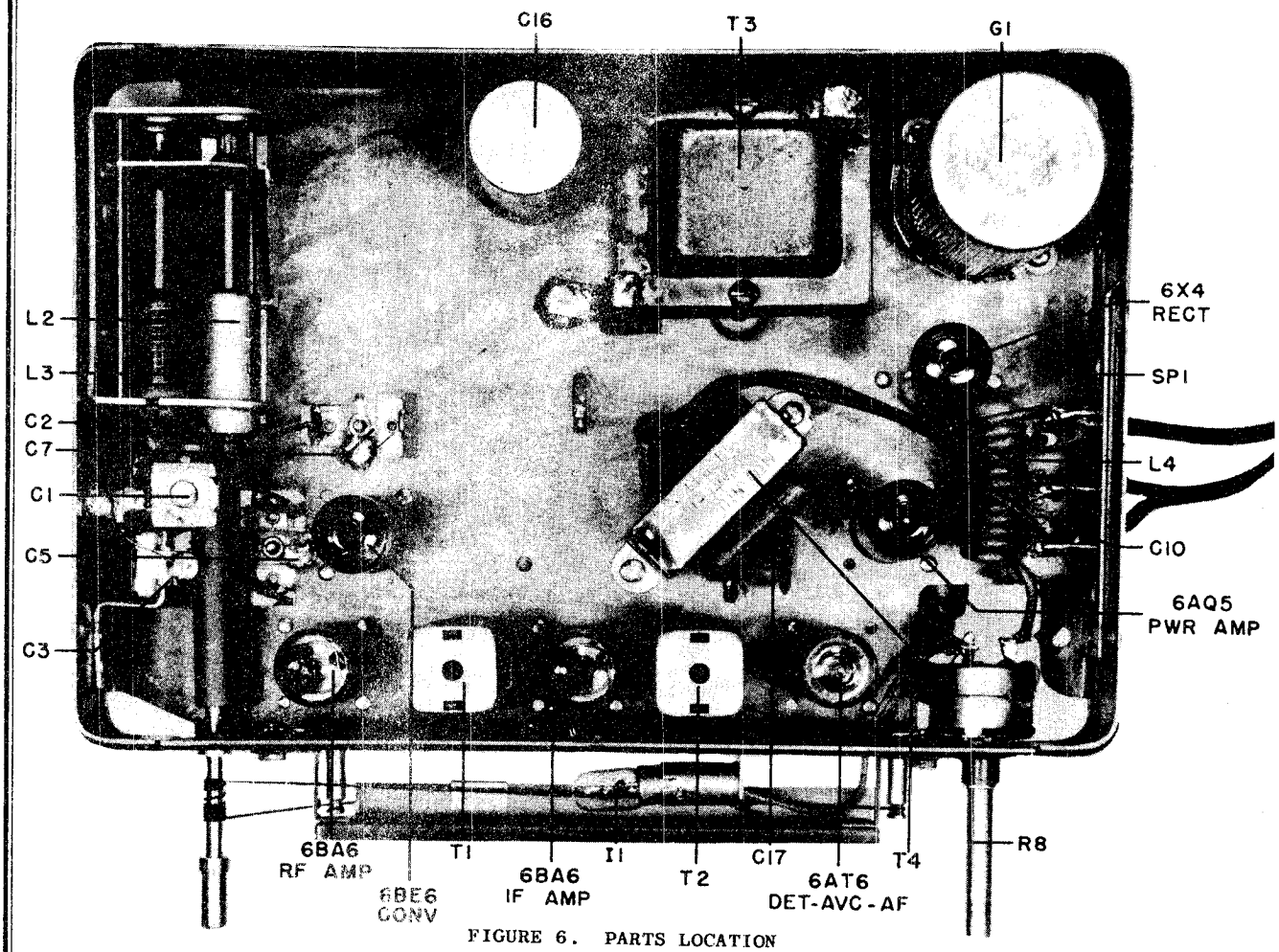


FIGURE 6. PARTS LOCATION

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A502338	Trimmer, mica: 20 to 180 mmf
C-4	21K70720	Molded: 5 mmf 500V.....
C-5	20A481526	Trimmer, mica: 20 to 80 mmf.
C-6	21K77373	Ceramic: 47 mmf .....
C-7	20A485708	Trimmer, mica: 395 to 470 mmf
C-8	8K14791	Paper: .05 mf 400V.....
C-9	8R13514	Paper: .05 mf 100V .....
C-10	8K17028	Paper: .5 mf 100V .....
C-11	8R472754	Paper: .01 mf 100V .....
C-12	8K17028	Paper: .5 mf 100V .....
C-13	8R23690	Paper: .01 mf 400V .....
C-14	21K481377	Ceramic: 500 mmf .....
C-15	8R9883	Paper: .03 mf 1000V .....
C-16	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
C-17	8K71909	Paper: .004 mf 400V .....
Fuse		
F-1	65K16248	Fuse: 9 amp .....
Vibrator		
G-1	48B3333	Vibrator: 4-pin; non-sync...
Dial Light		
I-1	65X10867	Bulb: 6.3V; .25A; tubular; bayonet base; #44 .....
Coils		
L-1	24B502472	Antenna Coil Assembly .....
L-2	24B502473	RF Coil Assembly .....
L-3	24B502474	Oscillator Coil Assembly ...
L-4	24K580706	Choke, RF .....
L-5	24A472535	Choke, hash .....
Speaker		
LS-1	50B501989	Speaker, PM: 5-1/4"; 3.2 ohm voice coil .....
Resistors		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W .....
R-2	6R3992	150 20% 1/2W .....
R-3	6R6075	100,000 20% 1/2W .....
R-4	6R6056	47,000 20% 1/2W .....
R-5	6R6010	330 20% 1/2W .....
R-6	6R490001	6800 10% 1W N.I. ....

MODEL 451

Ref. No.	Part Number	Description
R-7	6R6004	1 meg 20% 1/2W .....
R-8	18K501294	Volume Control: .5 meg; includes on-off switch....
R-9	6R5614	56 10% 1/2W .....
R-10	6R5614	56 10% 1/2W .....
R-11	6R2122	4.7 meg 20% 1/2W .....
R-12	6R6032	470,000 20% 1/2W .....
R-13	6R6414	270,000 10% 1/2W .....
R-14	6R6336	270 10% 1W .....
R-15	6R488312	2200 10% 1W N.I. .....
Spark Plate		
SP-1	1B501290	Spark Plate Assembly ....
Transformers		
T-1	24B485553	IF, 455 Kc: complete ....
T-2	24K485554	Diode, 455 Kc: complete..
T-3	25C501303	Power Transformer .....
T-4	25B70171	Output Transformer .....
CHASSIS PARTS - MECHANICAL		
	7K501418	Bracket, dial background: ivory
	1X76859	Cable Assembly, speaker .....
	42A485548	Clip, coil can mtg (T-1 & T-2)..
	42A4215	Clip, vibrator grounding .....
	11M8877	Cord, dial: 20 lb; black .....
	58A501296	Coupling, tuning shaft .....
	4S7666	Lockwasher, ext: #6; cad pl (power transformer mtg) .....
	2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) ....
	2S7051	Nut, hex: 3/8-32 x 9/16; Palnut; stl; cad pl (volume control mtg) .....
	1A501293	Pointer and Sliver Assembly ....
	9A472148	Receptacle, antenna .....
	5S7770	Rivet: .088 x 5/32; stl; nkl pl (tube socket mtg) .....
	5S7706	Rivet: .122 x 1/8; stl; nkl pl (dial light mtg) .....
	5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer, vibrator socket, and trimmer mtg) ....
	5S7703	Rivet: .122 x 7/32; stl; nkl pl (spark plate assembly mtg)...
	5K501365	Rivet, shoulder (dial cord guide) .....
	3S7247	Screw, machine: 6-32 x 3/16; slotted locking head; stl; cad pl (tuner mtg) .....
	3S7506	Screw, sheet metal: #6 x 1/4; plain hex head; stl; cad pl (dial background bracket mtg) .....
	47B501362	Shaft, tuning .....
	9K592354	Socket, dial light: includes mtg bracket .....
	9A472534	Socket, tube: miniature; 7-prong...
	9K580218	Socket, tube: miniature; 7-prong; with dummy lug .....
	9A70208	Socket, tube: 4-prong (vibrator)...
	41A485380	Spring, insert (inside tuning shaft coupling) .....
	29A76280	Terminal, pin and washer: black (speaker cable) .....
	29K76282	Terminal, pin and washer: white (speaker cable) .....
	4K501364	Washer, "C" (tuning shaft retainer) .....

Part Number	Description
HOUSING PARTS	
43A501295	Bushing, mounting (on control shafts) .....
15D501282	Cover, housing bottom .....
15K501310	Cover, housing top .....
13D501197	Escutcheon, dial: chrome pl .....
36B501297	Knob, control: includes setscrew...
64K501447	Plate, dial scale retaining: ivory.
34B501360	Scale, dial: glass .....
3S8114	Screw, sheet metal: #8 x 1/4; slotted acorn head; antique copper finish (housing screws) .....
3S490733	Screw, sheet metal: #8 x 1/4 Phillips head; chrome pl (escutcheon mtg) .....
3S7118	Setscrew (control knob) .....
2S7087	Speednut (dial scale mtg) ...
MOUNTING PARTS AND ACCESSORIES	
7B501298	Bracket, receiver mtg (recvr to instrument panel) .....
7A72256	Bracket, receiver mtg (on hsng)....
7A484424	Bracket and Stud Assembly (receiver mtg) .....
8A4491	Capacitor, noise suppression (generator cap) .....
9K592648 or 9K580705	Lead Assembly: complete with fuse..
4S7688	Lockwasher, int-ext: 1/4; cad pl (receiver mtg).....
2S2878	Nut, hex: 1/4-20 x 7/16; stl; cad pl (receiver mtg) .....
3S7475	Screw, sheet metal: #8 x 1/4 slotted acorn head; cad pl (mtg brkt mtg-rear) .....
3S8109	Screw, sheet metal: #8 x 3/8; PKZ; slotted acorn head; cad pl (mtg brkt mtg-front) .....
3S7295	Screw, machine: 1/4-20 x 3/4; plain hex head; stl; cad pl (receiver mtg strap) .....
3S9694	Screw, machine: 1/4-20 x 1-1/2; plain hex head; stl; cad pl (receiver mtg to firewall).....
42A485718	Strap, receiver mtg .....
6A4141	Suppressor, noise (distributor)..
TUNER - MODEL MT-87	
	Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List
51D502490	Tuner, Model MT-87: complete.....
43A502513	Bushing, stop (stop on manual drive shaft) .....
42A502507	Clip, spring (manual drive shaft retainer) .....
46A502505	Core, iron (L-1, 2 & 3 tuning-specify color coding on old core when ordering) .....
5A502510	Grommet (L-1 & L-2 mtg) .....
5K502516	Grommet (L-3 mtg) .....
5A501503	Grommet (L-1, 2 & 3 core mtg)...
2A502508	Nut, tension drive (on tuner carriage) .....
47A502509	Shaft, manual drive .....
46A502506	Sleeve, iron (inside L-1 & L-2 shields) .....
4K502518	Washer, fibre (on manual drive shaft) .....
4A502517	Washer, paper (inside L-1 & L-2 shields) .....

MODEL 451

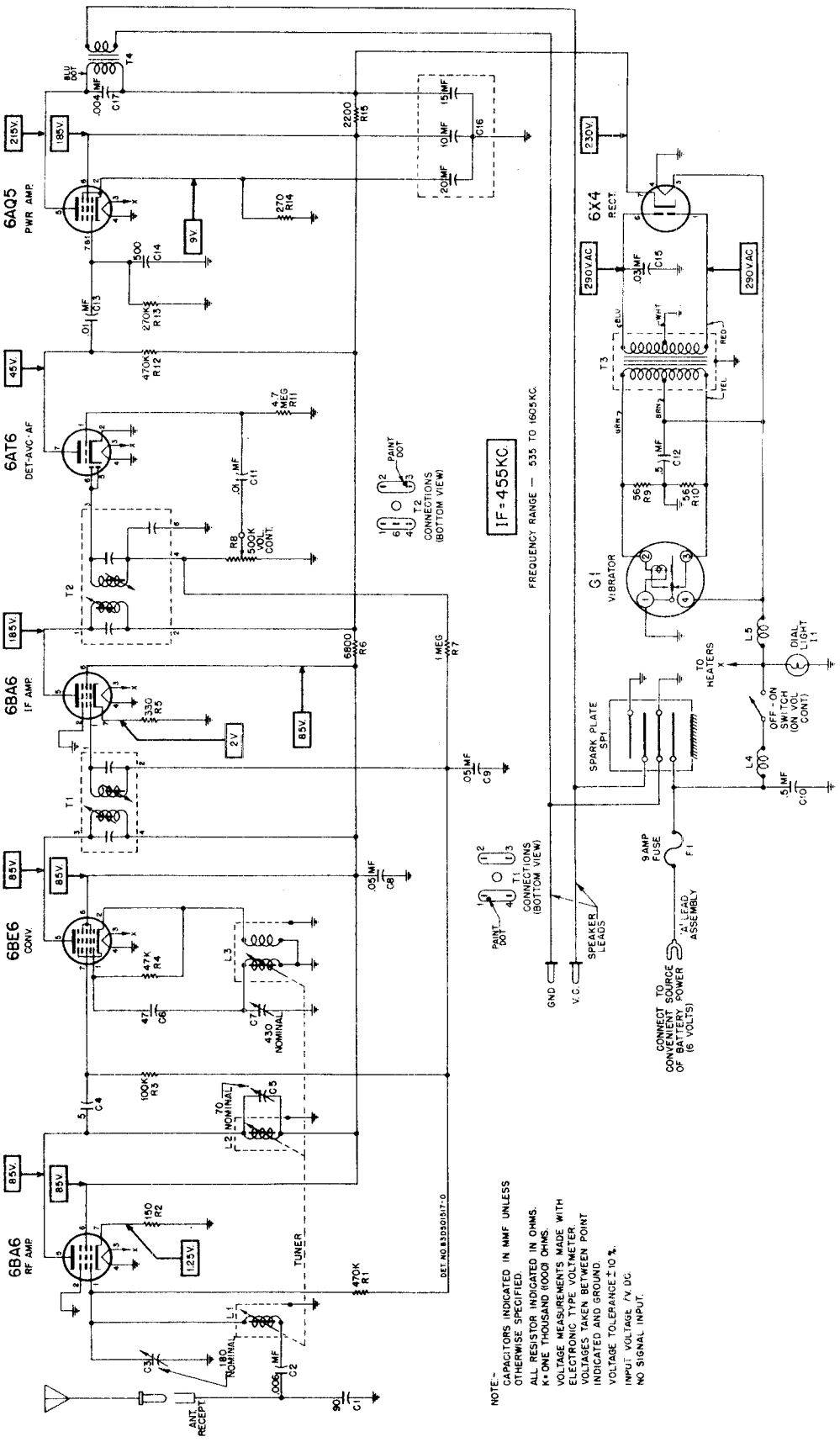


FIGURE 7. SCHEMATIC DIAGRAM

MODEL 501

GENERAL INFORMATION

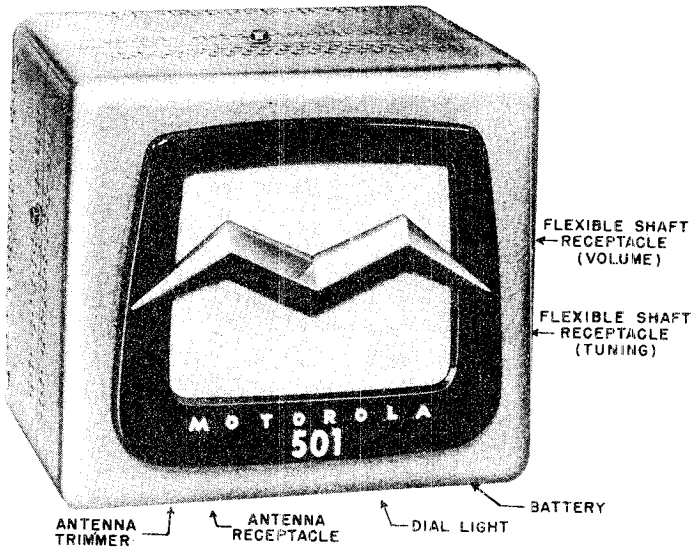
TYPE - Compact automotive type superheterodyne receiver with self-contained speaker. Receiver is designed for installation in any car when used with appropriate Motorola control head.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)



REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V .....
C-2	8C4529	Paper: .006 mf 100V .....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf; on same bracket as C-5 and C-7 (sold only as assembly) .....
C-4	21K70720	Molded: 5 mmf 500V .....
C-5	20K592078	Trimmer, variable: 20 to 180 mmf; on same bracket as C-3 and C-7 (sold only as assembly) .....
C-6	8K17028	Paper: .5 mf 100V .....
C-7	20K592078	Trimmer, variable: 500 to 580 mmf; on same bracket as C-3 and C-5 (sold only as assembly) .....
C-8	21R6513	Mica: 50 mmf 10% 300V....
C-9	8R13166	Paper: .1 mf 400V .....
C-10	8R13514	Paper: .05 mf 100V .....
C-11	8R13514	Paper: .05 mf 100V .....
C-14	21K70720	Molded: 5 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V .....
C-16	8R490449	Paper: .02 mf 1000V.....
C-17	21K478410	Ceramic: 1000 mmf 500V.....
C-18	8R71911	Paper: .03 mf 400V .....
C-19	8R23690	Paper: .01 mf 400V.....
C-20	23A485677	Electrolytic: 15-10-20 mf/350-350-25V .....
Fuse		
F-1	65K16248	9 amp .....
Vibrator		
G-1	48B3333	Non-sync: 4-pin .....
Coils		
L-1,2	24B71881	RF & Antenna Coil (specify color of paint dots on old coil when ordering) .....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24K78026	Choke,("A" lead).....
L-5	24K78026	Choke (dial light) .....
L-6	24A472535	Choke, hash .....
Resistors		
Note:		All resistors are insulated carbon type. 20% unless otherwise specified.
R-1	6R6032	470,000 1/2W .....

Ref. No.	Part Number	Description
R-2	6R6432	270 10% 1/2W .....
R-3	6R6075	100,000 1/2W .....
R-4	6R6056	47,000 1/2W .....
R-5	6R6090	470 10% 1/2W .....
R-6	6R6287	6800 1W N.I. .....
R-7	6R6004	1 meg 1/2W .....
R-8	1A472531	Volume Control: 500,000 ohms; includes SPST switch ..
R-9	6R6056	47,000 1/2W .....
R-10	6R6004	1 meg 1/2W .....
R-11	6R5614	56 10% 1/2W .....
R-12	6R5614	56 10% 1/2W .....
R-13	6R2118	3.3 meg 1/2W .....
R-14	6R6032	470,000 1/2W .....
R-15	6R6015	220,000 1/2W .....
R-16	6R6336	270 10% 1W .....
R-17	6R6184	1000 1W N.I. .....
R-18	6R5577	2700 10% 1/2W .....
Spark Plate		
SP-1	1X592328	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....

Part Number	Description
CHASSIS PARTS - MECHANICAL	
42A485548	Clip, coil can mtg .....
42A13177	Clip, center post grounding.....
42A4215	Clip, vibrator grounding .....
4S7695	Lockwasher, int: #5; stl; cad pl (terminal strip mtg).....
9A472148	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (center post ground clip mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and output transformer mtg) .....
5S7701	Rivet: .122 x 3/16; steel; nkl (vibrator grounding clip mtg)
3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 plain hex head; stl; cad pl (capacitor bracket assembly and spark plate mtg) .....
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power transformer mtg) .....
9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 8-prong...
31C4079	Strip, terminal: 1 insulated lug, end mtg .....
31A472573	Strip, terminal: 2 ins lugs, #2 mtg .....

Part Number	Description
HOUSING PARTS	
42A472033	Clip, chassis retainer .....
13B501659	Cloth, speaker escutcheon .....
13D501358	Escutcheon, speaker .....
1X501347	Housing and Bushing Assembly, rear.
1X501349	Housing, front: includes escutcheon.
3S7456	Screw, sheet metal: #8 x 1/4 PKA slotted acorn head; antique copper finish (housing screws).....
ACCESSORIES	
65X4151	Bulb, pilot light: 6-8V; clear bayonet base .....
8A4491	Capacitor, generator .....
9B473111	Lead Assembly, fuse: complete with 9 amp fuse .....
1X74340	Lead Assembly, dial light: complete with bulb .....
4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg) .....
4S7657	Lockwasher, ext: #8; stl; cad pl (speaker mtg) .....
2S7003	Nut, hex: #8 x 5/16; stl; cad pl (speaker mtg) .....
2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft, flexible: with housing 24" lg
50K500415	Speaker, PM: 5-1/4; 3.2 ohm VC.....
3A77542	Stud, receiver mtg .....
6X4141	Suppressor, distributor .....
TUNER PARTS - MECHANICAL	
	Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List.
1X592301	Manual Tuner MT-75 .....
1X592099	Base, Sleeve, Shields and Channels Assembly .....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly.....
42A70184	Clip, core adjustment .....
46K592080	Core, iron and screw.....
58K78012	Coupling, manual lead screw ...
14A70876	Insulator, coil sleeve .....
14B78007	Insulator, slug: bakelite.....
2A77596	Nut, floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw) .....
64A77593	Plate, tuner front .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg) .....
47A78002	Rod, carriage guide.....
3S7352	Screw, machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg) .....
43A70881	Sleeve, coil (iron) .....
41A77595	Spring, coil slug .....
41A77592	Spring, compression .....
42A21577	Washer, "C": spring (manual lead screw mtg) .....
4A70873	Washer, coil spacer .....
4A74571	Washer, fishpaper.....
4A70956	Washer, slug insulator .....
4K485653	Washer, spring (manual lead screw mtg) .....

MODEL 501

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part No. 66A76278, is required for adjusting the tuner cores. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

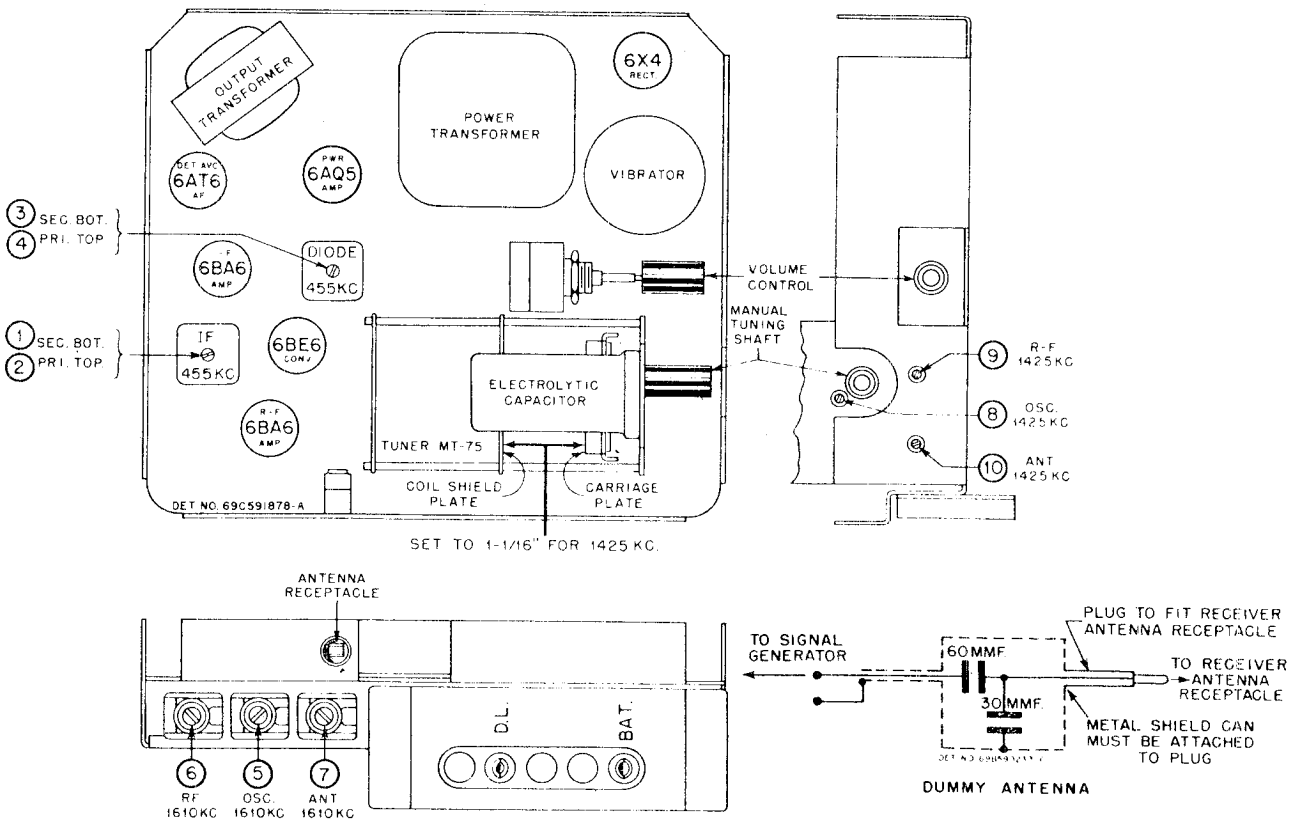


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA

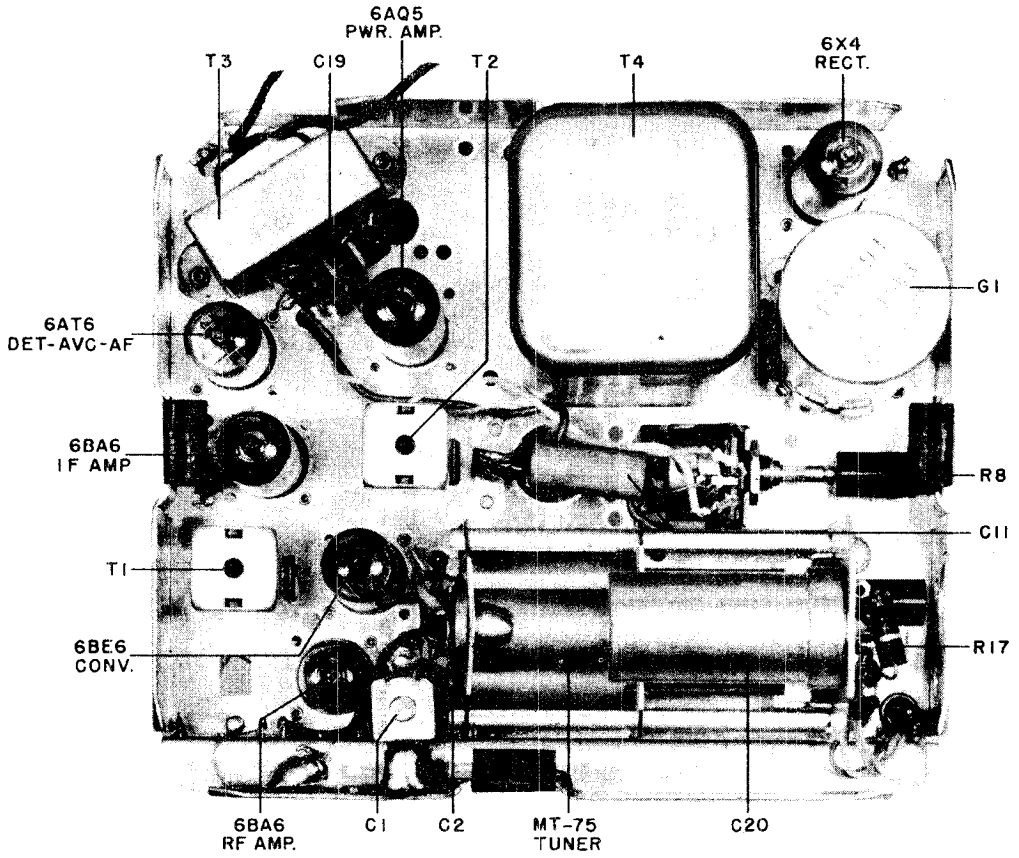


FIGURE 2. TOP VIEW OF CHASSIS

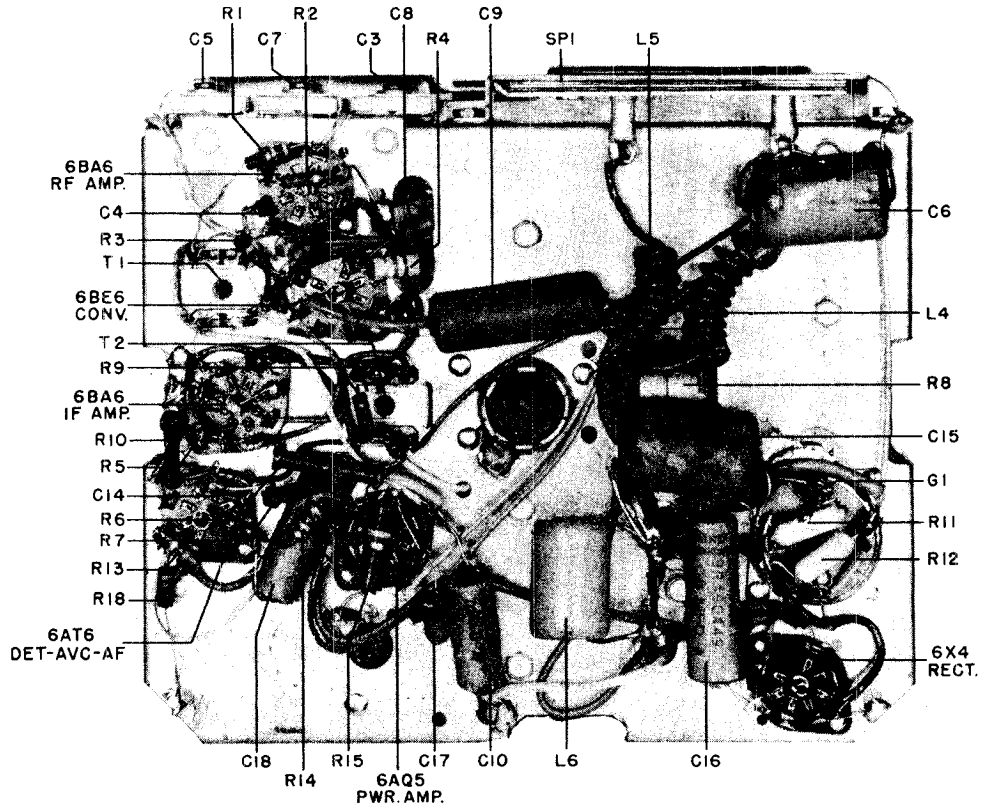


FIGURE 3. BOTTOM VIEW OF CHASSIS

MODEL 501

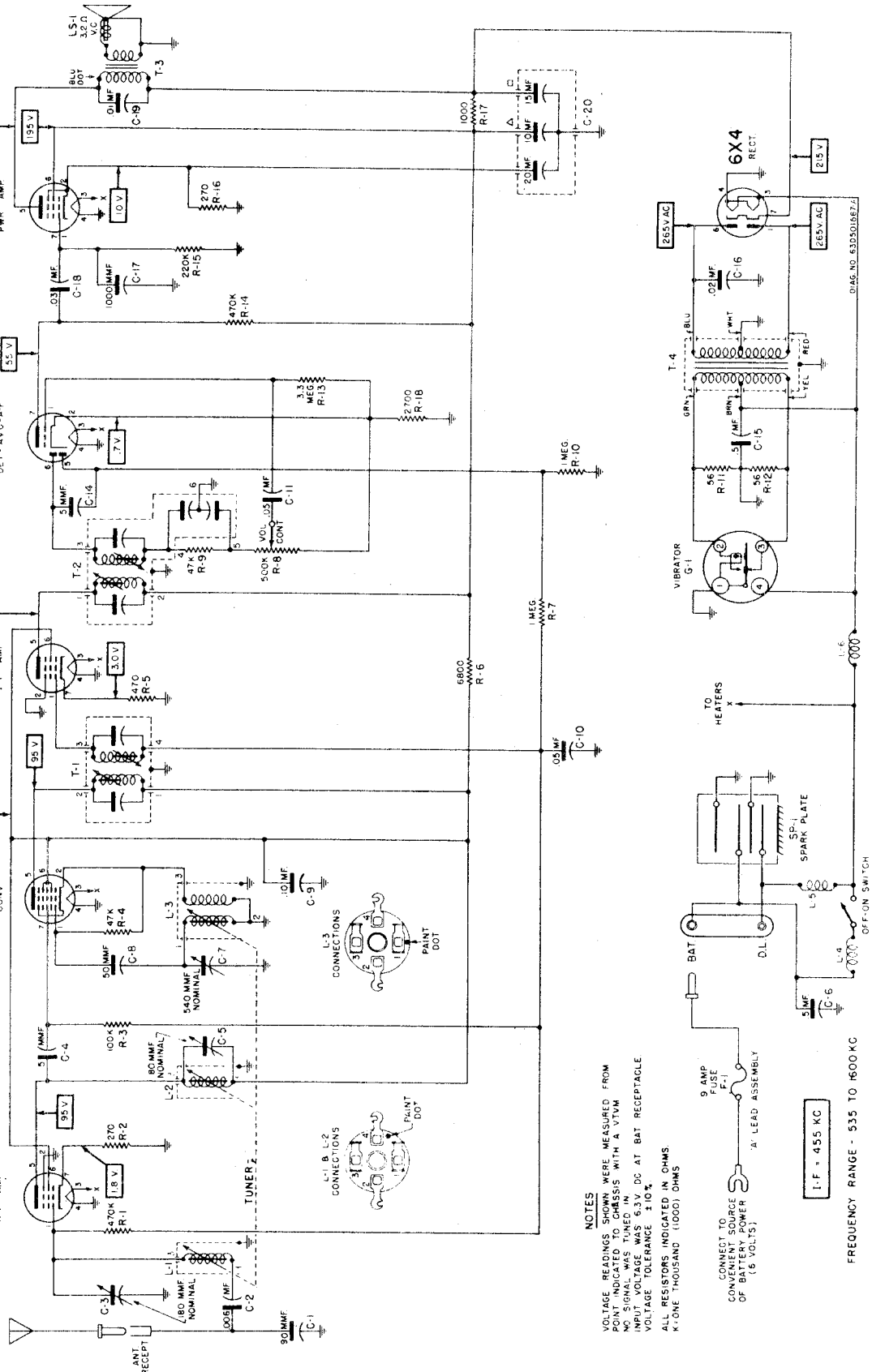


FIGURE 4. SCHEMATIC DIAGRAM

GENERAL INFORMATION

TYPE - Compact automotive type superheterodyne receiver with self-contained speaker. Receiver is designed for installation in any car when used with appropriate Motorola control head.

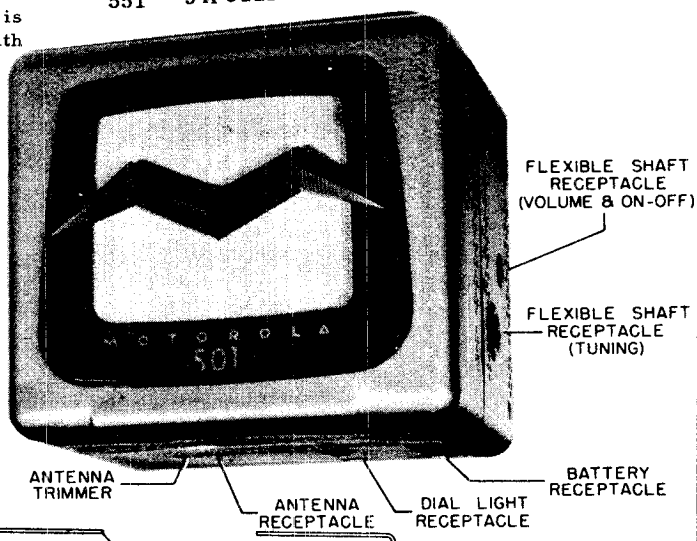
TUNING RANGE - 540 to 1600 Kc IF - 455 Kc

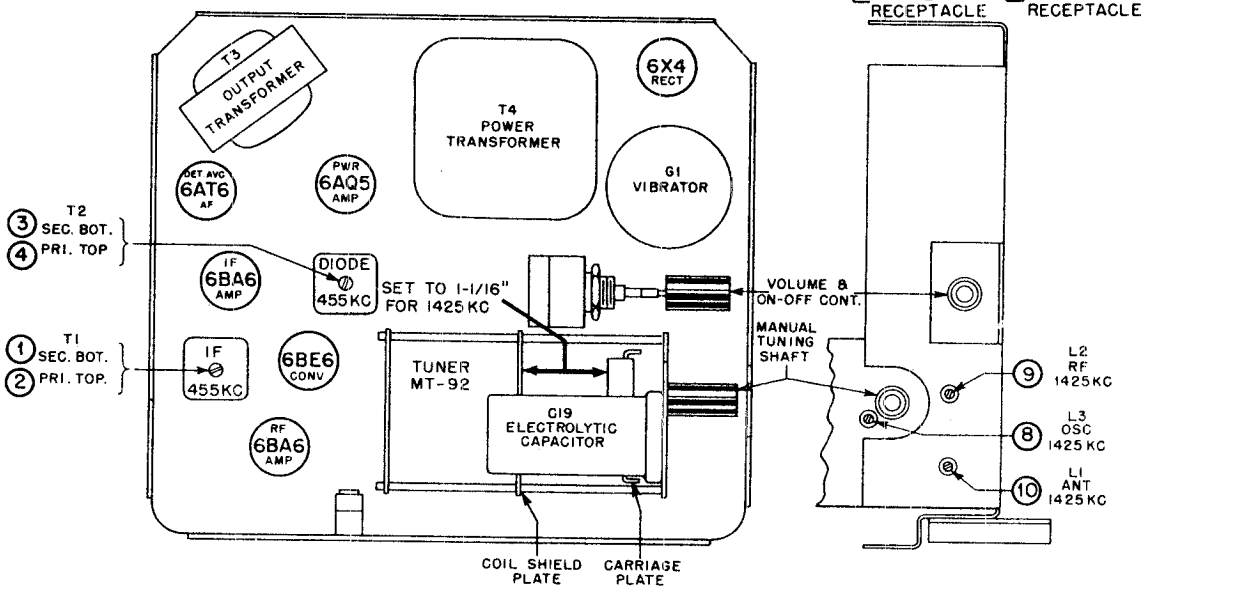
TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

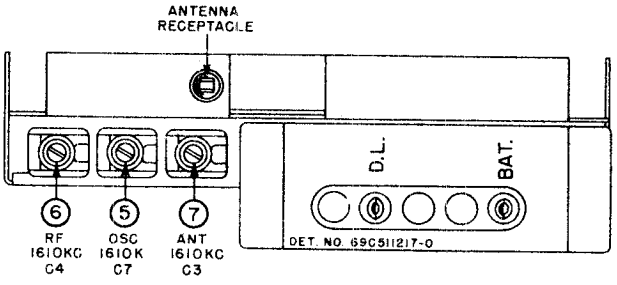
POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)

551 54P511221







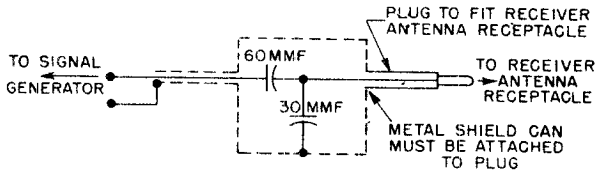


FIGURE 1. TUBE AND TRIMMER LOCATIONS AND DUMMY ANTENNA

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part No. 66A76278, is required for adjusting the tuner cores. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

MODEL 501A

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (screw out if necessary)	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1425Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

INSTALLATION INFORMATION

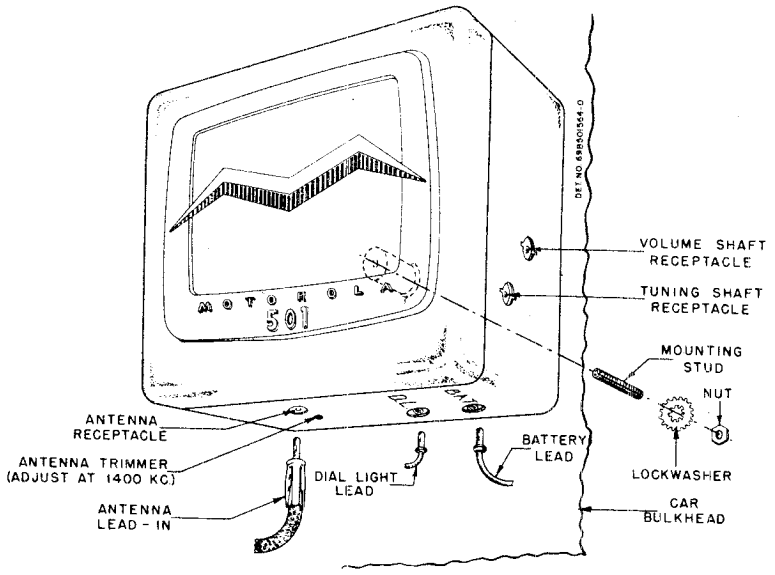


FIGURE 2. RECEIVER INSTALLATION DETAIL

INSTALL DISTRIBUTOR SUPPRESSOR

Cut the high tension lead, which runs from the center terminal of the car distributor to the ignition coil, approximately 1-1/2 inches from the distributor. See Figure 3. Screw the distributor suppressor in series with the two pieces of high tension wire, and plug the end terminal of the lead into the center receptacle of the distributor.

INSTALL CAPACITOR ON GENERATOR

Mount the noise suppression capacitor (Motorola Part Number 8A4491) on the generator frame, under the ground lead screw. See Figure 4. Connect the capacitor lead to the armature terminal of the generator. WARNING: DO NOT CONNECT THE CAPACITOR LEAD TO THE FIELD TERMINAL.

ADDITIONAL MOTOR NOISE HINTS

1. When checking the car for motor noise, clamp the hood down tight.
2. Hood Bonds (Motorola Part Number 39A4205) may be installed at the shoulders so that the hood makes a good ground to the cowl of the car.

TIRE STATIC

After completion of radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Elimination Powder (available in kit form - Motorola Part Number 51B591494) into tires, following instructions given on the package.

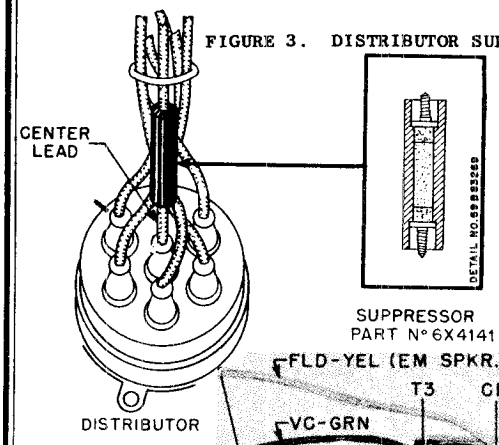


FIGURE 3. DISTRIBUTOR SUPPRESSOR INSTALLATION

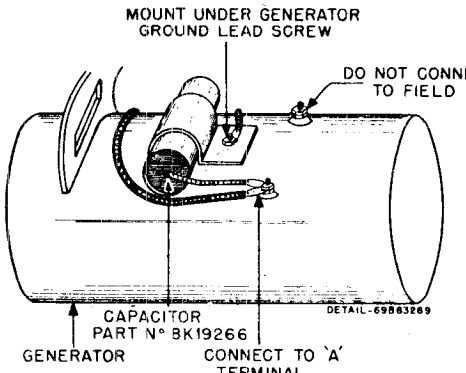


FIGURE 4. GENERATOR CAPACITOR INSTALLATION

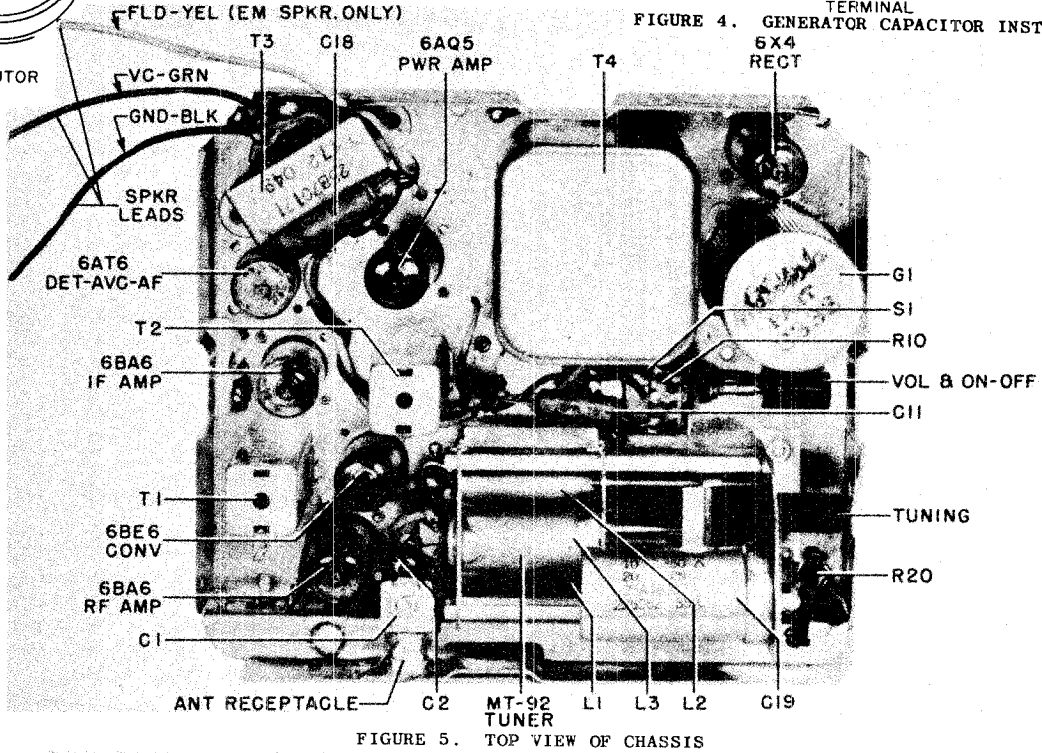


FIGURE 5. TOP VIEW OF CHASSIS

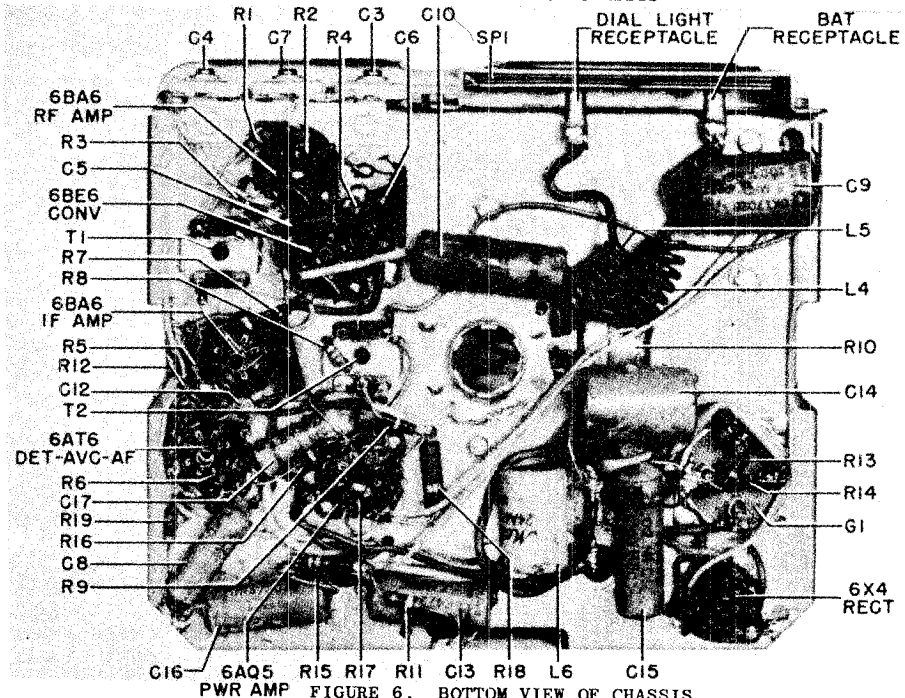


FIGURE 6. BOTTOM VIEW OF CHASSIS

MODEL 501A

REPLACEABLE PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

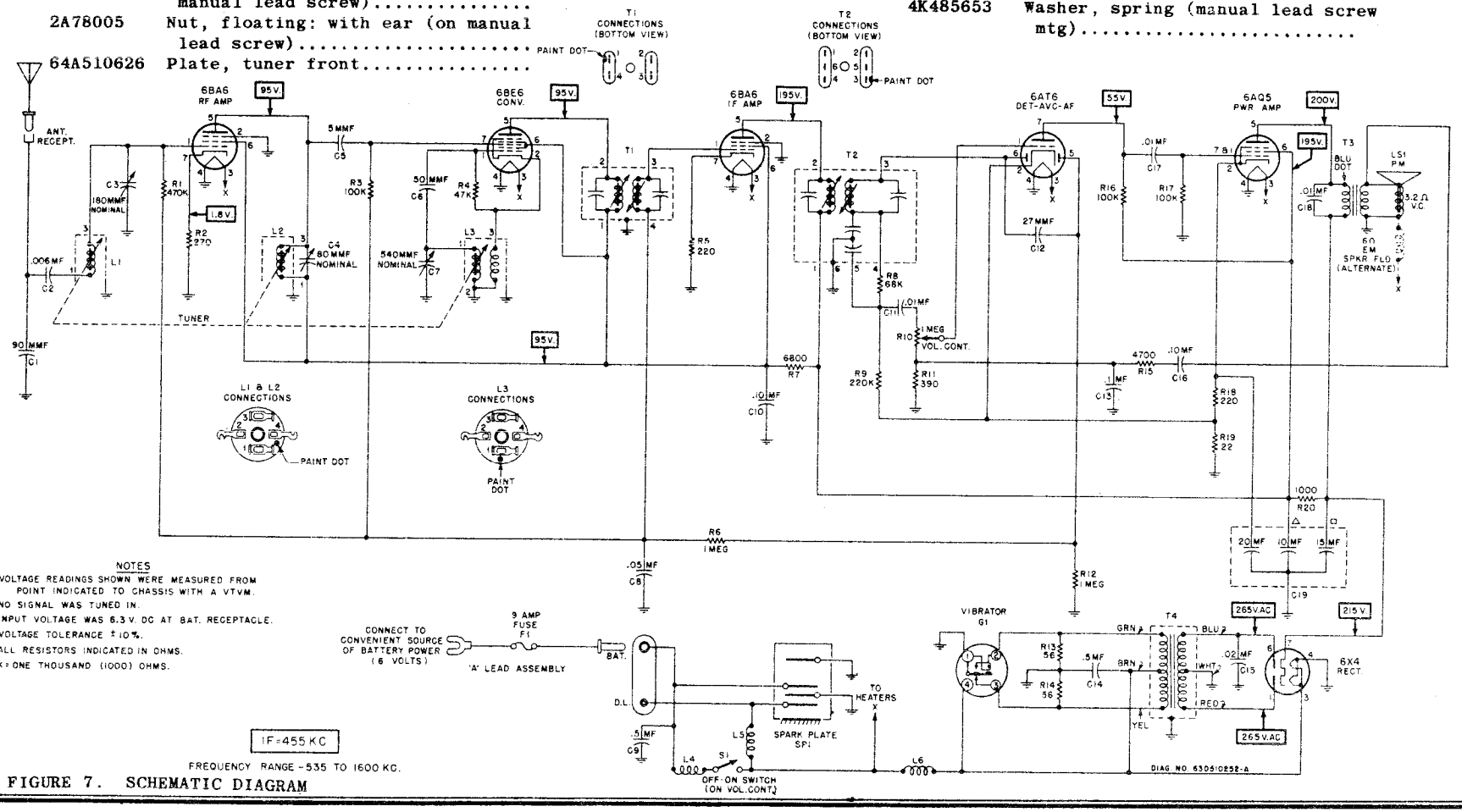
Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf on same brkt as C-4 and 7 (sold only as a assem)...
C-4	20K592078	Trimmer, variable: 20 to 180 mmf; on same brkt as C-3 and 7 (sold only as a assem)
C-5	21K70720	Molded: 5 mmf 500V.....
C-6	21R6513	Mica: 50 mmf 10% 300V....
C-7	20K592078	Trimmer, variable: 500 to 580 mmf; on same brkt as C-3 and 4 (sold only on as a assem).....
C-8	8R13514	Paper: .05 mf 100V.....
C-9	8K17028	Paper: .5 mf 100V.....
C-10	8R13166	Paper: .1 mf 400V.....
C-11	8R472754	Paper: .01 mf 100V.....
C-12	21R410089	Molded Disc.: 27 mmf.....
C-13	8R472035	Paper: 1 mf 100V.....
C-14	8K17028	Paper: .5 mf 100V.....
C-15	8R490449	Paper: .02 mf 1000V.....
C-16	8R472035	Paper: .1 mf 100V.....
C-17	8R9809	Paper: .01 mf 400V.....
C-18	8R23690	Paper: .01 mf 400V.....
C-19	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V.....
Fuse		
F-1	65K16248	9 amp.....
Vibrator		
G-1	48B3333	Non-sync: 4-pin.....
Coils		
L-1,2	24B71881	RF and Antenna Coil (Specify color of paint dots on old coil when ordering).....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering).....
L-4	24K78026	Choke, ("A" lead).....
L-5	24K78026	Choke (dial light).....
L-6	24A472535	Choke, hash.....
Resistors		
		Note: All resistors are insulated carbon type, 20%, unless otherwise specified.
R-1	6R6032	470,000 20% ½W.....
R-2	6R6432	270 10% ½W.....
R-3	6R6075	100,000 20% ½W.....
R-4	6R6056	47,000 20% ½W.....
R-5	6R3933	220 20% ½W.....
R-6	6R6004	1 meg 20% ½W.....
R-7	6R6287	6800 20% 1W.....
R-8	6R6074	68,000 10% ½W.....
R-9	6R6015	220,000 20% ½W.....
R-10	18A510819	Volume control: 1 meg; with Spst switch; incl mtg nut..
R-11	6R5554	390 10% ½W.....
R-12	6R6004	1 meg 20% ½W.....
R-13	6R5614	56 10% ½W.....
R-14	6R5614	56 10% ½W.....
R-15	6R6039	4700 20% ½W.....
R-16	6R6075	100,000 20% ½W.....
R-17	6R6075	100,000 20% ½W.....
R-18	6R6389	220 10% 1W.....
R-19	6R6406	22 10% ½W.....
R-20	6R6184	1000 20% 1W.....

Ref. No.	Part Number	Description
Spark Plate		
SP-1	1X592328	Spark Plate Assembly: complete.....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors.....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors.....
T-3	25B70171	Output Transformer.....
T-4	25B472533	Power Transformer.....
CHASSIS PARTS - MECHANICAL		
	42A485548	Clip, coil can mtg.....
	42A13177	Clip, center post grounding.....
	42A4215	Clip, vibrator grounding.....
	9A472148	Receptacle, antenna.....
	5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg).....
	9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket).....
	9A472534	Socket, tube: miniature; 7-prong...
	9K580218	Socket, tube: miniature; 7-prong; with dummy lug.....
	31C4079	Strip, terminal: 1 insulated lug, end mtg.....
	31A472573	Strip, terminal: 2 ins lugs, #2 mtg.....
HOUSING PARTS		
	42A472033	Clip, chassis retainer.....
	13B510654	Cloth, speaker grille.....
	13D501358	Escutcheon, speaker: plastic.....
	1X510826	Housing and Bushing Assembly, rear.
	1X510828	Housing, front: includes escutcheon
	3S7456	Screw, sheet metal: #8 x ¼ PKA slotted acorn head; antique copper finish (housing screws).....
ACCESSORIES		
	65X4151	Bulb, pilot light: 6-8V; bayonet base; #51.....
	8A4491	Capacitor, generator.....
	9B473111	Lead Assembly, fuse: complete with 9 amp fuse.....
	1X74340	Lead Assembly, dial light: complete with bulb.....
	4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg).....
	4S7657	Lockwasher, ext: #8 ; stl; cad pl (speaker mtg).....
	2S7003	Nut, hex: #8 x 5/16; stl; cad pl (speaker mtg).....
	2S2863	Nut, hex: 5/16-18 x 9/16; stl; cad pl (receiver mtg).....
	1K75148	Shaft, flexible: with housing; 24" lg.....
	50B510485 or 50B510878	Speaker, EM: 5¼; 3.2 ohm VC; 6V fld
	50K500415 or 50B510427	Speaker, PM: 5¼; 3.2 ohm VC.....
	3A77542	Stud, receiver mtg.....
	6A4141	Suppressor, distributor.....
	29K76284	Terminal, pin: red (fuse lead)....
	29K76287	Terminal, pin: gray (dial light lead).....

TUNER PARTS - MECHANICAL

Note: Electrical parts of the tuner are included in the Electrical Chassis Parts List

1X510840	Manual Tuner MT-92: complete.....
1X592099	Base, Sleeve, Shields and Channels Assembly.....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly.....
42A70184	Clip, core adjustment.....
46K592080	Core, iron and screw.....
58K78012	Coupling and Manual Lead Screw....
14A70876	Insulator, coil sleeve.....
14B78007	Insulator, slug: bakelite.....
2A77596	Nut, floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw).....
64A510626	Plate, tuner front.....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg).....
47A78002	Rod, carriage guide.....
3S7352	Screw, machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg).....
43A70881	Sleeve, coil (iron).....
41A77595	Spring, core.....
41A77592	Spring, compression (on manual tuning shaft).....
42A21577	Washer, "C": spring (manual lead screw mtg).....
4A70873	Washer, coil spacer.....
4A74571	Washer, fishpaper.....
4A70956	Washer, slug insulator.....
4K485653	Washer, spring (manual lead screw mtg).....



NOTES

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS WITH A VTVM.
NO SIGNAL WAS TUNED IN.
INPUT VOLTAGE WAS 6.3 V. DC AT BAT. RECEPTACLE.
VOLTAGE TOLERANCE ±10%.
ALL RESISTORS INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.

FIGURE 7. SCHEMATIC DIAGRAM

MODEL 601

GENERAL INFORMATION

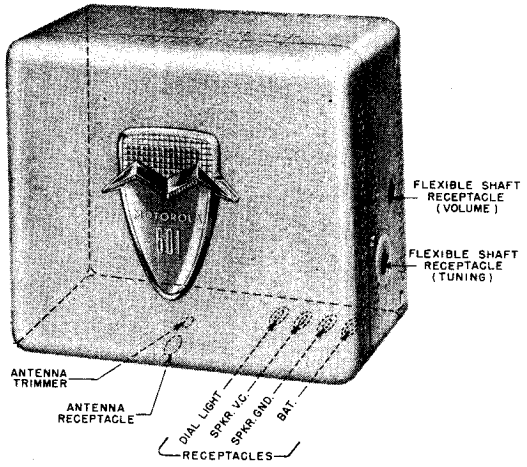
TYPE - Compact automotive type superheterodyne receiver designed for installation in any car when used with appropriate Motorola control head and speaker.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amp
6AQ5 - Power Amplifier
6X4 - Rectifier

POWER INPUT - 6.8 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)



REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Ceramic: 90 mmf 500V.....
C-2	8C4529	Paper: .006 mf 100V.....
C-3	20K592078	Trimmer, variable: 50 to 280 mmf; on same bracket as C-5 and C-8 (sold only as assembly) .....
C-4	8R13166	Paper: .1 mf 400V .....
C-5	20K592078	Trimmer, variable: 20 to 180 mmf; on same bracket as C-3 and C-8 (sold only as assembly) .....
C-6	21K70720	Molded: 5 mmf 500V.....
C-7	21R6513	Mica: 50 mmf 10% 300V....
C-8	20K592078	Trimmer, variable: 500 to 580 mmf; on same bracket as C-3 and C-5 (sold only as assembly) .....
C-9	8K17028	Paper: .5 mf 100V.....
C-10	8R13514	Paper: .05 mf 100V.....
C-11	8R13514	Paper: .05 mf 100V.....
C-14	21K70720	Molded: 5 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V.....
C-16	8R490449	Paper: .02 mf 1000V.....
C-17	21K478410	Ceramic: 1000 mmf 500V.....
C-18	8R71911	Paper: .03 mf 400V.....
C-19	8R23690	Paper: .01 mf 400V.....
C-20	23A485677	Electrolytic: 15-10-20 mf/ 350-350-25V .....
Fuse		
F-1	65K16248	9 amp .....
Vibrator		
G-1	48B3333	Non-sync: 4-pin .....
Coils		
L-1,2	24B71881	RF and Antenna Coil (specify color of paint dots on old coil when ordering) .....
L-3	24B592153	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24K78026	Choke ('A' lead) .....
L-5	24K78026	Choke (dial light) .....
L-6	24A472535	Choke, hash .....
Resistors		
	Note:	All resistors are insulated carbon type, 20% unless otherwise specified.
R-1	6R6032	470,000 1/2W .....

Ref. No.	Part Number	Description
R-2	6R6432	270 10% 1/2W .....
R-3	6R6075	100,000 1/2W .....
R-4	6R6056	47,000 1/2W .....
R-5	6R6090	470 10% 1/2W .....
R-6	6R6287	6800 1W N.I. .....
R-7	6R6004	1 meg 1/2W .....
R-8	1A472531	Volume Control: 500,000 ohms; includes SPST switch....
R-9	6R6056	47,000 1/2W.....
R-10	6R6004	1 meg 1/2W .....
R-11	6R5614	56 10% 1/2W .....
R-12	6R5614	56 10% 1/2W .....
R-13	6R5577	2700 10% 1/2W .....
R-14	6R2118	3.3 meg 1/2W .....
R-15	6R6032	470,000 1/2W .....
R-16	6R6015	220,000 1/2W .....
R-17	6R6336	270 10% 1W .....
R-18	6R6184	1000 1W N.I. .....
Spark Plate		
SP-1	1X78041	Spark Plate Assembly: complete .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24B485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....

Part Number	Description
CHASSIS PARTS - MECHANICAL	
42A13177	Clip, center post grounding.....
42A485548	Clip, coil can mtg .....
42A4215	Clip, vibrator grounding .....
4S7695	Lockwasher, int: #5; stl; cad pl (terminal strip mtg) .....
9A472148	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (center post ground clip mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and output trans mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator grounding clip mtg)
3S8140	Screw, sheet metal: #8 x 3/16 PKZ plain hex head; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 plain hex head; stl; cad pl (capacitor bracket assembly and spark plate mtg) .....
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; cad pl (power transformer mtg) .....
9A70208	Socket, tube: 4-pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7-prong...
9K580218	Socket, tube: miniature; 8-prong...
31C4079	Strip, terminal: 1 insulated lug, end mtg .....
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg .....

Part Number	Description
HOUSING PARTS	
42A501270	Clip, escutcheon retainer.....
42A472033	Clip, chassis retainer .....
13D501271	Escutcheon, complete .....
1X501390	Housing and Bushing Assembly, rear.
1X501375	Housing, front; with escutcheon....
3S400356	Screw, sheet metal: #4 x 1/4 plain hex head; stl; cad pl (escutcheon mtg) .....
3S7456	Screw, sheet metal: #8 x 1/4 PKA slotted acorn head; antique copper finish (housing screws) .....
ACCESSORIES	
65X4151	Bulb, pilot light: 6-8V; clear; bayonet base .....
8A4491	Capacitor, generator .....
9B473111	Lead Assembly, fuse: complete with 9 amp fuse .....
1X74340	Lead Assembly, dial light: complete with bulb .....
1X76859	Lead Assembly, speaker: 2-conductor, 36" long, with pin terminals on one end .....
4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16-18 x 9/16; cad pl (receiver mtg) .....
1K75148	Shaft, flexible: with housing: 24" long .....
50B500708 or 50B500684	Speaker: 6" PM; 3.2 ohm VC; less speaker lead .....
3A77542	Stud, receiver mtg .....
6X4141	Suppressor, distributor .....
TUNER PARTS - MECHANICAL	
Note:	Electrical parts of the tuner are included in the Electrical Chassis Parts List
1X592301	Manual Tuner MT-75 .....
1X592099	Base, Sleeve, Shields and Channels Assembly .....
1X78034	Carriage Plate, Slug Insulator and Center Guide Rod Assembly .....
42A70184	Clip, core adjustment .....
46K592080	Core, iron and screw .....
58K78012	Coupling, manual lead screw ....
14A70876	Insulator, coil sleeve .....
14B78007	Insulator, slug: bakelite .....
2A77596	Nut, floating: without ear (on manual lead screw).....
2A78005	Nut, floating: with ear (on manual lead screw) .....
54A77593	Plate, tuner front .....
5S7770	Rivet: .088 x 5/32; stl; nkl pl (slug insulator mtg) .....
47A78002	Rod, carriage guide .....
3S7352	Screw, machine: 8-32 x 2 slotted round head; stl; cad pl (front plate mtg) .....
43A70881	Sleeve, coil (iron) .....
41A77595	Spring, coil slug .....
41A77592	Spring, compression .....
42A21577	Washer, "C": spring (manual lead screw mtg) .....
4A70873	Washer, coil spacer .....
4A74571	Washer, fishpaper .....
4A70956	Washer, slug insulator .....
4K485653	Washer, spring (manual lead screw mtg) .....

MODEL 601

ALIGNMENT

Remove receiver front and rear housings to expose all adjustments.

Connect a 6 volt battery to BAT terminal and chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part No. 66A76278, is required for adjusting the tuner cores. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3, & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Fig. 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

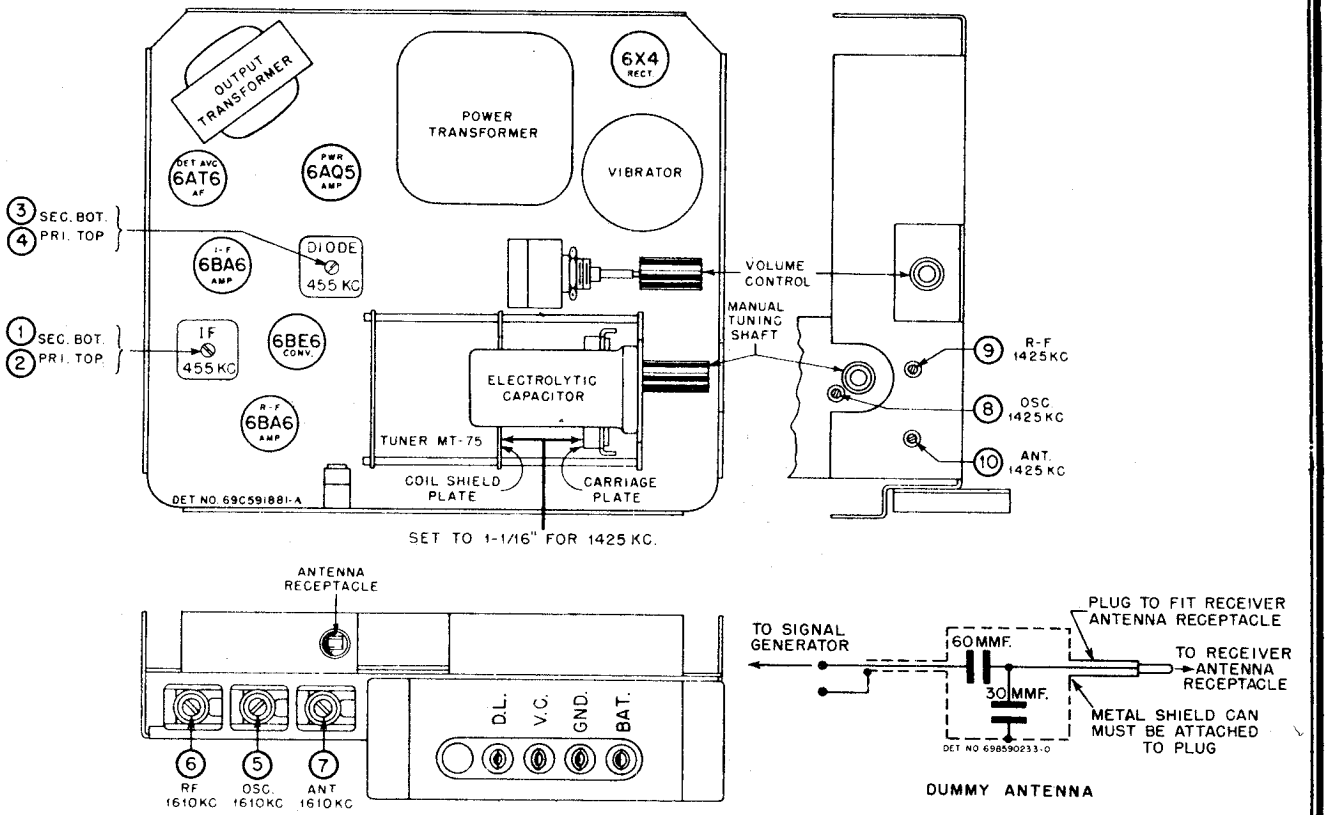


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA

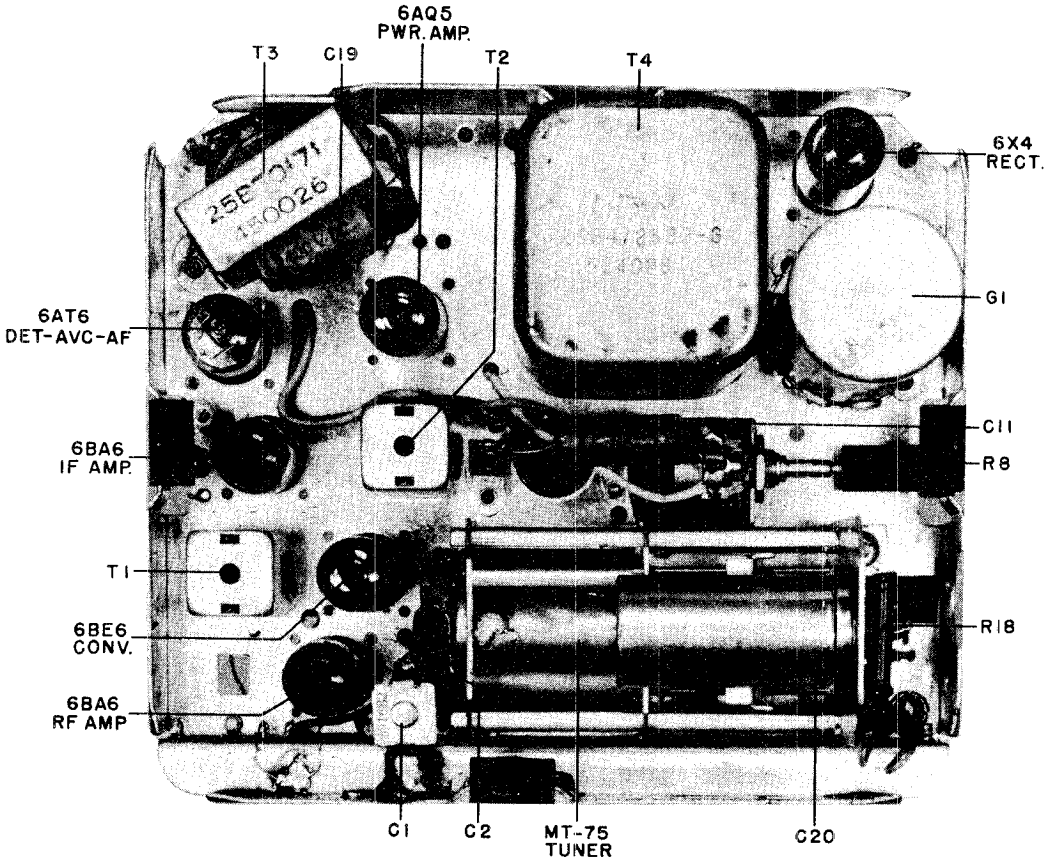


FIGURE 2. TOP VIEW OF CHASSIS

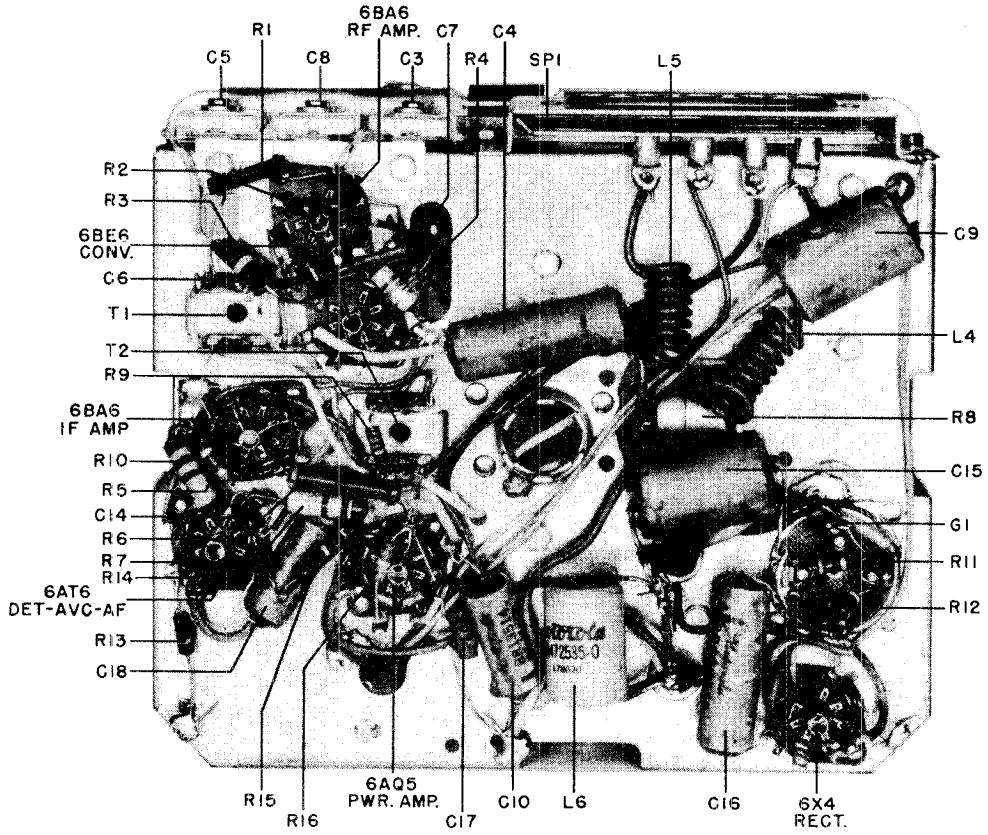
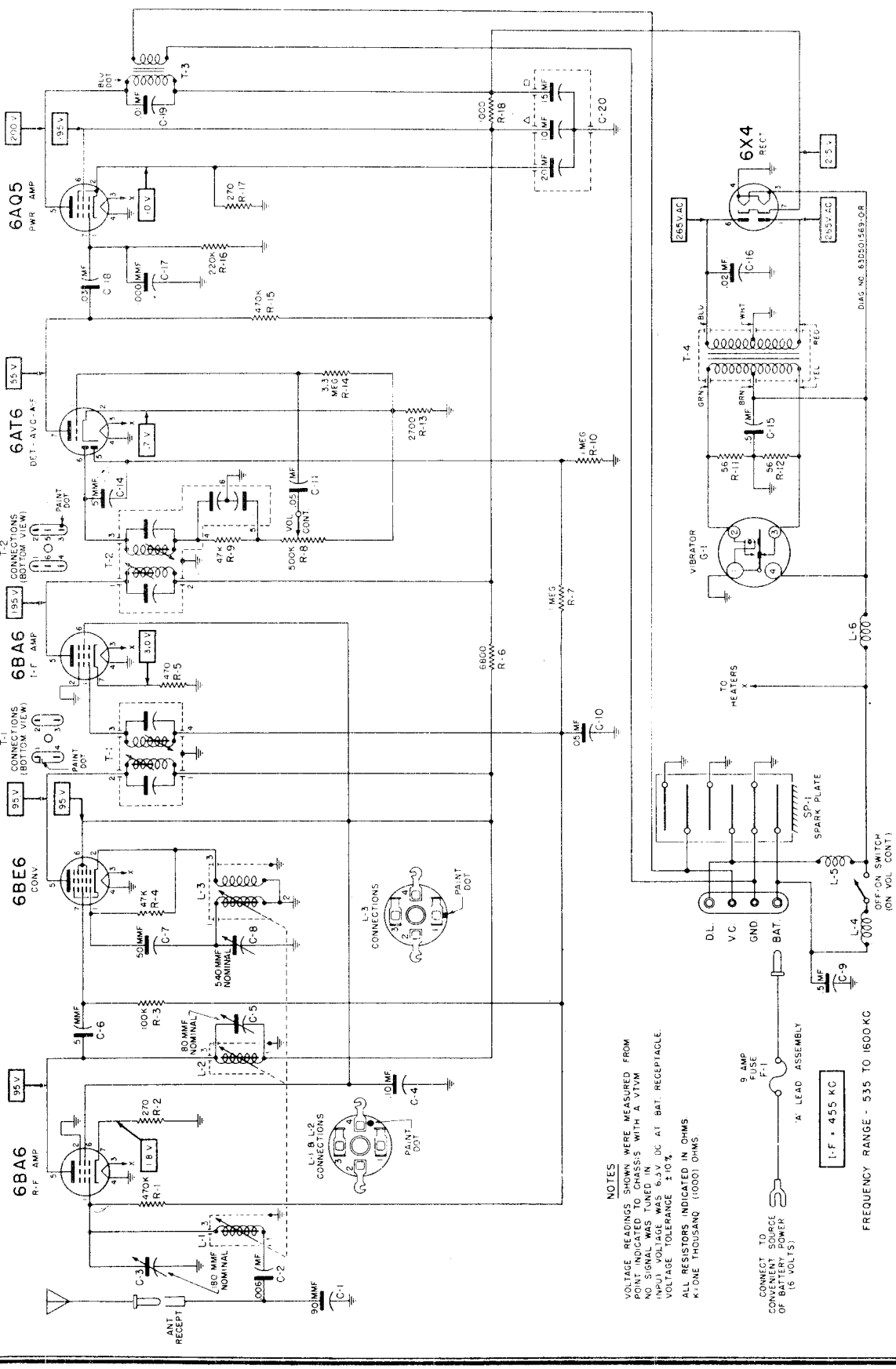


FIGURE 3. BOTTOM VIEW OF CHASSIS

MODEL 601



NOTES

VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO CHASSIS WITH A VTVM
NO SIGNAL WAS TUNED IN
INPUT VOLTAGE WAS 6.3 V DC AT BAT. RECEPTACLE.
VOLTAGE TOLERANCE ±10%.

ALL RESISTORS INDICATED IN OHMS K=ONE THOUSAND (1000) OHMS

FIGURE 4. SCHEMATIC DIAGRAM

MODEL 604,
Dodge, Plymouth

GENERAL INFORMATION

TYPE - Automotive type superheterodyne receiver, designed to operate from a 6 volt storage battery. This receiver is specifically designed to fit Plymouth P-19, P-20 and Dodge D-33 and D-34 cars.

TUNING RANGE - 535 to 1605 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 6BA6 - RF Amplifier
6BE6 - Oscillator-Modulator
6BA6 - IF Amplifier
6AT6 - Detector, AVC & 1st Amplifier
6V6GT - Power Amplifier
6X4 - Rectifier

POWER SUPPLY - Input is 6.3V DC at 7.1 amperes

INSTALLATION & OPERATING INSTRUCTIONS

Refer to Figure 1 for operating control locations.

TO TURN THE RADIO ON. Turn the left-hand knob (volume control) clockwise until a click is heard.

MANUAL TUNING. Tune stations with the right-hand knob.

PUSH BUTTON TUNING. After stations have been set up, it is only necessary to push in the button (1, 2, 3 or 4) that has been set to the desired station. Push the button all the way in, to make sure that the station will be tuned in correctly.

TONE CONTROL. The TONE push button operates a three-position tone control. Push the button until the most pleasing tone is obtained.

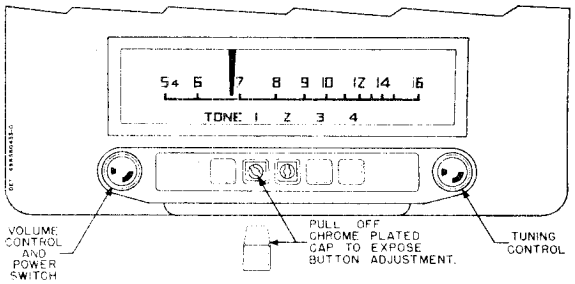


FIGURE 1. PUSH BUTTONS AND CONTROLS

TO SET THE PUSH BUTTONS

Push buttons should preferably be set up in daytime since weak station signals are stronger at night and the button may be set on a distant station carrying the same program as the desired station.

1. Turn radio ON (see Operating Instructions) and allow it to warm up for at least 15 minutes. Antenna should be fully extended and tone control in high position.

2. Pull off the chrome plated push button caps from buttons 1, 2, 3 and 4, exposing the knurled metal buttons. See Figure 1.

3. Unlock the four push button settings by turning each knurled button counterclockwise about one turn.

CAUTION: Never turn buttons more than two turns in a counterclockwise direction.

4. With the tuning knob, tune in the station to be set up on No. 1 button. Select only the best and most powerful local stations.

5. Push in the No. 1 button as far as it will go and tighten knurled button securely.

6. Perform steps 4 and 5 for the remaining three push buttons.

7. After all buttons have been set up, check if they can be tuned in more accurately with the tuning knob. If so, unlock button and reset it.

8. A push button may be reset at any time by unlocking the push button , tuning in a new station, and resetting as in step 5.

9. Replace push button caps with the notched side down.

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.

2. A small fibre screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 2.

PROCEDURE

1. Remove the housing and dial scale to expose all alignment adjustment screws.

2. Connect the output meter across speaker voice coil.

3. Connect a 6 volt storage battery to receiver battery receptacle and chassis. Turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to treble (high) position.

4. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

5. IF & RF ALIGNMENT. See Alignment Chart & Figure 2.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

CAUTION: Do not press hard on the alignment screwdriver when aligning the IF & diode transformers as damage to the core or transformer may result.

6 ANTENNA TRIMMER ADJUSTMENT. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL 604, Dodge, Plymouth

ALIGNMENT CHART

STEP	TUNER SET TO	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR FREQUENCY	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	High frequency end (cores out)	.1 mf	Hi side - 6BE6 grid (pin #7) Lo side-chassis	455 Kc	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
2.	High frequency end, cores should project 1-1/8" from cans. (Screw out)	See Fig. 2	Ant receptacle through dummy	1605 Kc	5, 6 & 7	Peak for maximum in order indicated.
3.	Set spacing between treadle bar & tuner frame to 21/32". See Fig. 2	"	"	1300 Kc	8, 9 & 10	Peak for maximum in order indicated. Replace dial scale and set pointer to 1300 Kc by means of pointer adjustment eccentric. See Figure 2-

CHASSIS PARTS - ELECTRICAL

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V
C-2	8C4529	Paper: .006 mf 100V
C-3	20A77536	Variable, mica: 50 mmf to 280 mmf 500V
C-4	8K13514	Paper: .05 mf 100V
C-5	21K70720	Molded: 5 mmf 500V
C-6	20A481526	Variable, mica: 20 mmf to 180 mmf 500V
C-7	8K13166	Paper: .1 mf 400V
C-8	8C580845	Paper: .5 mf 100V
C-9	8K13514	Paper: .05 mf 100V
C-10	20A77537	Variable, mica: 5 mmf to 88 mmf 500V
C-11	21K74661	Ceramic: 50 mmf 300V
C-12	21K580276	Ceramic: 220 mmf 5% 500V
C-13	8C580845	Paper: .5 mf 100V
C-14	8K13514	Paper: .05 mf 100V
C-15	21K74661	Ceramic: 50 mmf 300V
C-16	8K12840	Paper: .006 mf 1600V
C-17	21K481377	Ceramic: 500 mmf
C-18	8K71910	Paper: .006 mf 400V
C-19	8K71911	Paper: .03 mf 400V
C-20	8K71910	Paper: .006 mf 400V
C-21	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V
FUSE		
F-1	65X12894	Fuse, tubular: 14 amp
VIBRATOR		
G-1	48B3333	Vibrator, non-sync: 4-pin
PILOT LIGHT		
I-1	65X10867	Bulb: 6.3V .25A tubular; bayonet base; clear; #44
COILS		
L-1	24B580278	Antenna coil (specify color coding on old coil when ordering)
L-2	24K580557	RF coil (specify color coding on old coil when ordering)
L-3	24B580279	Oscillator coil (specify color coding on old coil when ordering)
L-4	24A472535	Choke, hash
SPEAKER		
LS-1	50B580175 or 50B580176 or 50B485788	Speaker: 5 x 7 oval type; PM; 3.2 ohm voice coil
RESISTORS		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W
R-2	6R6075	100,000 20% 1/2W
R-3	6R6012	33,000 20% 1/2W
R-6	6R5554	390 10% 1/2W
R-7	6R6287	6800 20% 1W N.I.
R-8	6R6004	1 meg 20% 1/2W
R-9	6R5614	56 10% 1/2W
R-10	6R5614	56 10% 1/2W
R-11	18A485390	Volume Control: .5 meg; with sw.
R-12	6R6056	47,000 20% 1/2W
R-13	6R2118	3.3 meg 20% 1/2W
R-14	6R6428	6800 10% 1/2W
R-15	6R6054	10,000 20% 1/2W
R-16	6R6032	470,000 20% 1/2W
R-17	6R6032	470,000 20% 1/2W
R-18	6R6434	27,000 10% 1/2W
R-19	6R6004	1 meg 20% 1/2W
R-20	6R6389	220 10% 1W
R-21	6R476004	1000 20% 2W
R-22	6R6432	270 10% 1/2W
SWITCHES		
S-1		Power Switch (part of volume control R-11)
S-2		Tone Control (see Tuner AT-63A Parts List)
SPARK PLATE		
SP-1	1B485528	Spark Plate Assembly
TRANSFORMERS		
T-1	24B485553	IF, 455 Kc: complete
T-2	24K485554	Diode, 455 Kc: complete
T-3	25B70171	Output Transformer
T-4	25K580539	Power Transformer

CHASSIS PARTS - MECHANICAL

PART NUMBER	DESCRIPTION
43A489319	Bearing, pointer link mtg
43A580213	Bushing, receiver mounting
42A485548	Clip, can mounting (T-1 & T-2 mtg).
42A4215	Clip, vibrator grounding
29R5282	Lug, soldering: #10; plain long tab
52A580636	Pointer, dial
1X580507	Pointer Link Plate, Arm and Rivets Assembly: less pointer
9A472148	Receptacle, antenna input
5S7771	Rivet: .088 x 3/16; stl; nkl pl (min tube socket mtg)
5S7706	Rivet: .122 x 1/8; stl; nkl pl (ground strip and light shield mtg)
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator socket mtg)

MODEL 604,
Dodge, Plymouth

PART NUMBER	DESCRIPTION
5S7707	Rivet: .122 x 5/32; stl; nkl pl (octal tube socket and terminal strip mtg)
5S7700	Rivet: .122 x 1/4; stl; nkl pl (output trans mtg)
34C591923	Scale, dial
3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; stl; cad pl (dial scale mtg)
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (tuner, spkr plate and wiper mtg)
3S3397	Screw, sheet metal: #8 x 5/16 PKZ plain hex head; stl; cad pl (power trans mtg)
3S8176	Screw, sheet metal: #10 x 3/8 PKZ plain hex head; stl; cad pl (spkr mtg)
26A485262	Shield, light: end; (on spkr plate)
24B485268	Shield, light: painted (on spkr plate)
30B580838	Shield, spiral (lead shield)
26A592419	Shield, tube: spring type
9A485228	Socket, pilot light: includes bracket.
9A472534	Socket, tube: miniature; 7-prong
9K580218	Socket, tube: miniature; 7-prong (for 6BE6 tube)
9A6788	Socket, tube: octal
9A70208	Socket, vibrator: 4-prong
1X485536	Speaker Plate, Stud and Shield Assembly
41A590038	Spring, pointer arm backlash
42A580578	Strip, ground (grounds tuner to chassis)
31K86126	Strip, terminal: 2 insulated lugs, #2 mtg
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg (choke mtg)
46A485229	Stud, speaker plate mtg
4S1719	Washer, flat: 3/8 x .140 x .030 thick; stl; cad pl (output trans mtg)
4A590466	Washer, spring (pointer bearing retainer)
39A591197	Wiper, ground
HOUSING PARTS	
42A580509	Clip, dial crystal retainer
39A28036	Clip, grounding (on rear cover)
39A580575	Clip, tension (on front hsng)
15K591954	Cover, housing bottom
61K580238	Crystal, dial: glass
13D590448	Escutcheon, push button: chrome plated
32B580722	Gasket, radio mounting: rubber
1X580506	Housing, front: includes receiver mtg gasket & crystal
1X590344	Housing, rear
2S2869	Nut, mounting: 7/16-28; round; knurled (PB escutcheon mtg)
32A580577	Pad, dial crystal cushion; 6-1/4" long
32K590510	Pad, dial crystal cushion; 1-5/8" long
5S7706	Rivet: .122 x 1/8; stl; nkl pl (front housing clip mtg)
3S7205	Screw, machine: 8-32 x 1/4; slotted hex head; locking type; stl; cad pl (front housing mtg)
3S7475	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; stl; cad pl (housing screws)
2A580224	Thumbscrew (bottom cover retaining)
ACCESSORY PARTS	
7B580009	Bracket, radio mounting (Dodge)
7B580877	Bracket, radio mounting (Plymouth)
15A485225	Cap, push button: chrome plated
8A580014	Capacitor, radio interference
15A485342	Cover, receiver mounting nut: chrome pl
1X580809	Knob, control: chrome plated
9K591242	Lead Assembly, radio to ignition sw.
4S2641	Lockwasher, int-ext tooth: 3/4 x 1/4; stl; cad pl (for radio mtg brkt mtg screw)
2S7022	Nut, hex: 1/4-20 x 7/16; stl; cad pl (for radio mtg brkt mtg screw)

PART NUMBER	DESCRIPTION
2S1393	Nut, hex: 5/16-18 x 1/2; stl; cad pl (radio mtg)
2A485540	Nut, hex: 7/16-28 x 9/16; cad pl (radio mtg)
3A591799	Screw, machine: special; with cup washer; 21/32" lg; stl; cad pl (radio mtg)
3K591900	Screw, machine: special; with cup washer; 15/16" lg; stl; cad pl (radio bracket mtg)
4A590795	Washer, cup: stl: cad pl (radio mtg)

AUTOMATIC TUNER AT-63A

Note: Tuner replacement electrical parts not listed here are listed under Chassis Parts - Electrical. When ordering replacement coils or tuning cores, specify color coding on old coil or core.

51D590440	AT-63A Automatic Tuner Assembly: comp
45A485508	Arm, push button cap support
42A70184	Clip, core adjustment (on tuning core screws)
42A472671	Clip, guide rod retainer: spring steel
1A580751	Core Bar Assembly: complete with bakelite core insulator, carriage guide brkt, pointer actuating arm with link drive pin, pointer adjustment eccentric & 2 bearing eyelets
46K580518	Core, Iron & Screw (ant, RF & osc tuning cores)(specify color coding on old core when ordering)
5S7862	Eyelet: .130 x .155; brass (coil shield mtg)
5S7819	Eyelet: .185 x .187; brass (core bar bearings)
51X591557	Gear Assembly, crown drive
5K580504	Grommet, insulating: rubber (ant & RF coil mtg)
5K580503	Grommet, insulating: rubber (osc coil mtg)
29A580756	Lug, carriage retainer
51A591149	Pinion Shaft & Drive Disc Assembly
51X590124	Ratchet & Contact Assembly (tone control)
5S8497	Rivet: .088 x 1/8; stl; nkl pl (ratchet stop spring mounting)
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tone control assem mtg)
5S7707	Rivet: .122 x 5/32; stl; nkl pl (term strip mtg)
47K580230	Rod, guide (core bar guide)
1A580209	Screw, push button locking
3S8140	Screw, sheet metal: #8 x 3/16 PKZ; plain hex head; cad pl (trimmer mtg)
51A591148	Shaft Assembly, tuning (manual tuning shaft)
26A485610	Shield, coil
41A77595	Spring, coil core
41A580287	Spring, ratchet stop (tone control)
41A580220	Spring, treadle bar tension
41A580223	Spring, tuner locking screw (on push button locking screw)
31A71802	Strip, terminal: 1 insulated lug, #2 mtg
46A485513	Stud, tone switch push arm
51X590123	Tone Control Contact Assembly
4K24124	Washer, 'C' (tone ratchet retainer)
4A21577	Washer, 'C' (on core bar assembly)
4A70956	Washer, core insulator: bakelite
4A111189	Washer, fibre (on core bar assembly)
4A580644	Washer, spring (on core bar assembly)
4K580283	Washer, spring (tone control assembly)

MODEL 604,
Dodge, Plymouth

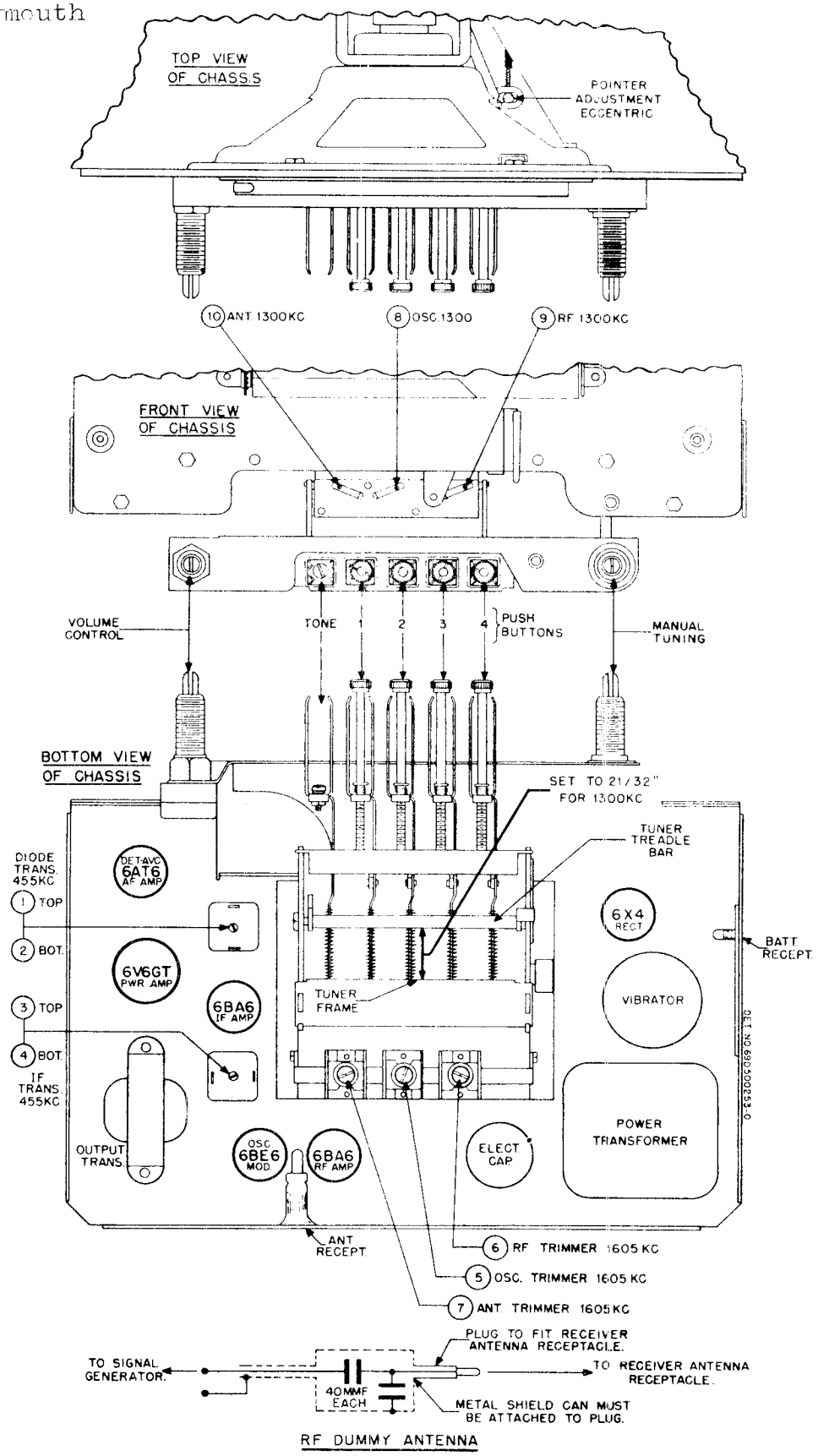


FIGURE 2. TUBE & TRIMMER LOCATION

MODEL 604,
Dodge, Plymouth

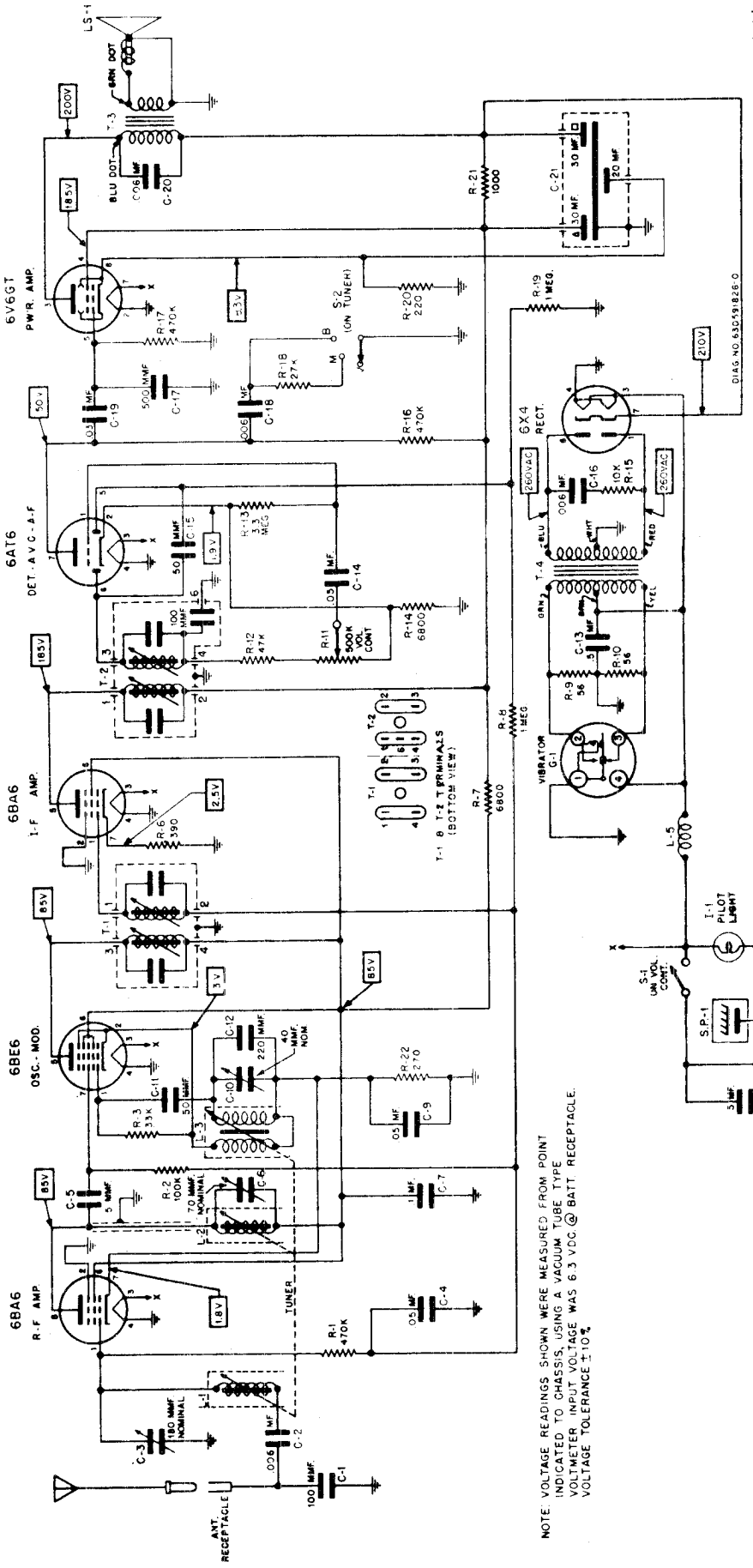
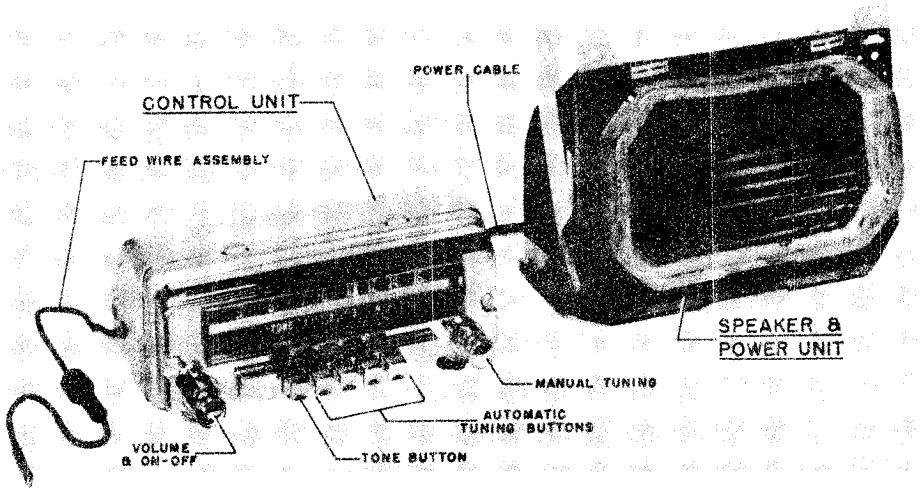


FIGURE 3. SCHEMATIC DIAGRAM

MODEL 606,
Plymouth



GENERAL INFORMATION

TYPE - Two-piece automotive type receiver, specifically designed for installation in Plymouth P-22 and P-23 cars.

TUNING RANGE - 540 to 1600 Kc. IF FREQUENCY - 455 Kc

POWER OUTPUT - 1.25 watts undistorted

TUNER - Model AT-84 or AT-89. See AT-84 and AT-89 Service Manuals for Replacement Parts.

TUBE COMPLEMENT - Control Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amplifier

Speaker & Power Unit
6AQ5 - Power Amplifier
6X4 - Rectifier

OPERATES FROM - 6.3 volts DC; 7.1 amperes

ALIGNMENT

EQUIPMENT REQUIRED:

1. A special tool for adjusting the tuner cores. Use alignment tool, Motorola Part No. 66A76278.

2. A small screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1.

PROCEDURE:

1. To expose the alignment adjustments, remove the rear housing, escutcheon and dial scale & bracket assembly.

2. Connect Control Unit & Speaker and Power Unit together by means of the power cable.

3. Connect an output meter across the speaker voice coil.

4. Connect 6.6 volts (measured at the "on-off" switch) to the receiver "BAT" terminal and chassis.

5. Turn the receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum and tone control to "high" position.

6. For greatest accuracy, keep the output of the receiver at 1 watt (1 watt = 1.79 volts on output meter) by reducing signal generator output (not receiver volume control) as stages are brought into alignment.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

7. Antenna Trimmer Adjustment. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

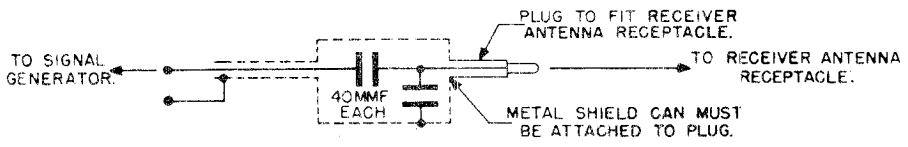


FIGURE 1. DUMMY ANTENNA

MODEL 606,
Plymouth

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side-6BE6 grid (pin #7) Low side-chassis	455 Kc	Extreme high frequency end of travel	1, 2 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT						
Note: Back out tuner cores 8, 9 & 10 until 1-3/16" of core projects from end of coil, before performing step 2.						
2.	Dummy-see Figure 1.	Ant receptacle through dummy antenna	1610 Kc	Extreme high frequency end of travel	5, 6 & 7	Peak for maximum in order indicated.
3.	"	"	1400 Kc	With tuning knob, move carriage "in" until pointer is located 1-45/64" ±1/32" from tip of pointer to center of middle push button arm.	8, 9, & 10	Peak for maximum in order indicated.
4.	"	"	1610 Kc	With tuning knob, tune for maximum signal at high frequency end.	6 & 7	Peak for maximum in order indicated.
5.	"	"	1400 Kc	With tuning knob, tune to maximum signal	9 & 10	Peak for maximum in order indicated.
6.	-	-	-	-	-	Repeat step 4.

7. With set installed in car, peak ant trim (7) for maximum signal at approximately 1400 Kc. Car antenna should be fully extended.

OPERATING INSTRUCTIONS

ON-OFF SWITCH AND VOLUME CONTROL. To turn the receiver on, turn the left-hand control knob to the right until it "clicks" and the dial is illuminated. Allow the receiver to reach operating temperature (approximately 20 seconds). To increase the volume, continue to turn this control to the right. To turn the receiver off, turn this control knob to the left until it "clicks".

TUNING. Tuning is accomplished manually or automatically. Any one of four stations may be selected automatically by means of pushbutton control. To receive stations that are not set for automatic selection, use Manual tuning.

MANUAL TUNING. Select the desired station or program by turning the manual tuning knob (right-hand knob). Tune to the exact frequency position for clearest reception. The pointer indicates the frequency to which the receiver is tuned.

AUTOMATIC TUNING. The four pushbuttons, located beneath the dial scale, may be set to four favorite local stations. Firmly pressing one of the pushbuttons automatically selects the station for which the pushbutton was set. The dial pointer will automatically indicate the frequency of the selected station.

TONE CONTROL. The TONE pushbutton operates a three-position tone control. Push the button until the most pleasing tone is obtained. You will find that static and other types of electrical interference will be minimized in the "Bass" position.

TO SET THE PUSHBUTTONS

The receiver has 4 buttons for automatic station selection.

To set the pushbuttons for automatic tuning, proceed as follows:

1. Turn volume up until stations can be heard.

2. Pull out button and with the manual tuning knob tune to the station desired.

3. Push button in. This station is now set for automatic tuning.

4. Follow the same procedure for the remaining three buttons.

NOTE: The numbers on the dial scale indicate the frequency range of the receiver. Before setting the pushbutton, tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality and excessive noise. When setting automatic tuning, it is preferred that the left-hand buttons tune in the lower KC stations and the right-hand buttons tune in the higher KC stations.

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Plymouth

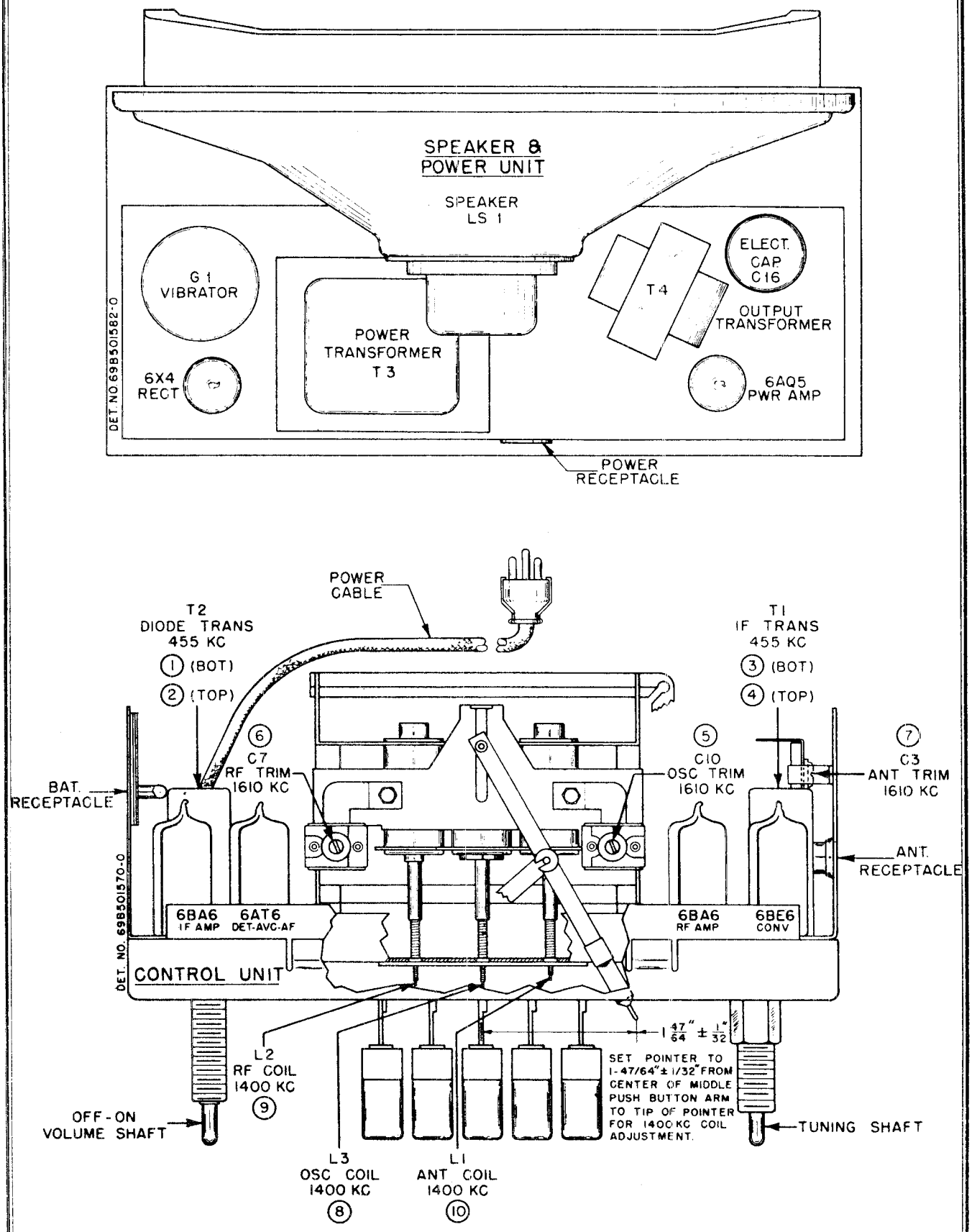


FIGURE 2. TUBE & TRIMMER LOCATION

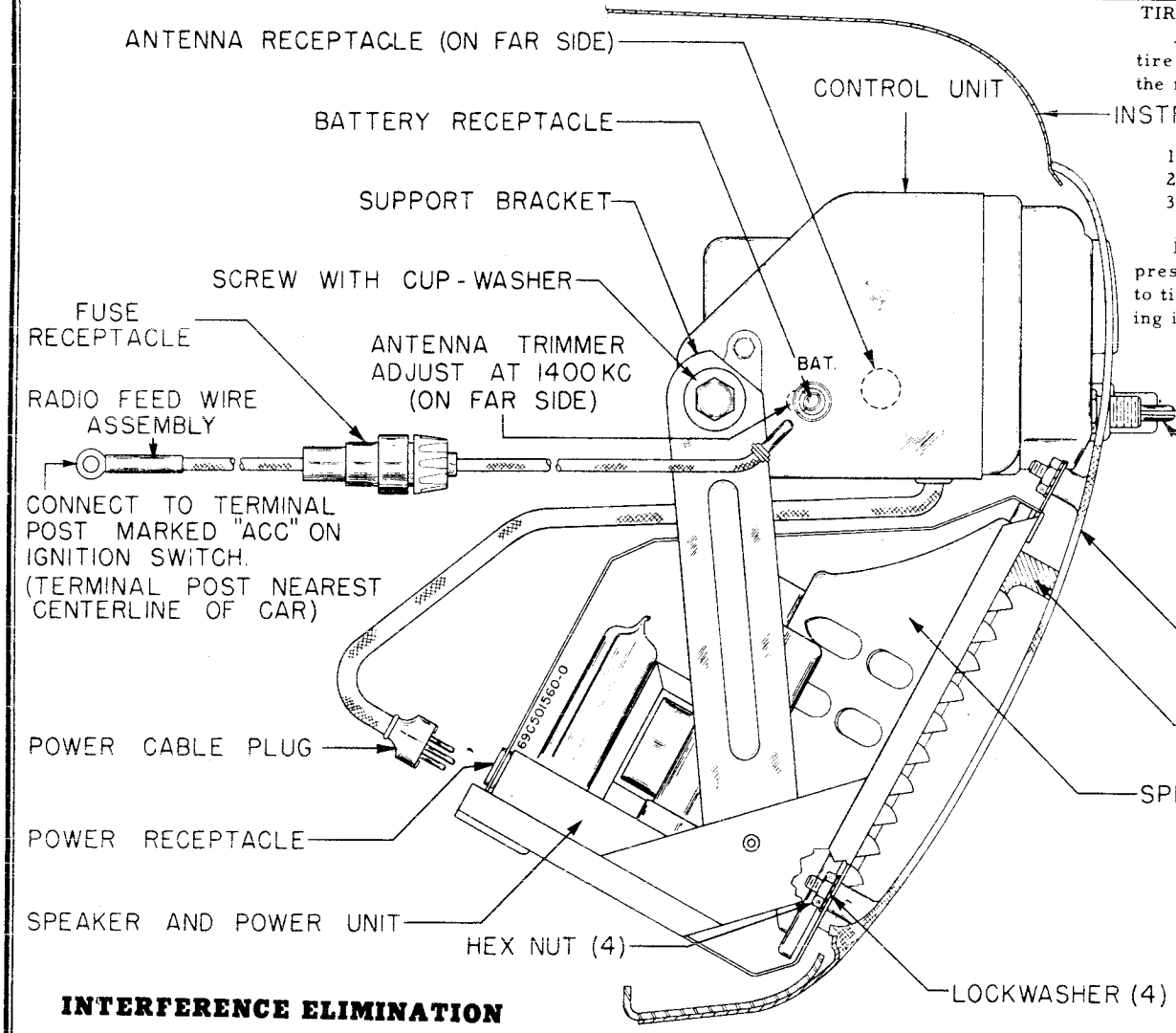


FIGURE 4. RADIO INSTALLATION

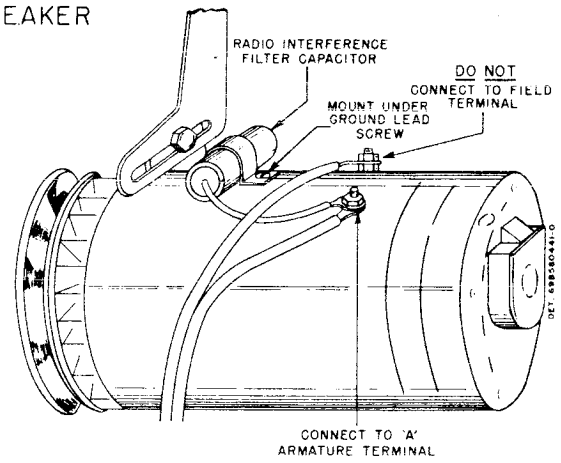


FIGURE 3. GENERATOR CAPACITOR INSTALLATION

TIRE STATIC

After completion of Radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds.
2. With antenna extended to operating position.
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Suppression Powder (Chrysler Package Part No. 1233 883) into tires with Injector (Chrysler Part No. 1233 884), following instructions given on package.

INTERFERENCE ELIMINATION

GENERATOR INTERFERENCE

Install radio interference filter capacitor on generator as shown in Figure 3. Mount the capacitor on the generator frame under the ground lead screw. Connect the eyelet terminal on the capacitor lead to the armature terminal of the generator.

WARNING: Do not connect to field terminal; to do so will result in damage to voltage regulator.

MODEL 606,
Plymouth

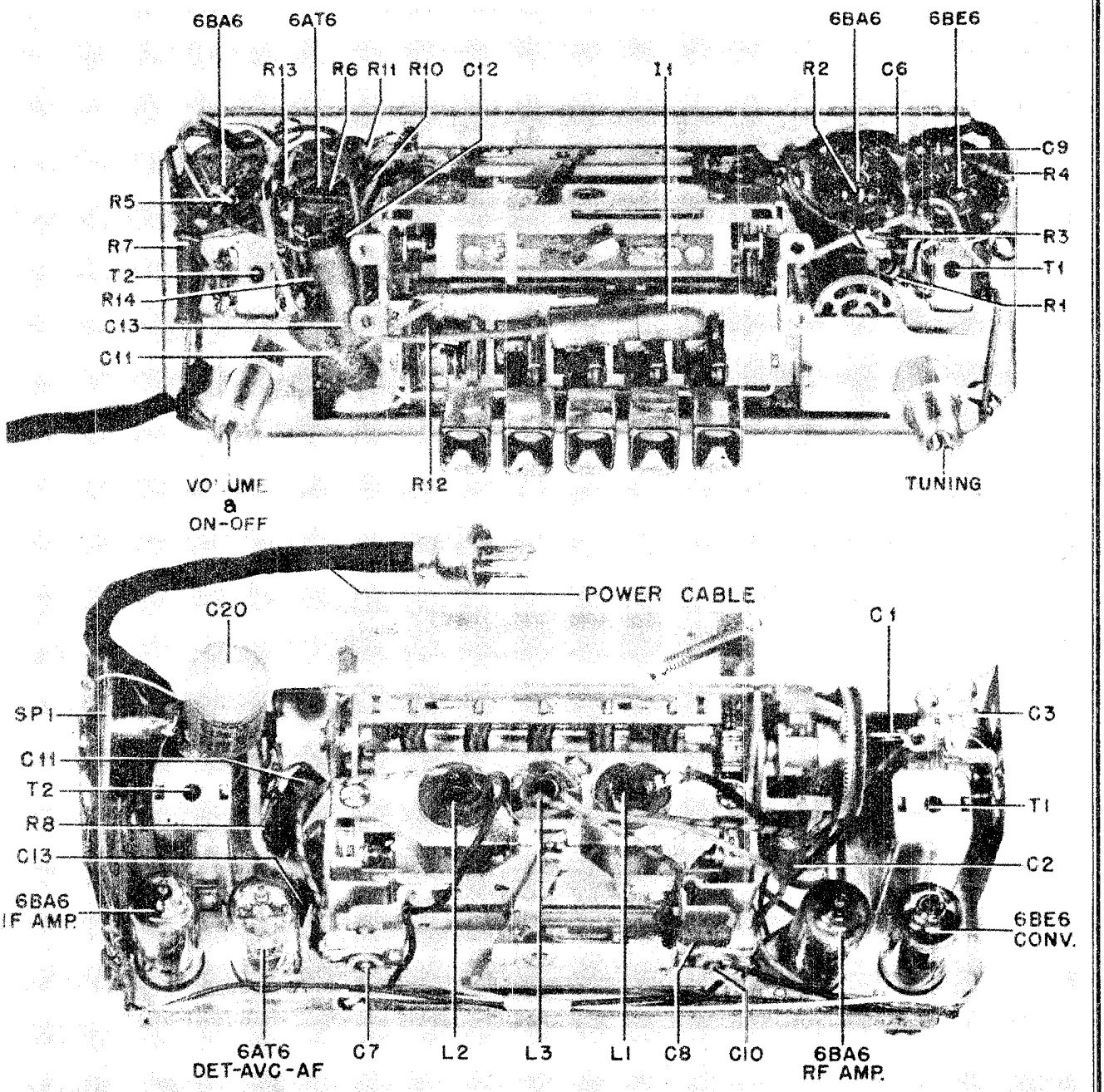


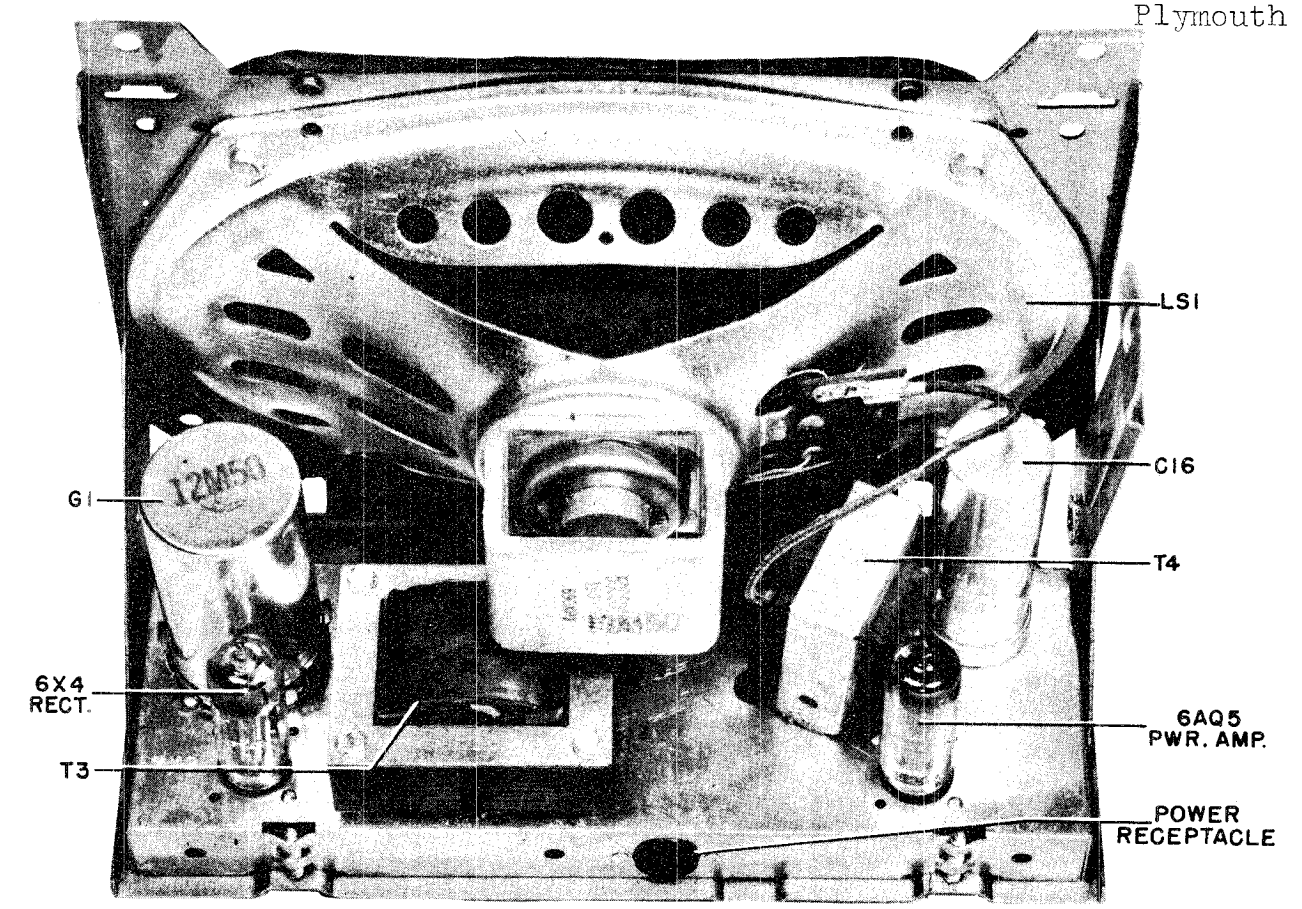
FIGURE 5. PARTS LOCATION - CONTROL UNIT

REPLACEMENT PARTS LIST

NOTE: When ordering parts specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CONTROL UNIT - CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21A591682	Mica, metal: 90 mmf .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3	20A502338	Variable, mica: 50 to 280 mmf
C-4	8R13514	Paper: .05 mf 100V .....
C-5	8R14791	Paper: .05 mf 400V .....
C-6	21K70720	Molded: 5 mmf 500V .....
C-7,8	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....
C-9	21R6513	Mica: 50 mmf 10% 500V.....
C-10	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....
C-12	21K70720	Molded: 5 mmf 500V .....
C-13	8K71910	Paper: .006 mf 400V.....
C-20	8C580845	Paper: .5 mf 100V .....
Fuse		
F-1	65K12894	Fuse, tubular: 14 amp .....
Pilot Light		
I-1	65X10867	Bulb: 6.3V; .25A; tubular bayonet base; clear; #44...

MODEL 606,
Plymouth



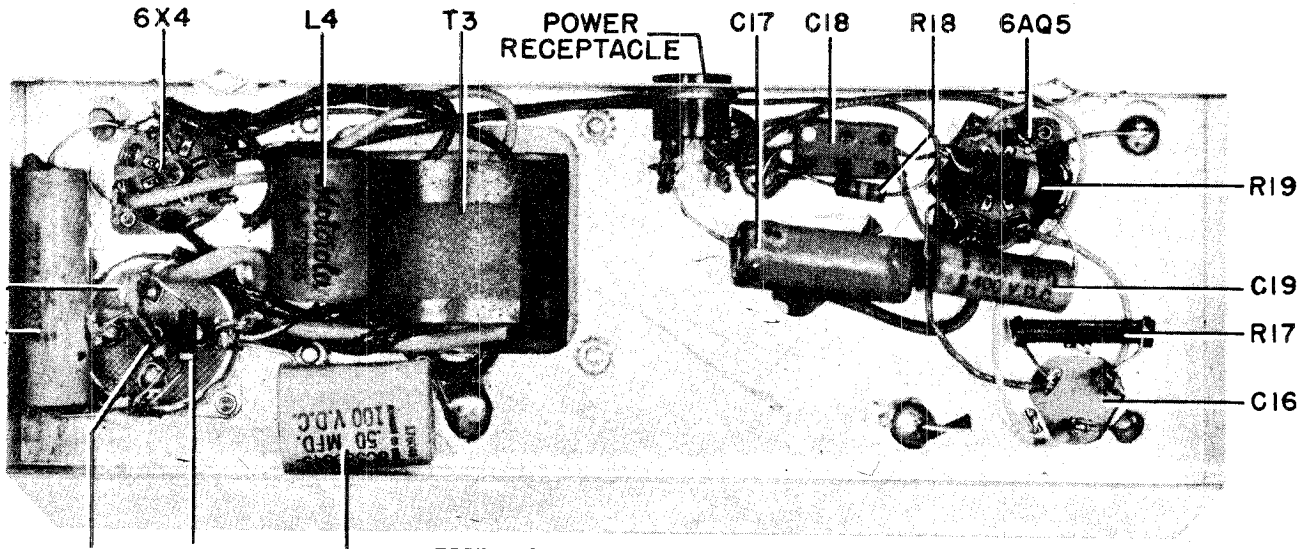


FIGURE 6. PARTS LOCATION - SPEAKER & POWER UNIT

Coils

L-1,2,3	-	(Refer to AT-84 & AT-89 Tuner Service Manual) .....

Resistors

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R6032	470,000 20% 1/2W .....
R-2	6R5554	390 10% 1/2W .....
R-3	6R6028	22,000 20% 1/2W .....
R-4	6R6012	33,000 20% 1/2W .....
R-5	6R5554	390 10% 1/2W .....
R-6	6R6004	1 meg 20% 1/2W .....
R-7	6R490349	6800 20% 2W .....
R-8	6R6056	47,000 20% 1/2W .....
R-9	18A501616	Volume control: 500,000; with switch .....
R-10	6R6004	1 meg 20% 1/2W .....
R-11	6R6428	6800 10% 1/2W .....
R-12	6R6434	27,000 10% 1/2W .....
R-13	6R2118	3.3 meg 20% 1/2W .....
R-14	6R6032	1 meg 20% 1/2W .....

Spark Plate

SP-1	1A501489	Spark Plate Assembly .....

MODEL 606,
Plymouth

Transformers		
T-1	24B485553	
or	24K502819	IF, 455 Kc: complete.....
T-2	24K485554	Diode, 455 Kc: complete.....
Tuners		
	51D501988	Automatic Tuner Model AT-84: complete (See AT-84 Tuner Service Manual for breakdown) .....
or	51D501875	Automatic Tuner Model AT-89: complete (See AT-89 Tuner Service Manual for breakdown) .....

SPEAKER AND POWER UNIT - CHASSIS PARTS - ELECTRICAL

Capacitors		
C-14	8C580845	Paper: .5 mf 100V .....
C-15	8R490449	Paper: .02 mf 1000V.....
C-16	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
C-17	8R71911	Paper: .03 mf 400V .....
C-18	21R6590	Mica: 500 mmf 20% 500V...
C-19	8K71910	Paper: .006 mf 400V .....
Vibrator		
G-1	48B3333	Vibrator: non-sync; 4-pin...
Coil		
L-4	24K472535	Choke, hash .....
Speaker		
LS-1	50C502449	
or	50C501656	Speaker, PM: 6" x 9" oval; 3.2 ohm VC .....

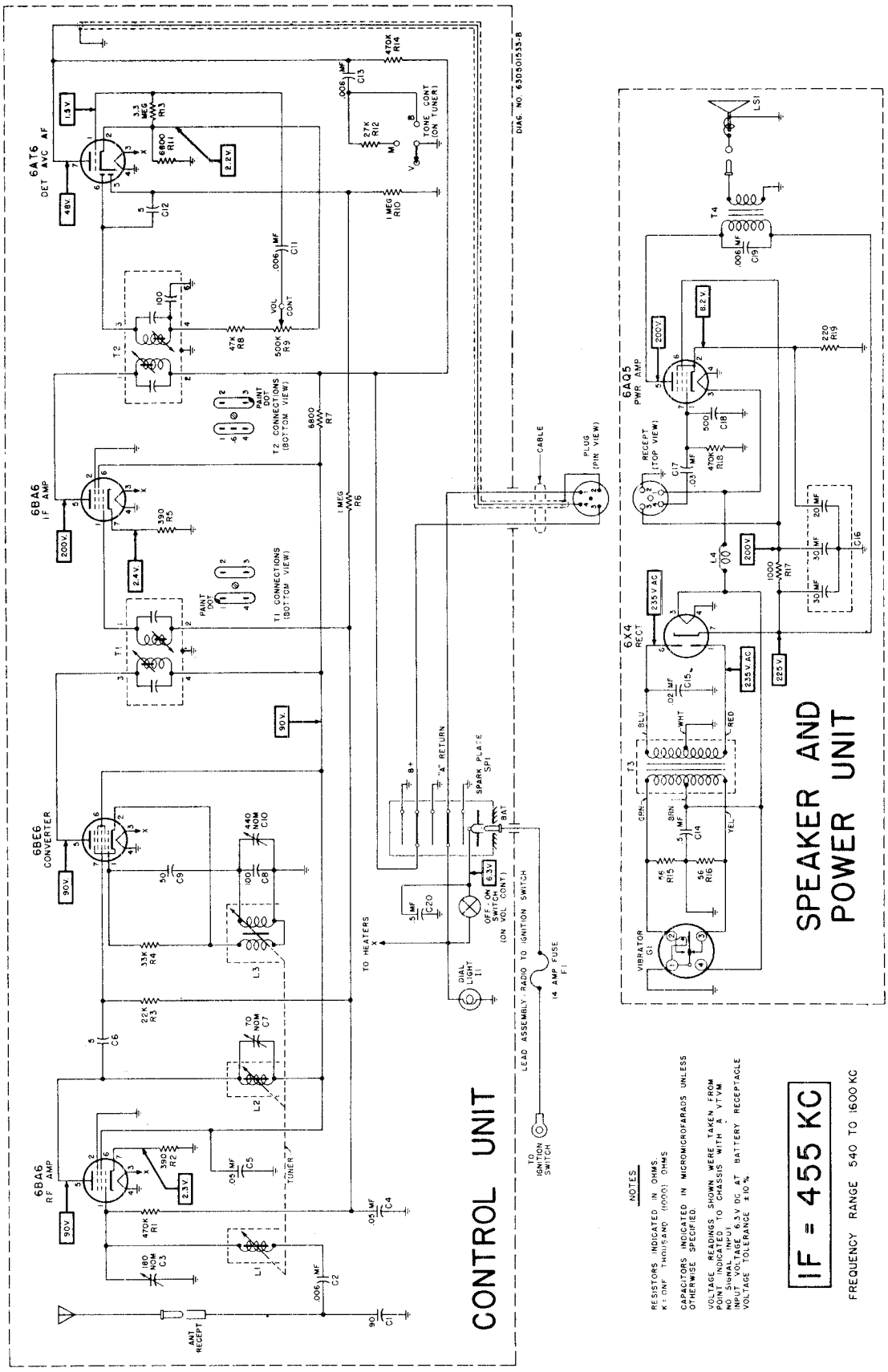
Resistors

Note: All resistors are carbon insulated unless otherwise specified.

R-15	6R5614	56 10% 1/2W .....
R-16	6R5614	56 10% 1/2W .....
R-17	6R476004	1000 20% 2W .....
R-18	6R6032	470,000 20% 1/2W .....
R-19	6R6389	220 10% 1W .....
Transformers		
T-3	25C501644	Power Transformer .....
T-4	25B501684	Output Transformer.....

Part Number	Description
CONTROL UNIT - CHASSIS PARTS - MECHANICAL	
30B501680	Cable and Plug Assembly, power.....
42A485548	Clip, coil can mtg .....
42A501477	Clip, pointer (pointer retainer)...
1X501683	Dial Scale and Background Assembly.
5A470399	Grommet, rubber (on power cable)
2A501465	Nut, hex: 7/16-28 x 3/4 (volume control mtg) .....
64D501492	Plate, front: painted white.....
28K38360	Plug, 5-pin (on power cable).....
52B501601	Pointer, dial .....
9A472148	Receptacle, antenna contact.....
34D501619	Scale, dial .....
15A22087	Shell, receptacle (on power cable).
26A470013	Shield, pilot light .....
9A501497	Socket, pilot light: includes brkt.
9K580218	Socket, tube: 7-prong; miniature; with dummy lug .....
CONTROL UNIT - HOUSING PARTS	
1X501673	Bracket Assembly, dial crystal retaining .....
61A501603	Crystal, dial .....
1X501672	Escutcheon & Dial Crystal Assembly.
1X500377	Housing, rear: includes speed grip nut .....
2A485540	Nut, hex: special; 7/16-28 x 9/16; stl; cad pl (escutcheon mtg).....
2S7035	Nut, speed (dial crystal retainer mtg) .....doz
2K501944	Nut, speed grip retaining (on rear housing) .....
3S400458	Screw, machine: 10-32 x 7/8; Phillips round head; stl; cad pl (escutcheon mtg) .....doz
SPEAKER AND POWER UNIT - MECHANICAL PARTS	
7B501620	Bracket, support (on spkr plate)...
42A501782	Clip, speed (rain shield mtg)...doz
42A4215	Clip, vibrator grounding.....
32C501637	Gasket, speaker: rubber .....
1X501667	Plate, Gasket and Bracket Assembly, speaker: less speaker .....
9A501887	Receptacle, 5-prong (for power cable)
3S7457	Screw, sheet metal: #8 x 7/8; plain hex head; stl; cad pl (spkr plate mtg) .....doz
3S8188	Screw, sheet metal: #10 x 1/2; plain hex head; stl; cad pl (spkr mtg) .....doz
1X502364	Shield, rain: includes pads .....
9A70208	Socket, tube: 4-prong (for vibrator)
9K580218	Socket, tube: 7-prong; miniature; with dummy lug .....
MOUNTING PARTS AND ACCESSORIES	
1X500376	Button, push: with shell and clip.
8B580014	Capacitor, noise suppression .....
15A485342	Cover, control unit mtg nut: chrome pl .....
1X501984	Knob, control: chrome pl (volume or tuning) .....
9K502069 or 9K502083	Lead Assembly, radio to ignition switch: includes fuse .....
4S7652	Lockwasher, ext: #10; stl; cad pl (speaker & power unit mtg)..per/c
2S2883	Nut, hex: 10-32 x 3/8; stl; cad pl (spkr & power unit mtg).....doz
2A485540	Nut, hex: 7/16-28 x 9/16 (control unit mtg) .....
3A501943	Screw and Cup Washer: 1/4-20 x 1/2 (support bracket attaching).....

MODEL 606,
Plymouth



NOTES

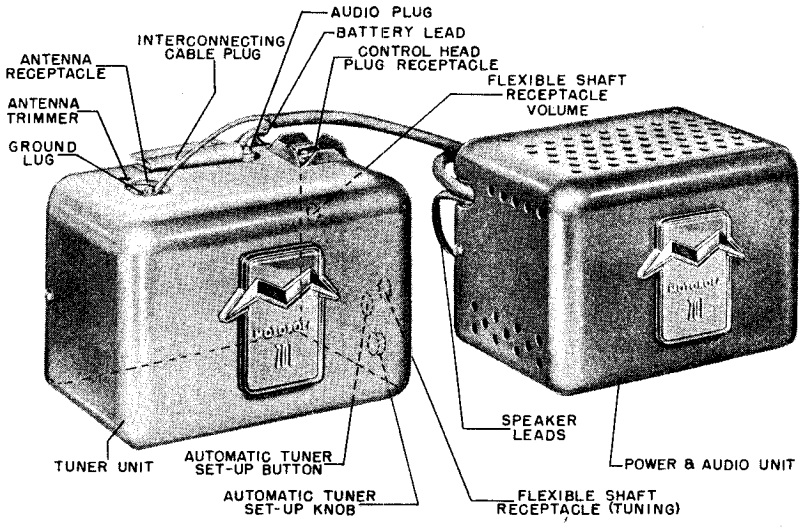
RESISTORS INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS

CAPACITORS INDICATED IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

VOLTAGE READINGS SHOWN WERE TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM.
NO SIGNAL INPUT.
INPUT VOLTAGE 6.3 V DC AT BATTERY RECEPTACLE
VOLTAGE TOLERANCE ±10%

FIGURE 7. SCHEMATIC DIAGRAM

MODEL 701



GENERAL INFORMATION

TYPE - Compact two-piece automotive type superheterodyne receiver. Receiver consists of a tuning unit and audio & power unit which are connected together by means of an interconnecting cable. This receiver is designed for installation in any car by using with appropriate Motorola control head and speaker kit.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

POWER INPUT - 7.0 amps at 6.3 volts

POWER OUTPUT - 3.5 watts (max)

TUBE COMPLEMENT - Tuner Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det-AVC-AF Amp

Audio & Power Unit
6AQ5 - Power Amplifier
6X4 - Rectifier

TUNER - Solenoid Tuner ST-78. Refer to ST-78 Tuner Service Manual for complete service information.

TO SET UP AUTOMATIC TUNING

To set push buttons to the desired stations:

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above.)
g. Turn automatic tuner set-up knob until previously noted program is heard. NOTE: Check the setting of the automatic button just set up by pressing the "M" button and manually tune in the station. There should be no difference in volume or clarity when the station is tuned in either manually or automatically. If a difference is noted, reset the automatic tuner push button more accurately by repeating above procedure. Also make sure the push button is set to same station that was selected manually and not to a weak distant station carrying the same network program.
h. Repeat steps c, d, e, f & g for balance of buttons.

TONE CONTROL

This receiver has a three-position tone control which may be operated by pushing "in" volume knob. Do not hold the knob "in"; merely push in and release. Each push changes the tone one step.

To operate the tone control, push in on the volume control knob. Make certain the volume control knob is properly adjusted to operate the tone switch. Adjust the knob in or out on the shaft, to allow the minimum amount of travel to actuate the switch when the knob is depressed. Too much motion may cause the shaft to stick and prevent the tone switch from opening when the knob is released. CAUTION: Failure of the tone switch to release will cause the tone relay to overheat. If the tone control knob does not operate the tone control switch, with a reasonable amount of pressure, loosen the acorn nuts and adjust the outer housing of the flexible shaft until proper action is obtained.

ALIGNMENT

Remove tuner unit front housing and bottom cover to expose all alignment adjustments. Connect power and audio unit to tuner unit. Connect a 6 volt battery to "A" lead and power & audio unit chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum.

Place tuner in manual position, either by actuating carriage plate manually or by connecting a control head to receiver and pressing "M" button.

For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part Number 66A76278, is required for adjusting the tuner cores.

IMPORTANT: Do not push in on the alignment tool when adjusting tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Figure 1	8, 9 & 10	Peak for maximum in order indicated.

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

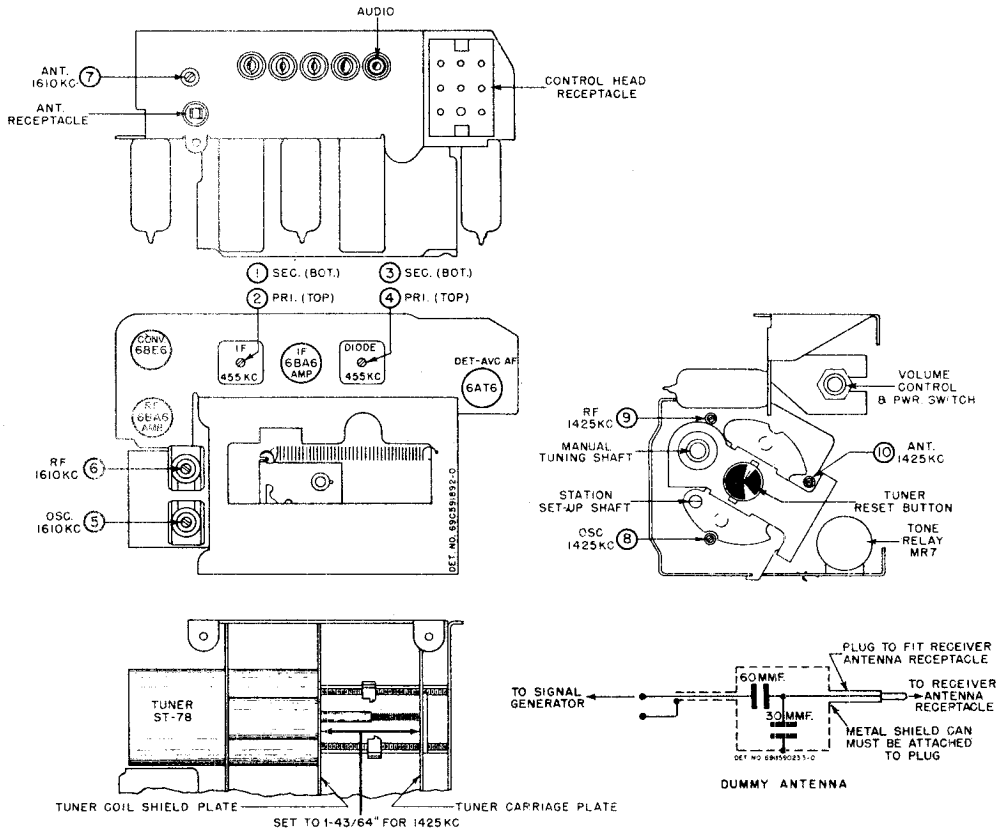
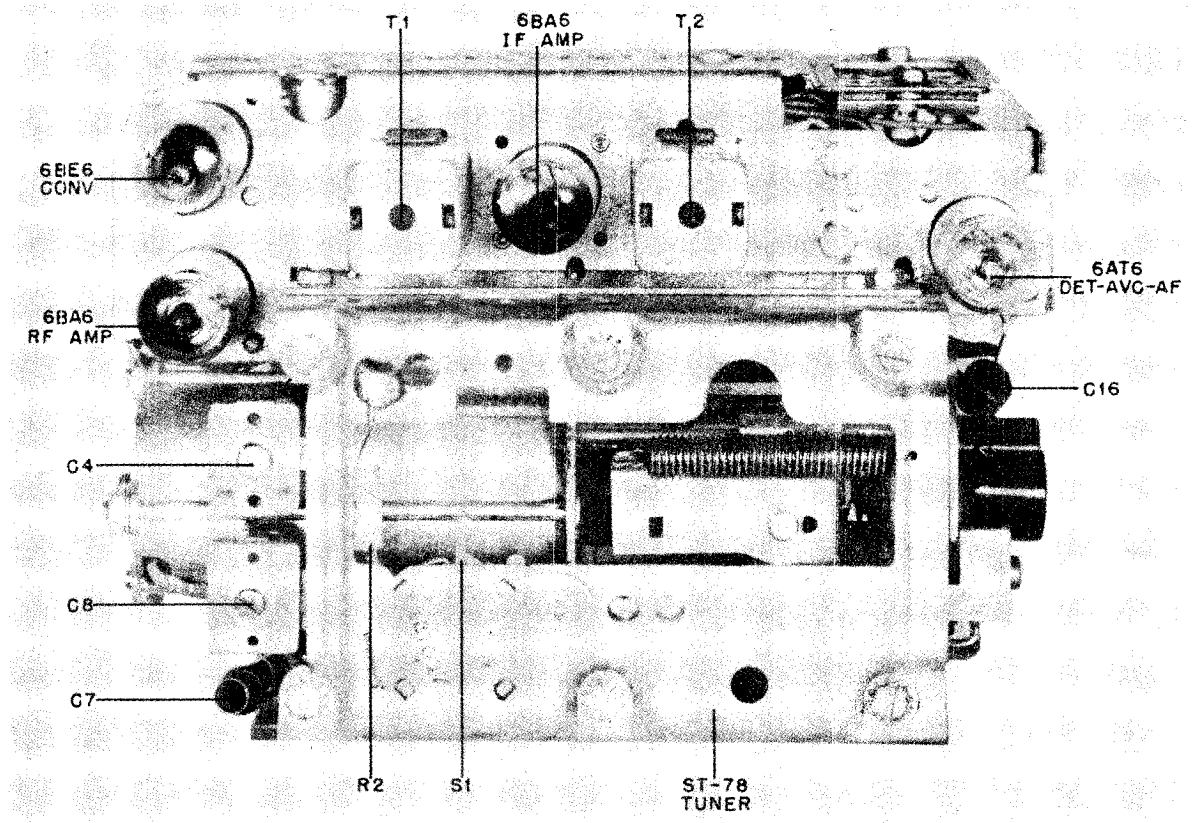


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL

MODEL 701



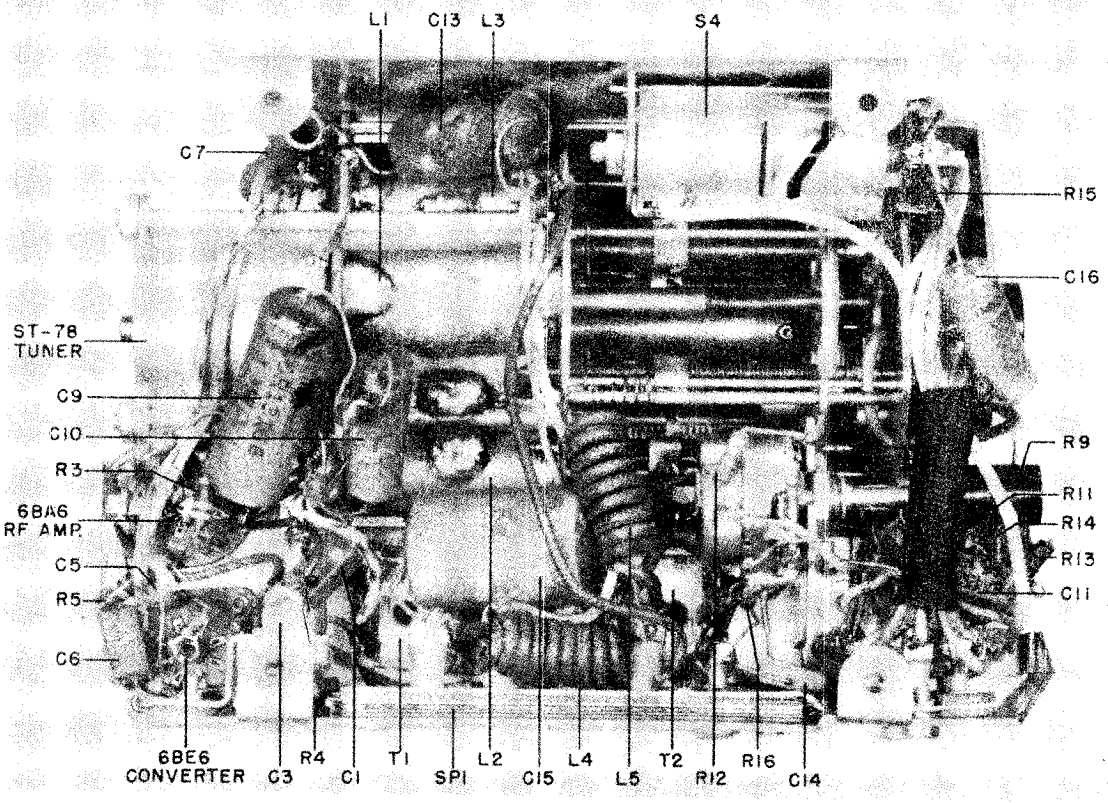
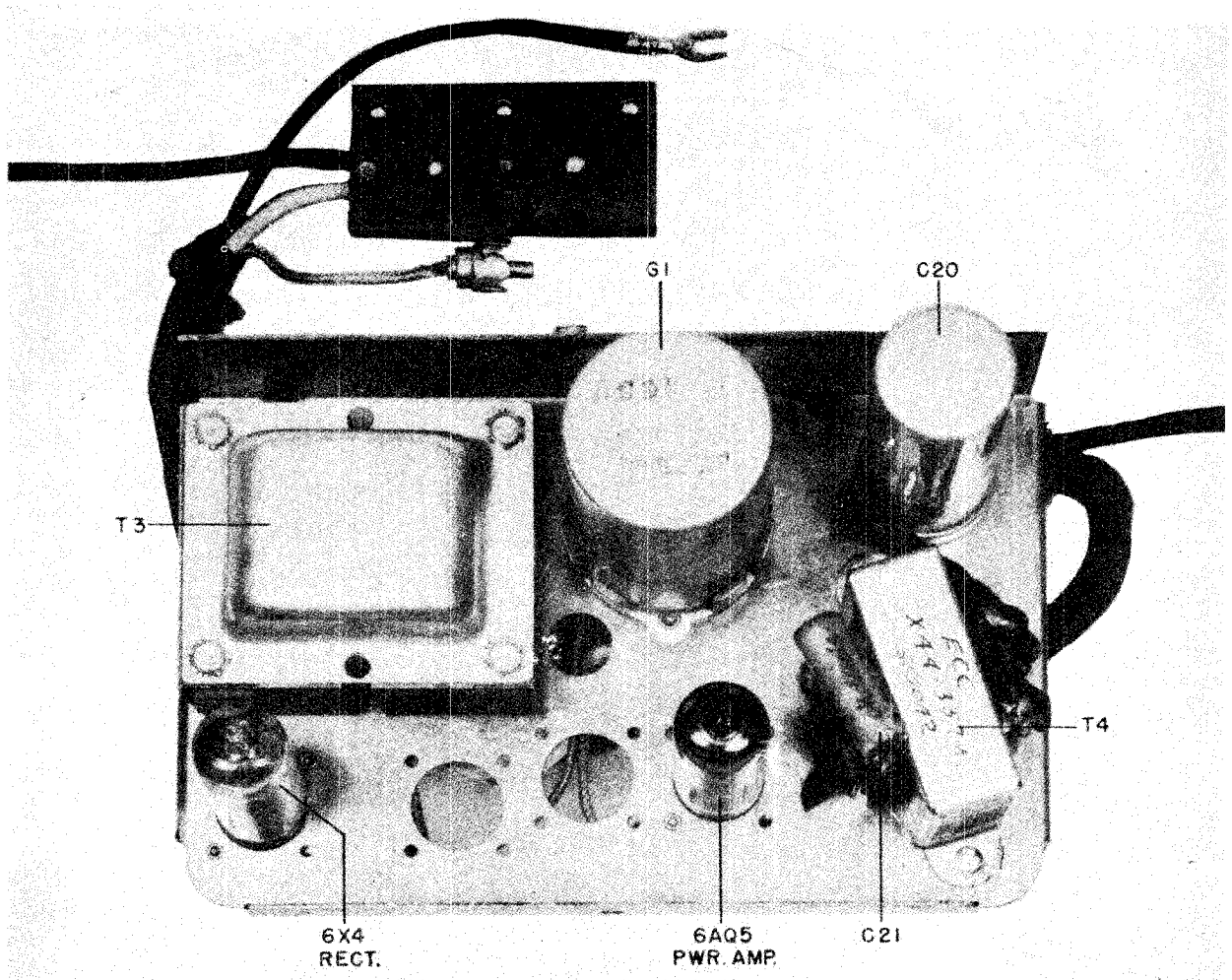


FIGURE 2. PARTS LOCATION - TUNING UNIT



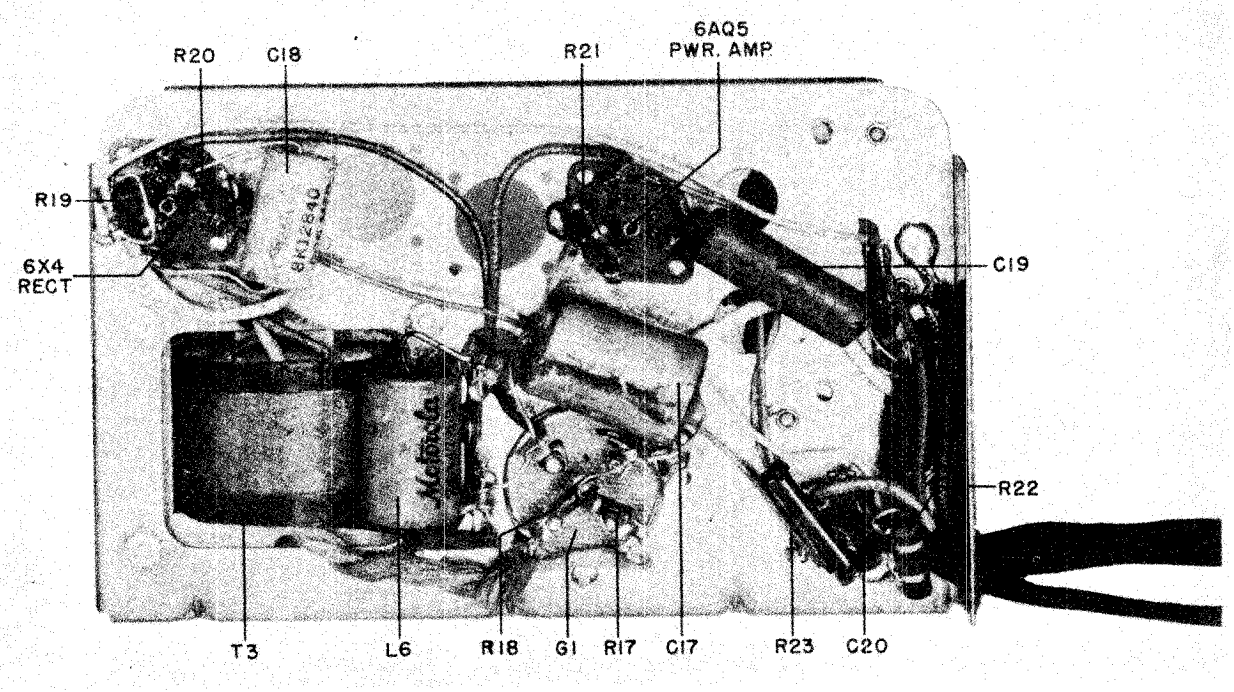


FIGURE 3. PARTS LOCATION - AUDIO & POWER UNIT

MODEL 701

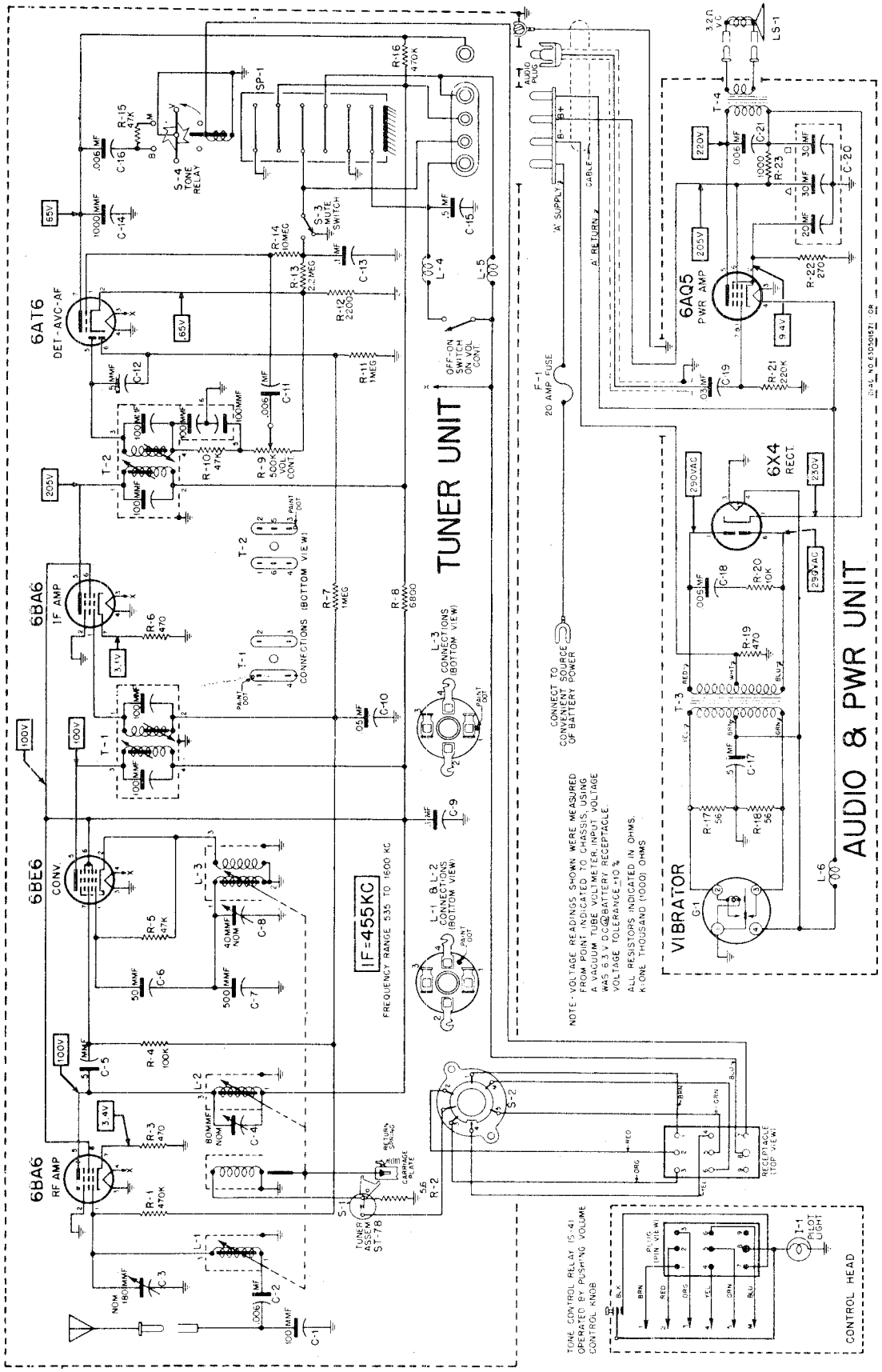


FIGURE 4. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
TUNER UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V.....
C-2	8A4529	Paper: .006 mf 100V.....
C-3*	20A592135	Variable, trimmer: 50 to 280 mmf; includes bracket.....
C-4*	20K481527	Variable, trimmer: 20 to 180 mmf; includes bracket.....
C-5	21K70720	Molded: 5 mmf 500V.....
C-6	21K74661	Ceramic: 50 mmf 300V.....
C-7	21K592327	Ceramic: 500 mmf 5% 500V...
C-8*	20K472612	Variable, trimmer: 5 to 80 mmf; includes bracket.....
C-9	8R13166	Paper: .1 mf 400V.....
C-10	8A13514	Paper: .05 mf 100V.....
C-11	8A4529	Paper: .006 mf 100V.....
C-12	21K70720	Molded: 5 mmf 500V.....
C-13	8R472035	Paper: .1 mf 100V.....
C-14	21R6638	Mica: 1000 mmf 500V.....
C-15	8K17028	Paper: .5 mf 100V.....
C-16	8K71910	Paper: .006 mf 400V.....
Pilot Light		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51 .....
Coils		
L-1,2*	24B71881	RF & Antenna Coil (specify color of paint dot on old coil when ordering).....
L-3*	24B592153	Oscillator Coil (specify color of paint dot on old coil when ordering) .....
L-4	24K592269	Choke ("A" lead).....
L-5	24K592269	Choke (dial light).....
Resistors		
		Note: All resistors are carbon insulated ty unless otherwise specified.
R-1	6R6032	470,000 20% 1/2W .....
R-2	17K484497	Wirewound: 5.6 .....
or	6R488139	5.6 10% 1W .....
R-3	6R6090	470 10% 1/2W .....
R-4	6R6075	100,000 20% 1/2W .....
R-5	6R6056	47,000 20% 1/2W .....
R-6	6R6090	470 10% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6287	6800 20% 1W N.I. ....
R-9	1A472531	Volume Control and Shaft Assembly: .5 meg .....
R-10	6R6056	47,000 20% 1/2W.....
R-11	6R6004	1 meg 20% 1/2W .....
R-12	6R6290	2200 20% 1/2W .....
R-13	6R3927	2.2 meg 20% 1/2W .....
R-14	6R2109	10 meg 20% 1/2W .....
R-15	6R6056	47,000 20% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....

Ref. No.	Part Number	Description
Switches		
S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3*	40A472644	Mute Switch .....
S-4	1X592220	Tone Relay MR-7 .....
Spark Plate		
SP-1	1B592133	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24K485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
Tuner		
	1X592280	Solenoid Tuner ST-78 ...
POWER & AUDIO UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-17	8K17028	Paper: .5 mf 100V .....
C-18	8K12840	Paper: .006 mf 1600V.....
C-19	8R71911	Paper: .03 mf 400V.....
C-20	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V .....
C-21	8K71910	Paper: .006 mf 400V.....
Fuse		
F-1	65K4637	Fuse: 20 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin ..
Coils		
L-6	24A472535	Choke, hash .....
Resistors		
		Note: All resistors are carbon insulated type unless otherwise specified.
R-17	6R5614	56 10% 1/2W .....
R-18	6R5614	56 10% 1/2W .....
R-19	6R3949	470 20% 1/2W .....
R-20	6R6054	10,000 20% 1/2W .....
R-21	6R6015	220,000 20% 1/2W .....
R-22	6R6336	270 10% 1W .....
R-23	6R6184	1000 20% 1W N.I. ....

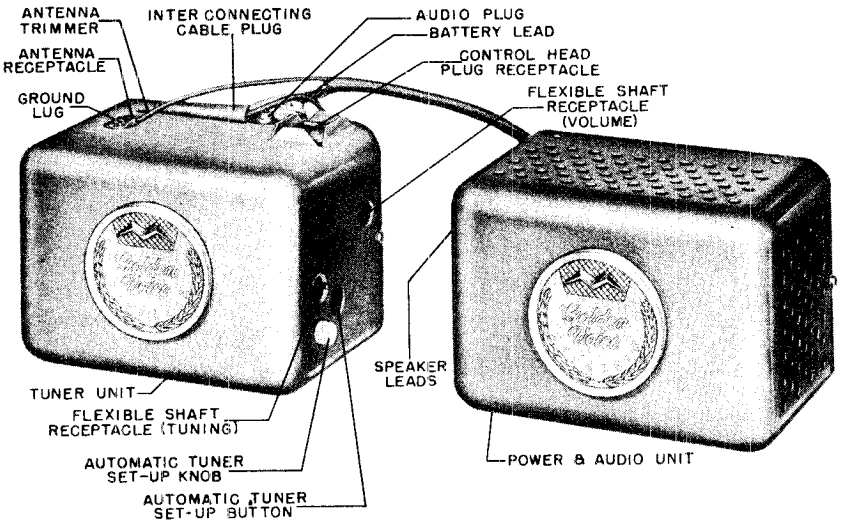
*Part of Solenoid Tuner ST-78

MODEL 701

Transformers

T-3	25K590650	Power Transformer .....
T-4	25B502330	Output Transformer .....

Part Number	Description
	TUNER UNIT
	CHASSIS PARTS - MECHANICAL
7A592127	Bracket, volume control mtg ...
42A485548	Clip, coil can mtg .....
4S7657	Lockwasher, ext: #8; stl; cad pl (tone relay mtg) .....
2S7000	Nut, hex: 8-32 x 5/16; stl; cad pl (tone relay mtg) .....
1X70646	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7719	Rivet: .088 x 5/32; stl; nkl pl (terminal strip mtg) .....
5S7728	Rivet: .122 x 5/16; stl; nkl pl (spark plate mtg) .....
3S7152	Screw, machine: 6-32 x 1/4 plain hex head; stl; cad pl (volume control bracket and capacitor bracket mtg) .....
3S8140	Screw, sheet metal: #8 x 3/16; plain hex head; stl; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4; PKZ plain hex head; stl; cad pl (tuner bracket mtg) .....
9A472534	Socket, tube: 7-prong; miniature.
9K580218	Socket, tube: 8-prong; miniature.
31A41318	Strip, terminal: 1 insulated lug, #2 mtg .....
	POWER & AUDIO UNIT
	CHASSIS PARTS - MECHANICAL
1X590362	Cable and Plug Assembly: includes fuse lead, power cable and plug.
42A4215	Clip, vibrator grounding.....
14A592132	Insulator, connector plug.....
9K592646	Lead Assembly, fuse: includes "A" lead and fuse receptacle.....
1X76859	Lead Assembly, speaker .....
4S7666	Lockwasher, ext: #6; stl; cad pl (power transformer mtg).....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) .....
28A592119	Plug, connector: 4-pin .....
28K71775	Plug, insulated .....
5S7771	Rivet: .088 x 3/16;stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (terminal strip mtg) .....
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator clip mtg).....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output trans mtg) .....
9A472534	Socket, tube: miniature; 7-prong .
9A70208	Socket, tube: 4-pin (for vibrator).
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 1-1/8" long .....
31A592258	Strip, terminal: 2 insulated lugs, #2 mtg; 1-3/8" long .....
29A76280	Terminal, insulated pin: black (on speaker leads) .....
29K76282	Terminal, insulated pin: white (on speaker leads) .....
	HOUSING PARTS
38A71874	Button, push: includes spring clamp
42A501255	Clip, escutcheon retainer .....
15K592124	Cover, bottom: with bushing.....
13C501269	Escutcheon .....
1X501273	Housing and Escutcheon Assembly (Tuner Unit) .....
1X501275	Housing and Escutcheon Assembly (Power & Audio Unit) .....
3S400356	Screw, sheet metal: #4 x 1/4; plain hex head; stl; cad pl (escutcheon mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ; plain hex head; stl; cad pl (bottom cover mtg) .....
3S8114	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; antique copper finish (housing screws) .....
	ACCESSORIES
8A4491	Capacitor, generator .....
4S7653	Lockwasher, int-ext: 5/16; stl; cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft and Housing Assembly, flexible 24" long .....
50K502269 or 50B502802	Speaker, PM; 6"; 3.2 ohm VC....
3S77542	Stud, threaded (receiver mtg)..
6A4141	Suppressor, distributor .....



GENERAL INFORMATION

TYPE - Compact two-piece automotive type superheterodyne receiver. Receiver consists of a tuning unit and audio & power unit which are connected together by means of an interconnecting cable. This receiver is designed for installation in any car by using with appropriate Motorola control head and speaker kit.

TUNING RANGE - 535 to 1600 Kc IF - 455 Kc

POWER INPUT - 8.2 amps at 6.3 volts

POWER OUTPUT - 4.5 watts.(max)

TUBE COMPLEMENT - Tuner Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det-AVC-AF Amp
Audio & Power Unit
6AT6 - Audio Inverter
6AQ5 - Power Amplifier
6AQ5 - Power Amplifier
6X4 - Rectifier

TUNER - Solenoid Tuner ST-78. Refer to ST-78 Tuner Service Manual for complete service information.

TO SET UP AUTOMATIC TUNING

To set push buttons to the desired stations:

a. Turn receiver on and allow it to warm up for a few minutes.
b. Collapse antenna until signal is weak.
c. Press Manual "M" button on control head.
d. Turn tuning knob until desired station is tuned in. (Make a mental note of the program). For best results choose only local stations.
e. Press desired button and wait until tuning mechanism completes its operation.
f. Press automatic tuner set-up button until "click" is heard. (See detail above).
g. Turn automatic tuner set-up knob until previously noted program is heard. NOTE: Check the setting of the automatic button just set up by pressing the "M" button and manually tune in the station. There should be no difference in volume or clarity when the station is tuned in either manually or automatically. If a difference is noted, reset the automatic tuner push button more accurately by repeating above procedure. Also make sure the push button is set to same station that was selected manually and not to a weak distant station carrying the same network program.
h. Repeat steps c, d, e, f & g for balance of buttons.

TONE CONTROL

This receiver has a three-position tone control which may be operated by pushing "in" volume knob. Do not hold the knob "in"; merely push in and release. Each push changes the tone one step.

To operate the tone control, push in on the volume control knob. Make certain the volume control knob is properly adjusted to operate the tone switch. Adjust the knob in or out on the shaft, to allow the minimum amount of travel to actuate the switch when the knob is depressed. Too much motion may cause the shaft to stick and prevent the tone switch from opening when the knob is released. CAUTION: Failure of the tone switch to release will cause the tone relay to overheat. If the tone control knob does not operate the tone control switch, with a reasonable amount of pressure, loosen the acorn nuts and adjust the outer housing of the flexible shaft until proper action is obtained.

MODEL 801

ALIGNMENT

Remove tuner unit front housing and bottom cover to expose all alignment adjustments. Connect power and audio unit to tuner unit. Connect a 6 volt battery to "A" lead and power & audio unit chassis.

Connect a low range output meter across speaker voice coil and set volume control at maximum.

Place tuner in manual position, either by actuating carriage plate manually or by connecting a control head to receiver and pressing "M" button.

For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver when aligning IF and diode transformers. A special tool, Motorola Part Number 66A76278, is required for adjusting the tuner cores.

IMPORTANT: Do not push in on the alignment tool when aligning the tuner cores; the slightest inward pressure may move tuner carriage and result in inaccurate alignment.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	6BE6 grid (pin #7) & chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating step.
RF ALIGNMENT						
2.	See Fig. 1	Antenna receptacle through dummy	1610 Kc	High frequency end; cores should project 1-1/8" from cans (Screw out if necessary)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1425 Kc	1425 Kc -per Figure 1	8, 9 & 10	Peak for maximum in order indicated

4. When receiver is installed in car, extend antenna fully, set dial to approximately 1400 Kc and repeak antenna trimmer (7) for maximum volume of a weak station or noise between stations.

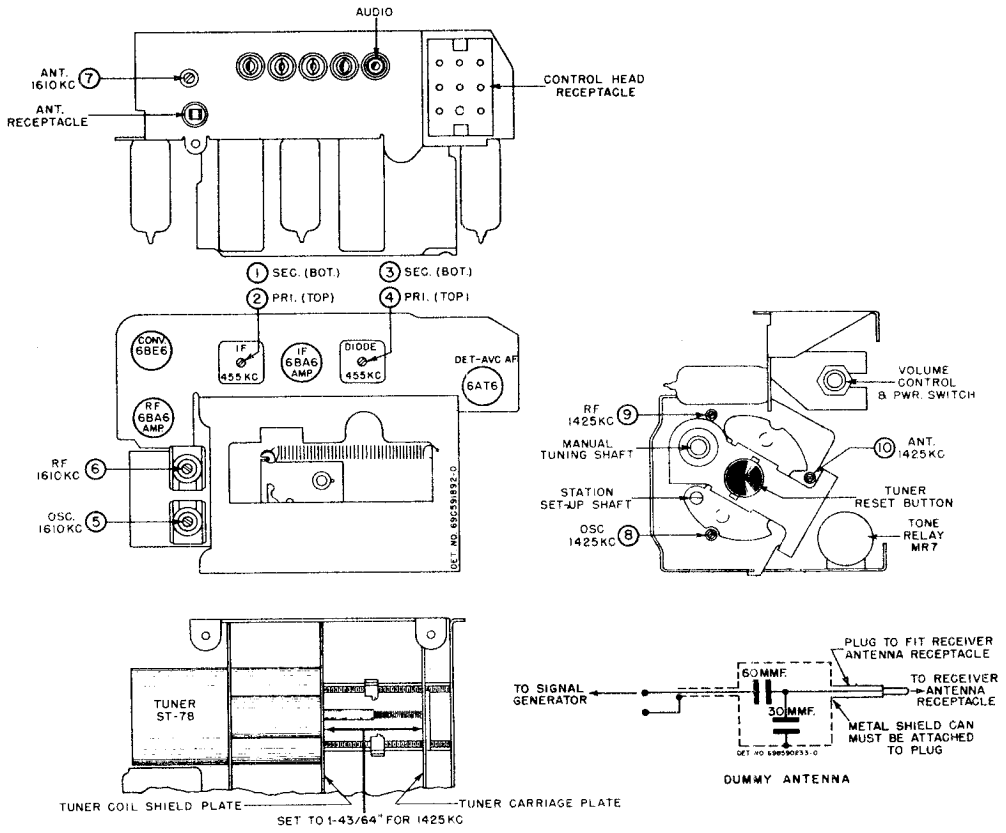
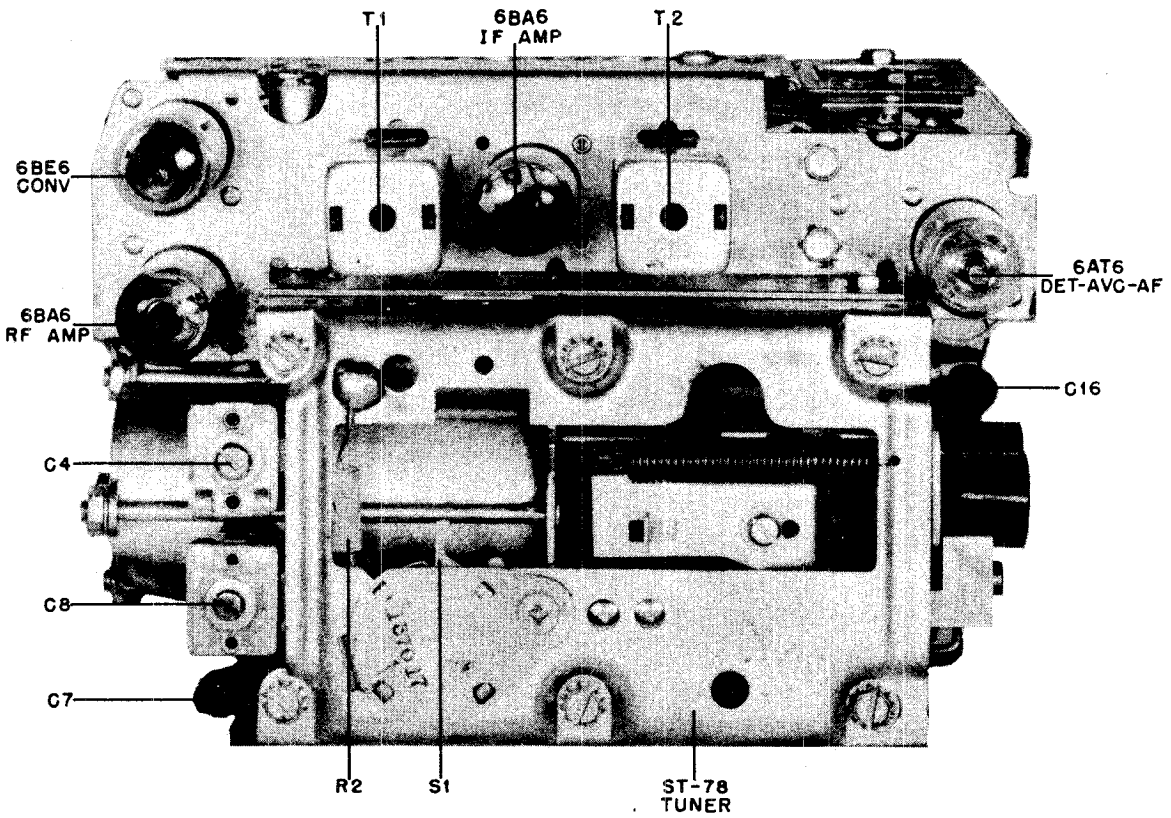


FIGURE 1. TUBE & TRIMMER LOCATIONS AND DUMMY ANTENNA DETAIL



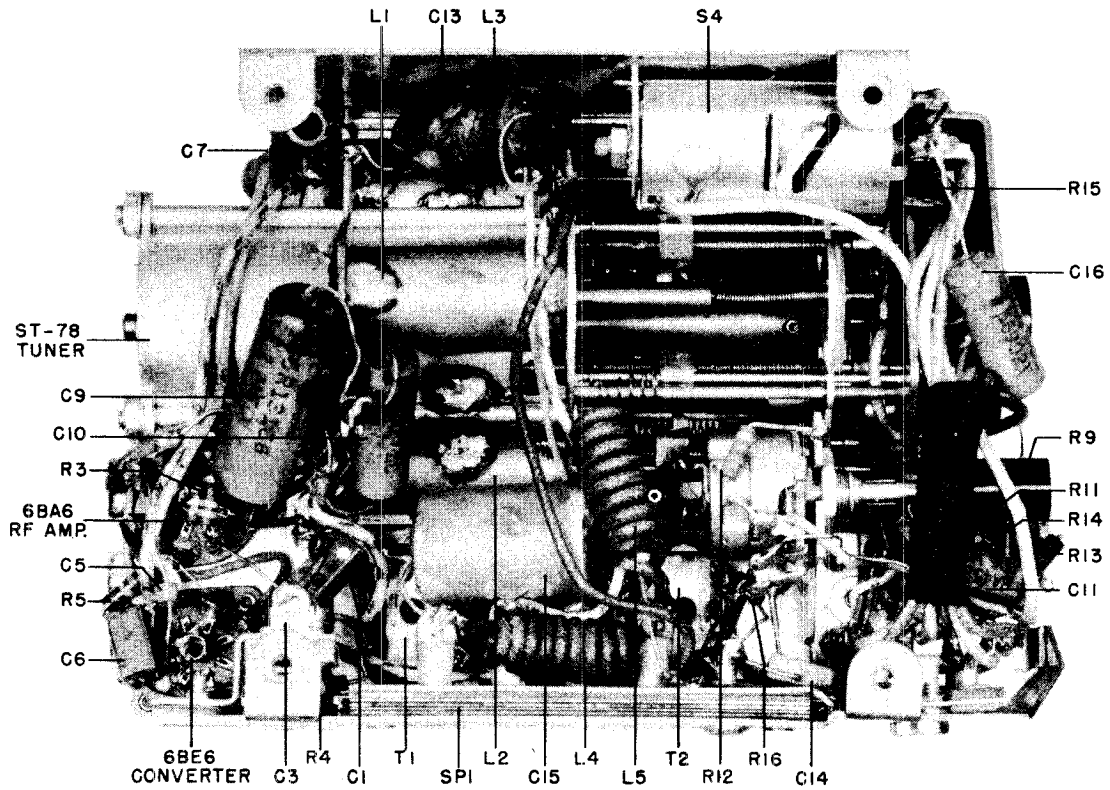
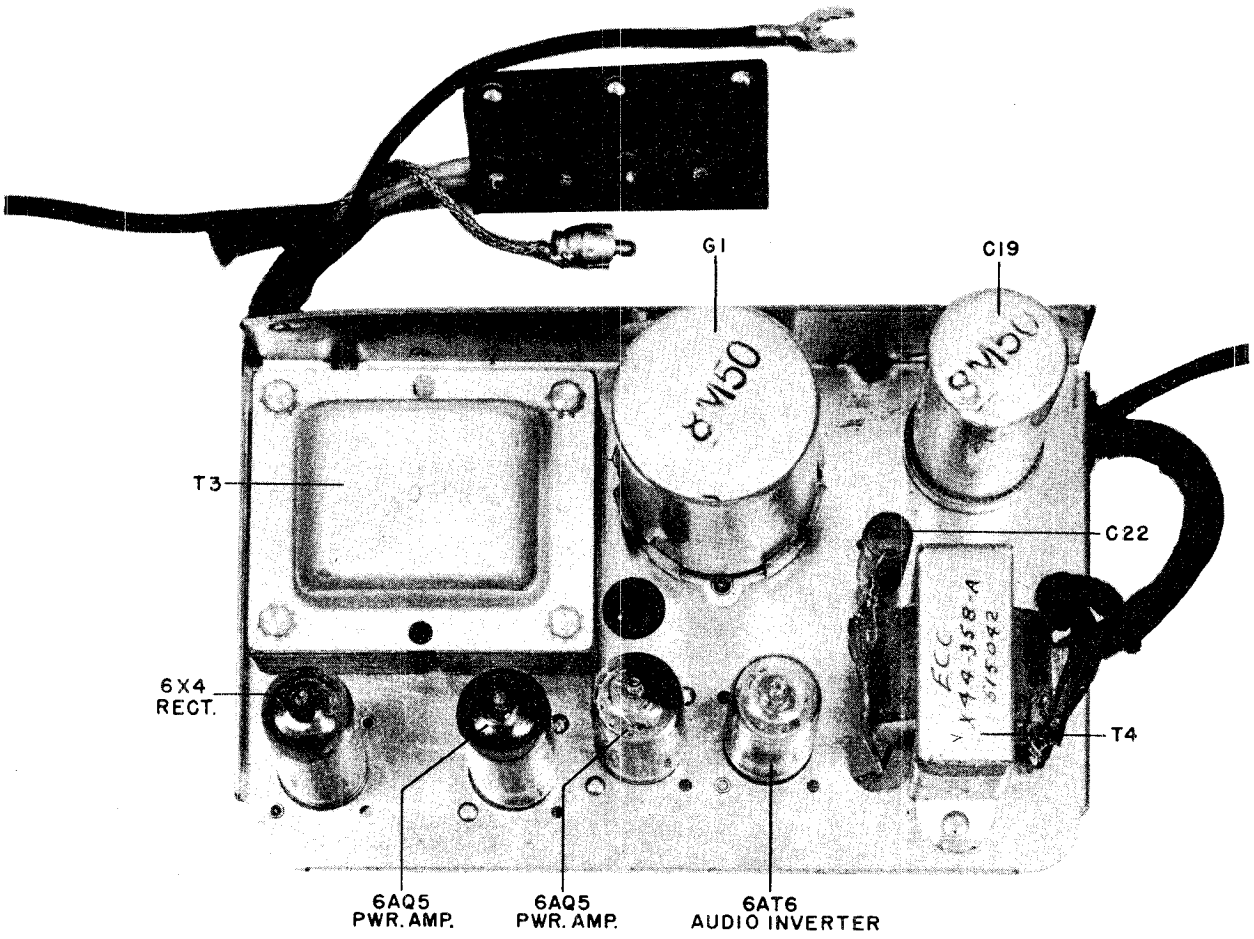


FIGURE 2. PARTS LOCATION - TUNING UNIT

MODEL 801



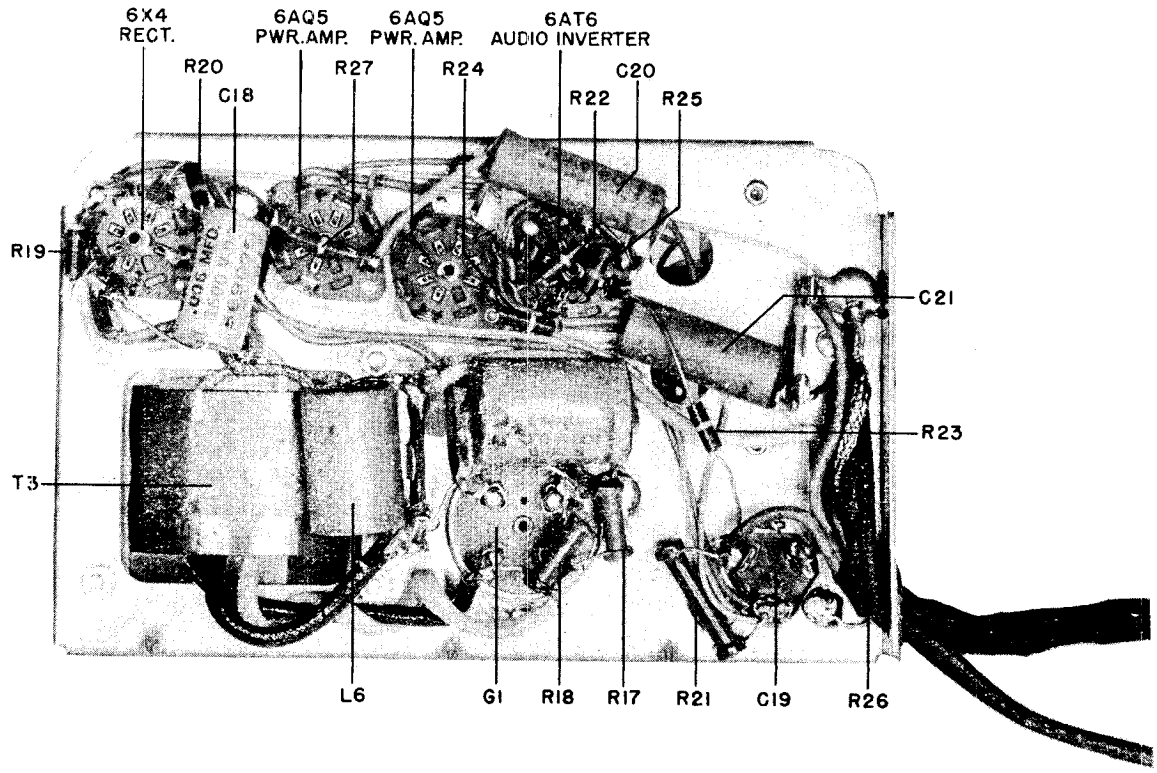


FIGURE 3. PARTS LOCATION - AUDIO & POWER UNIT

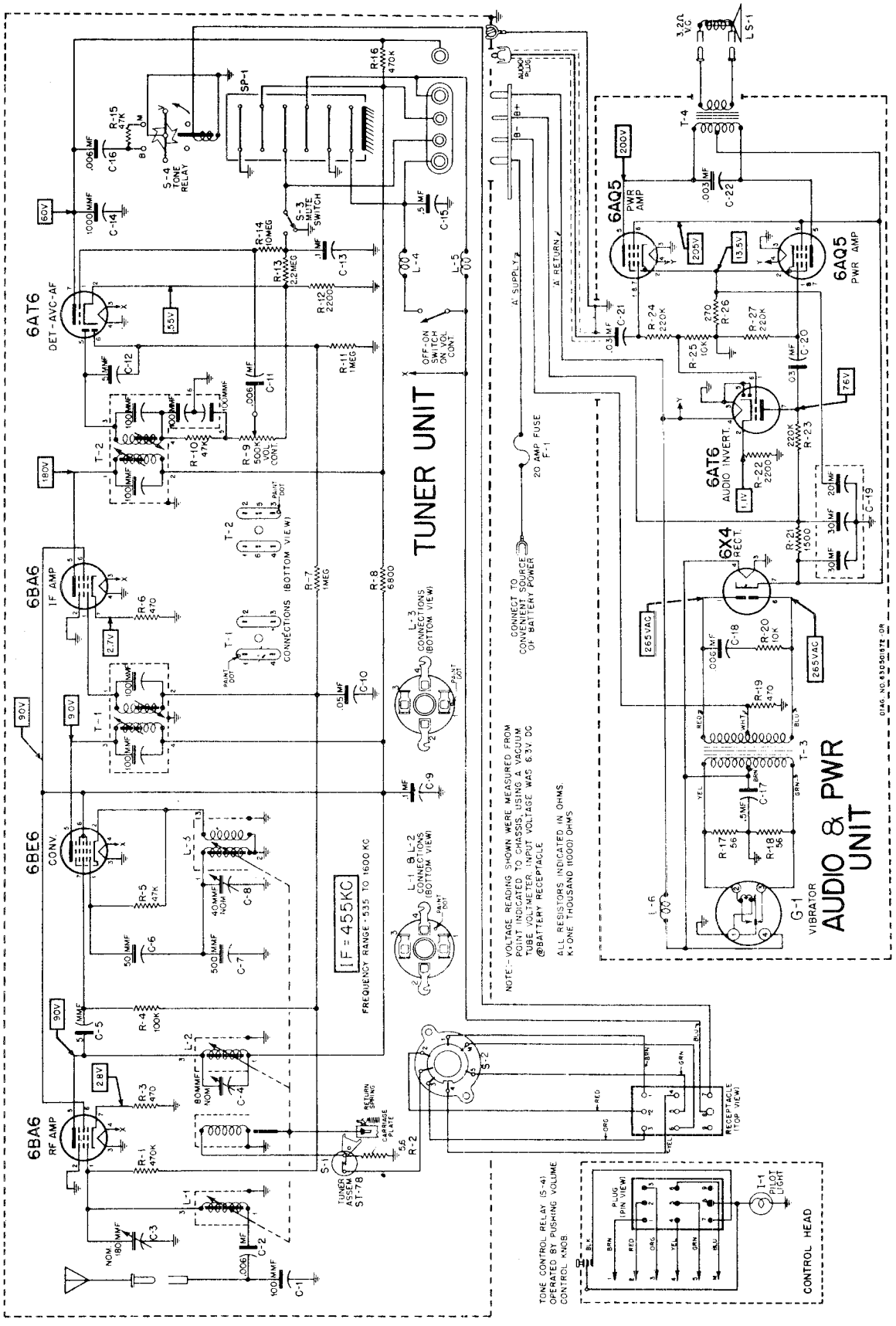


FIGURE 4. SCHEMATIC DIAGRAM

MODEL 801

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
TUNER UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3*	20A592135	Variable, trimmer: 50 to 280 mmf; includes bracket .....
C-4*	20K481527	Variable, trimmer: 20 to 180 mmf; includes bracket .....
C-5	21K70720	Molded: 5 mmf 500V .....
C-6	21K74661	Ceramic: 50 mmf 300V .....
C-7	21K592327	Ceramic: 500 mmf 5% 500V..
C-8*	20K472612	Variable, trimmer: 5 to 80 mmf; includes bracket .....
C-9	8R13166	Paper: .1 mf 400V .....
C-10	8A13514	Paper: .05 mf 100V .....
C-11	8A4529	Paper: .006 mf 100V .....
C-12	21K70720	Molded: 5 mmf 500V .....
C-13	8R472035	Paper: .1 mf 100V .....
C-14	21R6638	Mica: 1000 mmf 500V .....
C-15	8K17028	Paper: .5 mf 100V .....
C-16	8K71910	Paper: .006 mf 400V .....
Pilot Light		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51 .....
Coils		
L-1,2*	24B71881	RF & Antenna Coil (specify color of paint dot on old coil when ordering).....
L-3*	24B592153	Oscillator Coil (specify color of paint dot on old coil when ordering) .....
L-4	24K592269	Choke ("A" lead) .....
L-5	24K592269	Choke (dial light) .....
Resistors		
Note: All resistors are carbon insulated type unless otherwise specified.		
R-1	6R6032	470,000 20% 1/2W .....
R-2	17K484497	Wirewound: 5.6 .....
or	6R488139	5.6 10% 1W .....
R-3	6R6090	470 10% 1/2W .....
R-4	6R6075	100,000 20% 1/2W .....
R-5	6R6056	47,000 20% 1/2W .....
R-6	6R6090	470 10% 1/2W .....
R-7	6R6004	1 meg 20% 1/2W .....
R-8	6R6287	6800 20% 1W N.I. ....
R-9	1A472531	Volume Control and Shaft Assembly: .5 meg .....
R-10	6R6056	47,000 20% 1/2W .....
R-11	6R6004	1 meg 20% 1/2W .....
R-12	6R6290	2200 20% 1/2W .....
R-13	6R3927	2.2 meg 20% 1/2W .....
R-14	6R2109	10 meg 20% 1/2W .....
R-15	6R6056	47,000 20% 1/2W .....
R-16	6R6032	470,000 20% 1/2W .....
Switches		
S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3*	40A472644	Mute Switch .....
S-4	1X592220	Tone Relay MR-7 .....
Spark Plate		
SP-1	1B592133	Spark Plate Assembly .....
Transformers		
T-1	24B485553	IF, 455 Kc: complete with tuning cores and padding capacitors .....
T-2	24K485555	Diode, 455 Kc: complete with tuning cores and padding capacitors .....
Tuner		
	1X592280	Solenoid Tuner ST-78 .....
POWER & AUDIO UNIT		
CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-17	8K17028	Paper: .5 mf 100V .....
C-18	8K12840	Paper: .006 mf 1600V.....
C-19	23A473015	Electrical: 30-30-20 mf/ 350-300-25V .....
C-20	8R71911	Paper: .03 mf 400V .....
C-21	8R71911	Paper: .03 mf 400V .....
C-22	8R13165	Paper: .003 mf 1000V .....
Fuse		
F-1	65K4637	Fuse, 20 amp .....
Vibrator		
G-1	48B3333	Vibrator, non-sync: 4-pin...
Coil		
L-6	24A472535	Choke, hash .....

*Part of Solenoid Tuner ST-78

Resistors

Note: All resistors are carbon insulated type unless otherwise specified.

R-17	6R5614	56 10% 1/2W .....
R-18	6R5614	56 10% 1/2W .....
R-19	6R3949	470 20% 1/2W .....
R-20	6R6054	10,000 20% 1/2W .....
R-21	6R6286	1500 20% 1W N.I. ....
R-22	6R6069	2200 10% 1/2W .....
R-23	6R6015	220,000 20% 1/2W .....
R-24	6R6015	220,000 20% 1/2W .....
R-25	6R6054	10,000 20% 1/2W .....
R-26	6R6336	270 10% 1W .....
R-27	6R6015	220,000 20% 1/2W .....

Transformers

T-3	25K590650	Power Transformer .....
T-4	25B502331	Output Transformer .....

Part Number	Description
	TUNER UNIT
	CHASSIS PARTS - MECHANICAL
7A592127	Bracket, volume control mtg ....
42A485548	Clip, coil can mtg .....
4S7657	Lockwasher, ext: #8; stl; cad pl (tone relay mtg) .....
2S7000	Nut, hex: 8-32 x 5/16; stl; cad pl (tone relay mtg) .....
1X70646	Receptacle, antenna .....
5S7719	Rivet: .088 x 5/32; stl; nkl pl (terminal strip mtg) .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7728	Rivet: .122 x 5/16; stl; nkl pl (spark plate mtg) .....
3S7152	Screw, machine: 6-32 x 1/4 plain hex head; stl; cad pl (volume control brkt and capacitor brkt mtg) .....
3S8140	Screw, sheet metal: #8 x 3/16; plain hex head; stl; cad pl (tuner mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl; cad pl (tuner bracket mtg) .....
9A472534	Socket, tube: 7-prong; miniature...
9K580218	Socket, tube: 8-prong; miniature...
31A41318	Strip, terminal: 1 insulated lug, #2 mtg .....
	POWER & AUDIO UNIT
	CHASSIS PARTS - MECHANICAL
1X592233	Cable and Plug Assembly: includes fuse lead, power cable and plug.
42A4215	Clip, vibrator grounding .....
14A592132	Insulator, connector plug .....
9K592237	Lead Assembly, fuse: includes "A" lead and fuse receptacle .....
1X76859	Lead Assembly, speaker .....
4S7666	Lockwasher, ext: #6; stl; cad pl (power transformer mtg) .....
2S7005	Nut, hex: 6-32 x 1/4; stl; cad pl (power transformer mtg) .....
28A592119	Plug, connector: 4-pin .....
28K71775	Plug, insulated .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; stl; nkl pl (terminal strip mtg) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (output transformer mtg) ...
5S7701	Rivet: .122 x 3/16; stl; nkl pl (vibrator clip mtg) .....
9A472534	Socket, tube: miniature; 7-prong...
9A70208	Socket, tube: 4-pin (for vibrator).
31K490143	Strip, terminal: 2 insulated lugs, #2 mtg; 1-1/8" long .....
31A592258	Strip, terminal: 2 insulated lugs. #2 mtg; 1-3/8" long .....
29A76280	Terminal, insulated pin: black (on speaker leads) .....
29K76282	Terminal, insulated pin: white (on speaker leads) .....
	HOUSING PARTS
38A71874	Button, push .....
42A501255	Clip, escutcheon retainer .....
15K592124	Cover, bottom: with bushing .....
13C501302	Escutcheon (golden voice) .....
1X501276	Housing and Escutcheon Assembly (Power & Audio Unit) .....
1X501278	Housing and Escutcheon Assembly (Tuner Unit) .....
3S400356	Screw, sheet metal: #4 x 1/4; plain hex head; stl; cad pl (escutcheon mtg) .....
3S7454	Screw, sheet metal: #8 x 1/4 PKZ plain hex head; stl;cad pl (bottom cover mtg) .....
3S8114	Screw, sheet metal: #8 x 1/4 PKZ slotted acorn head; antique copper finish (housing screws)....
	ACCESSORIES
8A4491	Capacitor, generator .....
4S7653	Lockwasher, int-ext: 5/16; stl;cad pl (receiver mtg) .....
2S2863	Nut, hex: 5/16; stl; cad pl (receiver mtg) .....
1K75148	Shaft and Housing Assembly, flexible 24" long .....
50B502802 or 50K502269	Speaker, PM: 6"; 3.2 ohm VC ..
3A77542	Stud, threaded (receiver mtg)
6A4141	Suppressor, distributor .....

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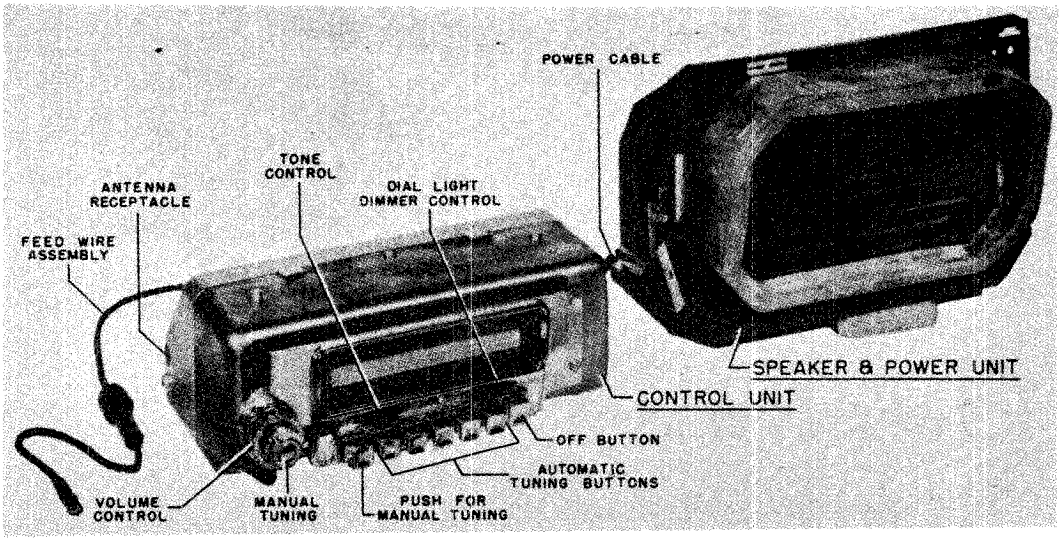

GENERAL INFORMATION

TYPE - Two-piece automotive type receiver, specifically designed for installation in DeSoto S-15 cars.

TUNING RANGE - 535 to 1605 Kc. IF FREQUENCY - 455 Kc

OPERATES FROM - 6.3 volts DC; 9 amperes

POWER OUTPUT - 4 watts undistorted

TUNER - Model AT-82. A breakdown of the tuner will be found in the Replacement Parts List.

TUBE COMPLEMENT - Control Unit
6BA6 - RF Amplifier
6BE6 - Converter
6BA6 - IF Amplifier
6AT6 - Det, AVC & AF Amplifier

Speaker & Power Unit
6AT6 - Audio Inverter
6AQ5 - Power Amplifier
6AQ5 - Power Amplifier
6X4 - Rectifier

ALIGNMENT

EQUIPMENT REQUIRED:

1. A special tool for adjusting the tuner cores. Use alignment Tool, Motorola Part No. 66A76278.

2. A small fibre screwdriver for IF & RF alignment.

3. An accurately calibrated AM modulated signal generator.

4. A low range output meter.

5. A dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1.

PROCEDURE:

1. Remove the front and rear housings and dial scale to expose alignment adjustment screws.

2. Connect the Control Unit & Speaker and Power Unit together by means of the power cable.

3. Connect an output meter across speaker voice coil.

4. Connect 6.6 volts (measured at the "on-off" switch) to receiver feed wire assembly and chassis.

5. Turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum. Push DIAL button to place tuner in manual position. Turn tone control to VOICE position.

6. For greatest accuracy keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

7. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment. CAUTION: Do not press hard on the alignment screwdriver when aligning IF & diode transformers as damage to the core or transformer may result.

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8. ANTENNA TRIMMER ADJUSTMENTS. Once alignment has been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmers (7 & 12) to car antenna after receiver is installed in car. These adjustments should be made with antenna fully extended. Trimmer (7) is adjusted with the DIAL button pushed in and dial set to approximately 1400 Kc; trimmer (12) is adjusted with #5 push button pushed in and tuned to approximately 1400 Kc. Peak these trimmers for maximum volume of a weak station or background noise between stations.

9. POINTER ADJUSTMENT. Pointer should be calibrated to dial scale by tuning in 1400 Kc signal and then adjusting pointer to 1400 Kc.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Hi side-6BE6 grid (pin #7) Lo side -chassis	455 Kc	High frequency end (cores out)	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
RF ALIGNMENT - MANUAL						
2.	See Fig. 1	Ant. receptacle through dummy	1605 Kc	High frequency end. Cores should project 1-1/8" from cans. (Screw out)	5, 6, & 7	Peak for maximum in order indicated.
3.	"	"	1400 Kc	Set spacing between carriage plate & coil shield plate to 3/8"	8, 9, & 10	Peak for maximum in order indicated.
4. NOTE: The following oscillator padder coil adjustment has been correctly made at the factory. Unless components have been changed in the oscillator circuit, this adjustment should not be made in the field. Front cover must be attached to chassis for this adjustment.						
	See Fig. 1	Ant. receptacle through dummy	Turn generator power off	Set tuner to 600 Kc ("6" on dial scale)	11	Peak oscillator padder for maximum noise. If padder core (11) must be moved more than 1/2 turn from its original position, repeat steps 2, 3, & 4 until it is necessary to move the padder core less than 1/2 turn in this step.
5. Repeat steps 2, 3, & 4 but eliminate preliminary step of moving cores to project 1-1/8" from cans.						
RF ALIGNMENT - PUSH BUTTON						
6. PUSH BUTTON #5:	See Fig. 1.	Ant. receptacle through dummy	1400 Kc	Set PB #5 to 1400 Kc	12	Peak PB ant. trimmer for max.
NOTE: The following push button tracking nut adjustments have been made at the factory. Unless components have been changed in the push button assembly circuit, these adjustments should not be made in the field.						
7. PUSH BUTTON #5:						
a.	See Fig. 1	Ant. receptacle through dummy	1605 Kc	Set PB #5 to 1605 Kc	12	Peak PB ant. trimmer (12) for max.
b.	"	"	1400 Kc	Set PB #5 to 1400 Kc	13	Peak tracking nut (13) for max.
c. Recheck pushbutton antenna trimmer (12) adjustment at 1605 Kc for max. response and repeat steps 7a & 7b if sensitivity rises with a change of push button antenna trimmer (12) setting.						
8. PUSH BUTTONS #4, 3 & 2:	See Fig. 1	Ant. receptacle through dummy	1020 Kc	Set PB's #4, 3, 2 to 1020 Kc	14 for #4 15 for #3 16 for #2	Peak tracking nuts for max.
9. PUSH BUTTON #1:	See Fig. 1	"	600 Kc	Set PB #1 to 600 Kc	17	Peak tracking nut for max.
IF TRAP ADJUSTMENT						
10.	See Fig. 1	"	455 Kc	Set PB #1 to 600 Kc	18	Tune wavetrap for minimum response.

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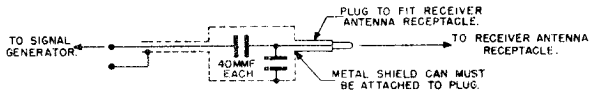

FIGURE 1. DUMMY ANTENNA

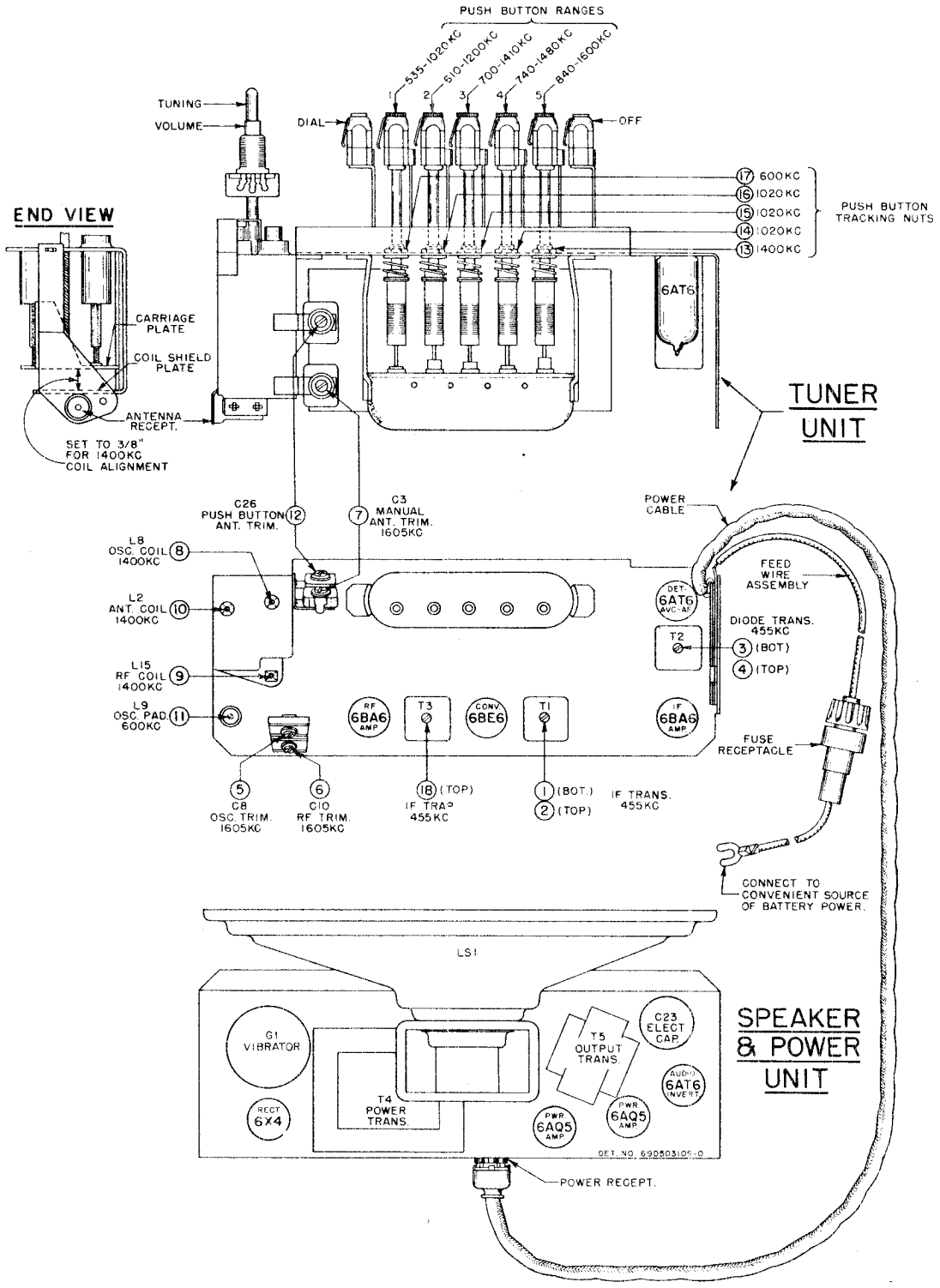

FIGURE 2. TUBE & TRIMMER LOCATION

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OPERATING INSTRUCTIONS

TO TURN THE RADIO ON. The on-off switch is combined with pushbutton operation. Pushing any button, other than the OFF button, will turn the radio on. Allow the receiver to reach operating temperature (approximately 20 seconds) before selecting a station.

TUNING. Tuning is accomplished manually or automatically. Any one of five stations may be selected automatically by means of pushbutton control. To receive stations that are not set for automatic selection, use Manual Tuning.

MANUAL TUNING. Push in the DIAL button (extreme left-hand button) then select the desired station or program by turning the manual tuning knob. Tune to the exact frequency or position for clearest reception. The pointer indicates the frequency to which the receiver is tuned.

AUTOMATIC TUNING. The five pushbuttons (1, 2, 3, 4 & 5) located beneath the dial scale, may be set for five favorite local stations. Firmly pressing one of the pushbuttons automatically selects the station for which the pushbutton was set.

VOLUME CONTROL. To increase the volume, turn the volume knob (located concentrically and behind the manual tuning knob) to the right.

TONE CONTROL. The knurled horizontal control at the left side of the dial escutcheon operates a variable tone control. Tuning this control to the right or to the left will change the tone of the receiver, as indicated on the dial escutcheon. With the control set at midway, the full tonal range is obtained. Static and other types of electrical interference will be minimized in the MELLO position.

DIMMER CONTROL. The knurled horizontal control at the right side of the dial escutcheon controls the intensity of the dial light. Turning this control to the left or right will vary the dial light intensity.

TO TURN THE RADIO OFF. Push in the OFF button (extreme right-hand button).

TO SET THE PUSHBUTTONS

The pushbuttons should preferably be set up during the day, since weak station signals are stronger at night and the button may be set to a distant station carrying the same program as the desired station.

1. Turn radio ON (see Operating Instructions) and allow it to warm up for at least 15 minutes. Antenna should be fully extended and tone control in VOICE position.

2. Pull off the chrome plated pushbutton caps from buttons 1, 2, 3, 4 and 5, exposing the knurled metal buttons.

3. Push in DIAL button and tune in station selected for No. 1 button, making sure it is within the 535 to 1020 kilocycle range as shown in Figure 2. Select only the most powerful local stations.

4. Push in No. 1 button. Turn No. 1 knurled button to right or left to tune in station already tuned in with manual control. Turning button counterclockwise will increase the frequency and turning clockwise will decrease the frequency. Check station by pushing in the DIAL button again to identify program. Tune carefully and do not force button beyond stop.

5. Perform steps 3 and 4 for the remaining four push buttons.

IMPORTANT: Check with Figure 2 for frequency range of each button.

6. Replace chrome plated pushbutton caps.

INTERFERENCE ELIMINATION

GENERATOR INTERFERENCE

Install radio interference filter capacitor on generator as shown in Figure 3. Mount the capacitor on the generator frame under the ground lead screw. Connect the eyelet terminal on the capacitor lead to the armature terminal of the generator.

WARNING: Do not connect to field terminal; to do so will result in damage to voltage regulator.

TIRE STATIC

After completion of Radio installation, road test car for tire static on dry concrete and blacktop pavements, under the following conditions:

1. At both low and high car speeds
2. With antenna extended to operating position
3. With radio at full volume and tuned off station.

If tire static noise is encountered, inject Tire Static Suppression Powder (Chrysler Package Part No. 1233 883) into tires with Injector (Chrysler Part No. 1233 884), following instructions given on package.

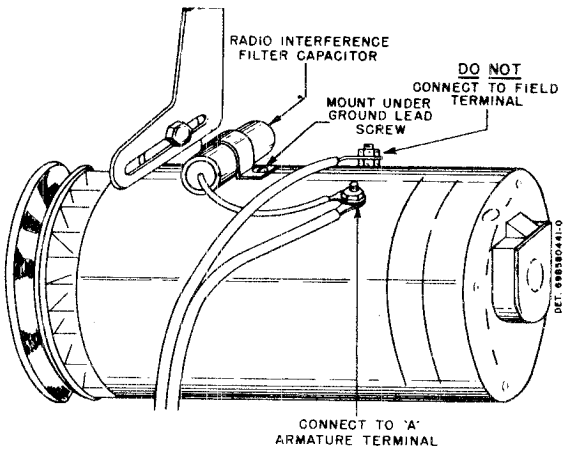

FIGURE 3. GENERATOR CAPACITOR INSTALLATION

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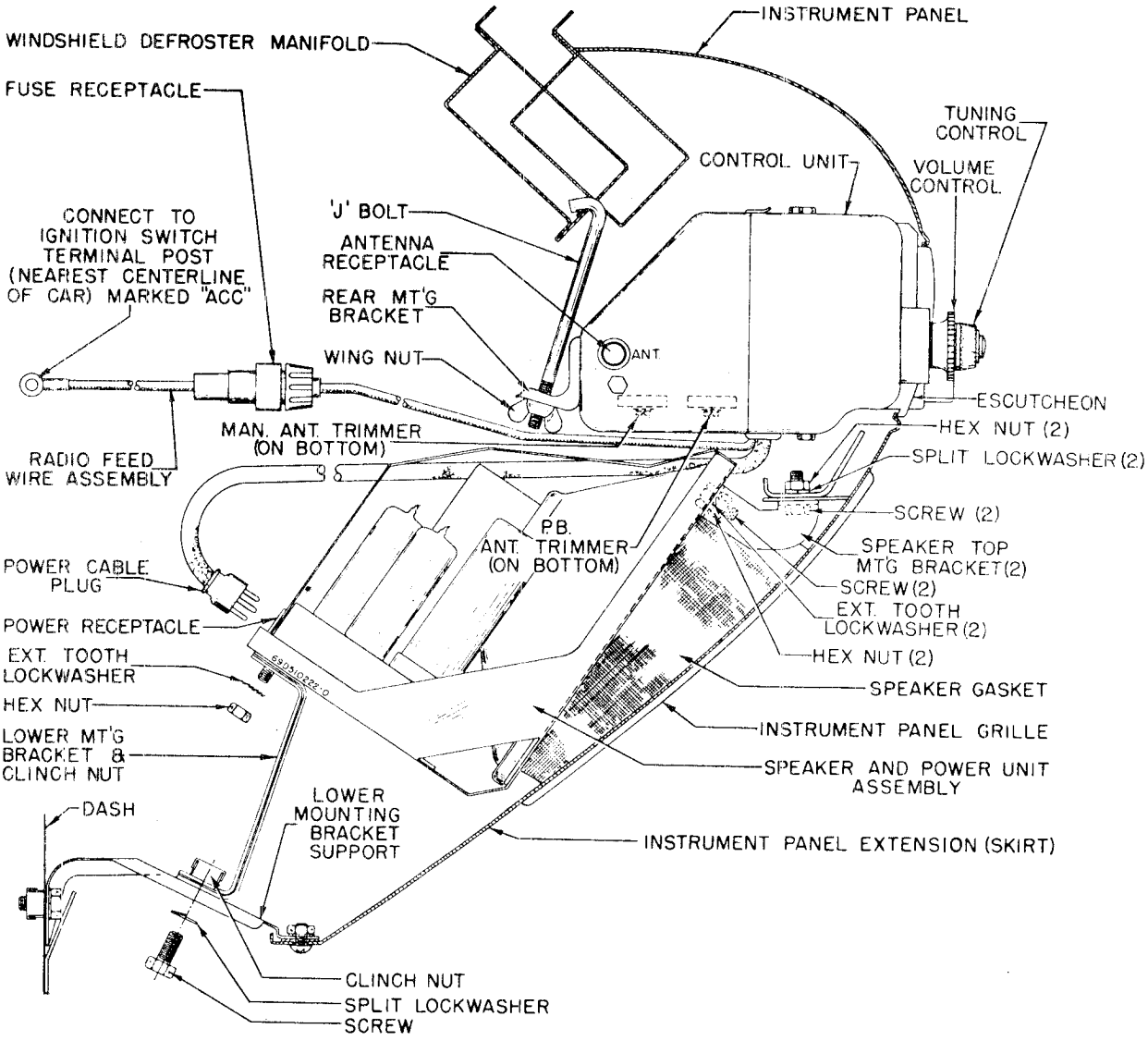

FIGURE 4. RADIO INSTALLATION

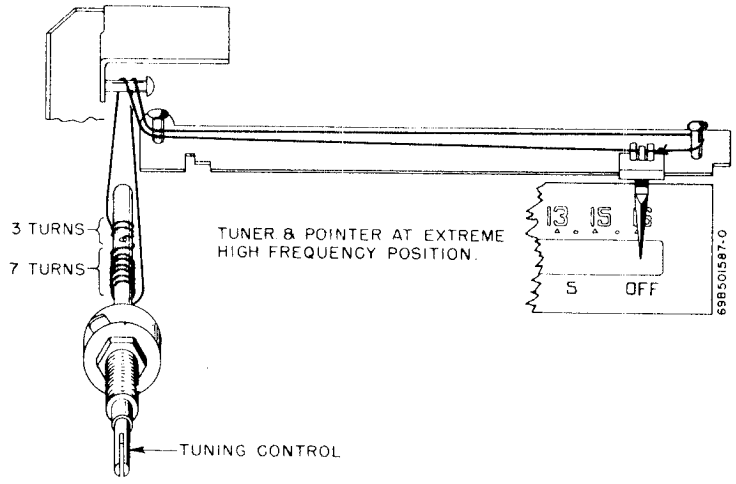

FIGURE 5. DIAL RESTRINGING

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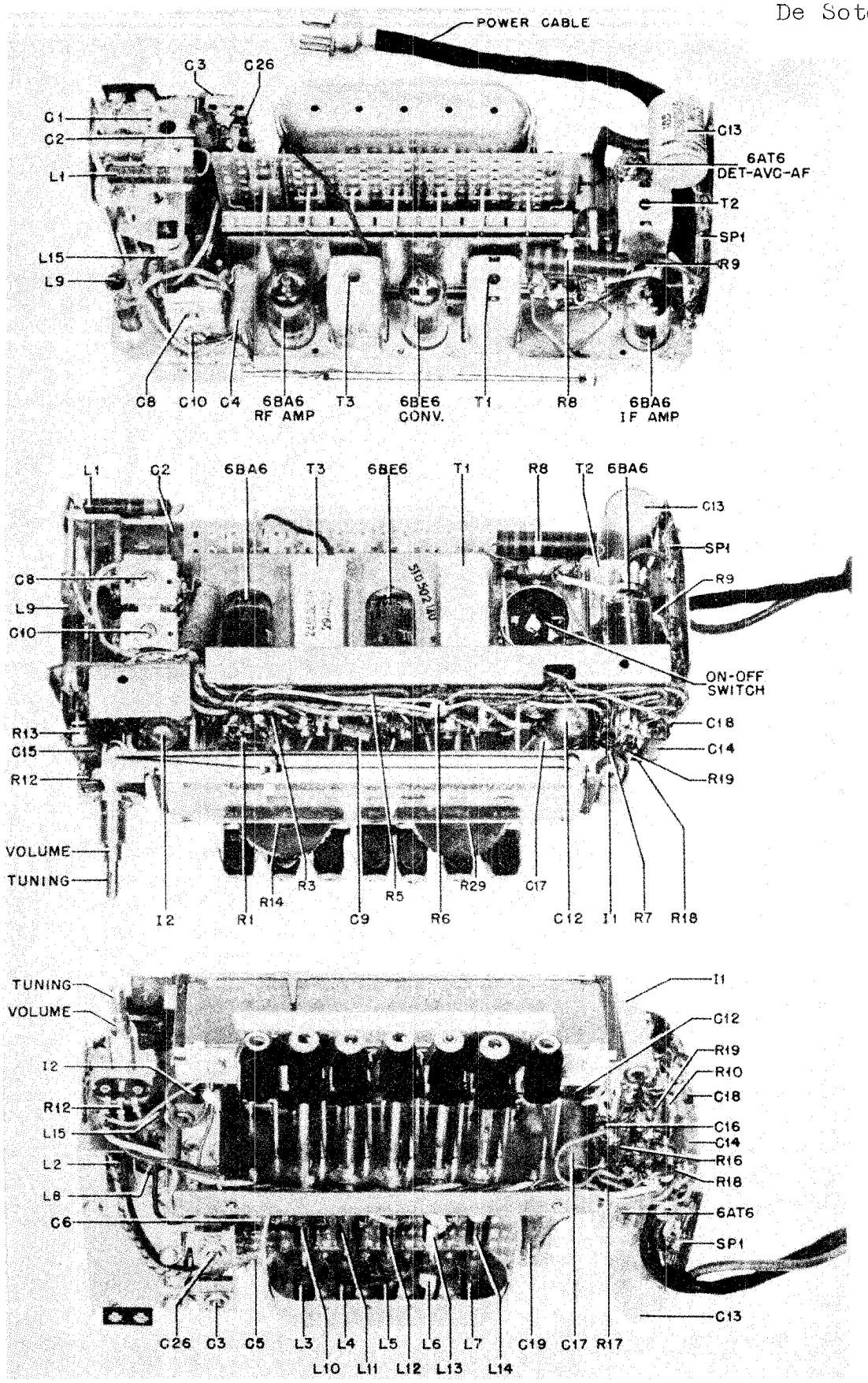

FIGURE 6. PARTS LOCATION - CONTROL UNIT

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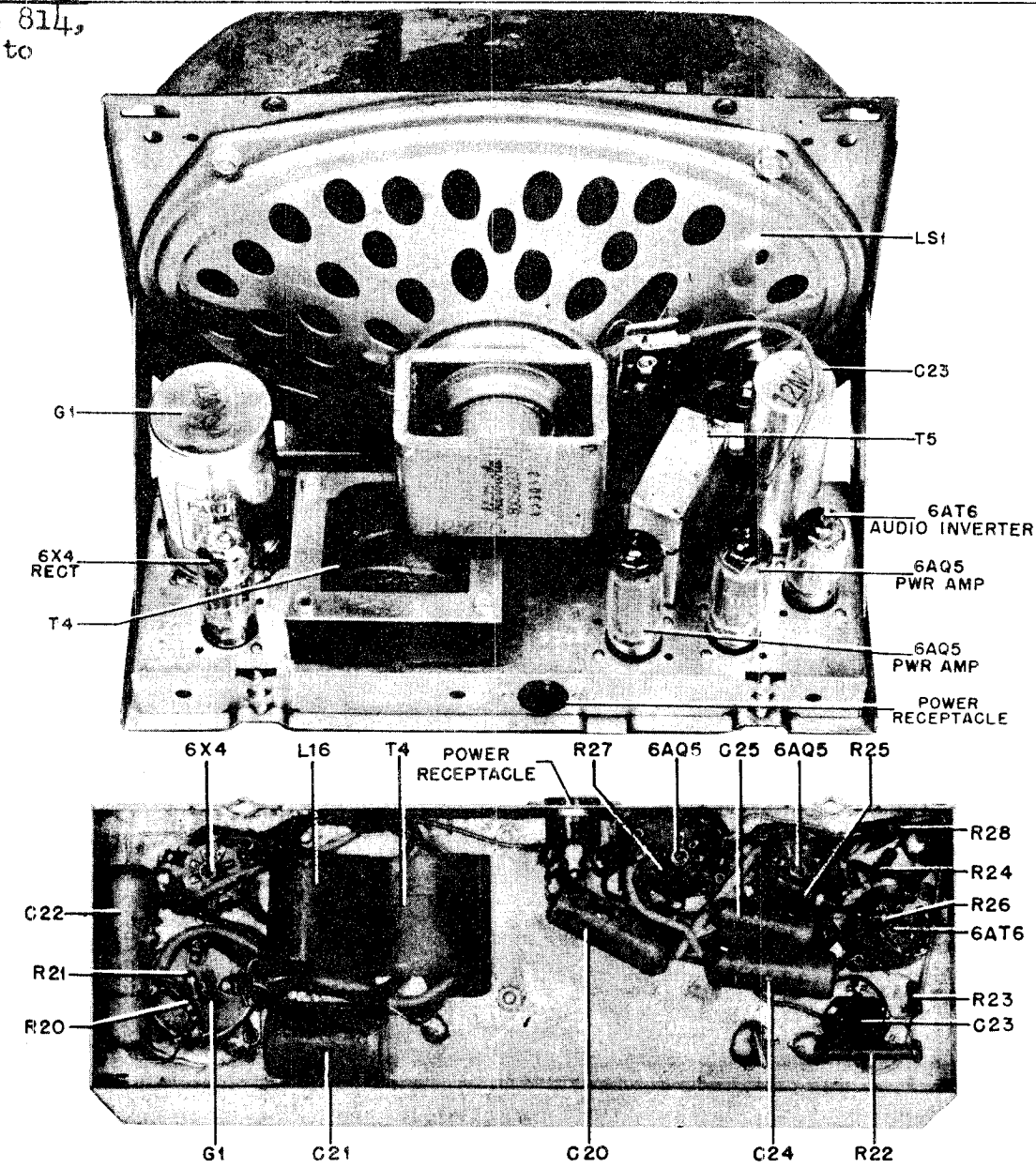

FIGURE 7. PARTS LOCATION - SPEAKER & POWER UNIT

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description
CONTROL UNIT - CHASSIS PARTS - ELECTRICAL		
Capacitors		
C-1	-	Part of Tuner AT-82.....
C-2	-	Part of Tuner AT-82.....
C-3	-	Part of Tuner AT-82.....
C-4	8R13514	Paper: .05 mf 100V.....
C-5	-	Part of Tuner AT-82.....
C-6	-	Part of Tuner AT-82.....
C-7	21K70720	Molded: 5 mmf 500V.....
C-8	-	Part of Tuner AT-82.....
C-9	21R6513	Mica: 50 mmf 10% 500V.....
C-10	-	Part of Tuner AT-82.....
C-11	8R13166	Paper: .1 mf 400V.....
C-12	8R14791	Paper: .05 mf 400V.....
C-13	8C580845	Paper: .5 mf 100V.....
C-14	8R472754	Paper: .01 mf 100V.....
C-15	8R51209	Paper: .02 mf 100V.....
C-16	21K70720	Molded: 5 mmf 500V.....
C-17	8R13514	Paper: .05 mf 100V.....
C-18	21R6590	Mica: 500 mmf 20% 500V....
C-19	8R23690	Paper: .01 mf 400V.....
C-26	-	Part of Tuner AT-82.....
Fuse		
F-1	65K12894	Fuse, tubular: 14 amp.....
Pilot Light		
I-1,2	65X11854	Bulb: 6.3V; .15A; tubular; bayonet base.....
Coils		
L-1 thru L-15	-	Part of Tuner AT-82.....
Resistors		

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R6270	220 10% 1/2W.....
R-2	6R6032	470,000 20% 1/2W.....

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R-3	6R6182	150,000 20% 1/2W.....
R-4	6R6075	100,000 20% 1/2W.....
R-5	6R6056	47,000 20% 1/2W.....
R-6	6R5656	12,000 10% 1W.....
R-7	6R5554	390 10% 1/2W.....
R-8	6R5732	15,000 10% 2W.....
R-9	6R6010	330 20% 1/2W.....
R-10	6R6001	68,000 20% 1/2W.....
R-11	6R6056	47,000 20% 1/2W.....
R-12	18A501857	Volume control: 500,000; tapped at 50,000.....
R-13	6R6054	10,000 20% 1/2W.....
R-14	18A501754	Tone control: 500,000...
R-15	6R6004	1 meg 20% 1/2W.....
R-16	6R6004	1 meg 20% 1/2W.....
R-17	6R6161	1500 20% 1/2W.....
R-18	6R2122	4.7 meg 20% 1/2W.....
R-19	6R6015	220,000 20% 1/2W.....
R-29	17A502225	Wirewound: 30 .....

Spark Plate

SP-1	1A501755	Spark Plate Assembly ...

Transformers

T-1	24B485553	
or	24K502819	IF, 455 Kc: complete....
T-2	24K485555	Diode, 455 Kc: complete.....
T-3	24B580274	IF trap, 455 Kc: complete...

SPEAKER AND POWER UNIT -CHASSIS PARTS -ELECTRICAL

Capacitors

C-20	8R71911	Paper: .03 mf 400V.....
C-21	8C580845	Paper: .5 mf 100V.....
C-22	8R490449	Paper: .02 mf 1000V.....
C-23	23A473015	Electrolytic: 30-30-20 mf/ 350-300-25V.....
C-24	8R71911	Paper: .03 mf 400V.....
C-25	8R490437	Paper: .003 mf 400V.....

Vibrator

G-1	48B3333	Vibrator, non-sync: 4-pin...

Coil

L-16	24A472535	Choke, hash.....

Speaker

LS-1	50C502337	
or	50C501778	
or	50C502190	Speaker, PM: 6" x 9" oval; 3.2 ohm VC .....

Resistors

Note: All resistors are carbon insulated type unless otherwise specified.

R-20	6R5614	56 10% 1/2W.....
R-21	6R5614	56 10% 1/2W.....
R-22	6R476130	2200 20% 2W.....
R-23	6R6015	220,000 20% 1/2W.....
R-24	6R6069	2200 10% 1/2W.....
R-25	6R6407	220,000 10% 1/2W.....
R-26	6R6320	10,000 10% 1/2W.....
R-27	6R6015	220,000 20% 1/2W.....
R-28	6R6336	270 10% 1W.....

Transformers

T-4	25C501644	Power transformer.....
T-5	25B501722	Output transformer.....

CONTROL UNIT - CHASSIS PARTS - MECHANICAL

7B501750	Bracket, dimmer and tone control retainer.....
30K501917	Cable and Plug Assembly, power.....
42B485548	Clip, coil can mtg.....doz
42A501781	Clip, hair-pin (dial scale bracket retainer).....doz
11M8944	Cord, dial: #18; nylon; black....yd
1X502120	Dial Scale and Bracket Assembly....
1X502091	Dial Scale Support Bracket Assembly: includes dimmer control resistor and shoulder rivets.....
9K471264	Grommet, insulating (on power & battery leads).....
36B501748	Knob, dimmer control.....
36B501747	Knob, tone control.....
9K502087 or 9K502241	Lead Assembly, radio to ignition switch: includes fuse.....
1K501718	Pointer and Slider Assembly.....
1X502121	Pushbutton and Arm Assembly (for OFF and DIAL).....
1X502122	Pushbutton and Arm Assembly (for 1, 2, 3, 4 & 5).....
5K71246	Rivet, shoulder: stl; nkl pl (dial cord guide).....
34B501752	Scale, dial: plastic.....
43K501785	Sleeve, pushbutton coupling.....
9A502226	Socket, pilot light: includes bracket; R.H; 2-1/4" & 4-1/2" leads
9A502227	Socket, pilot light: includes bracket; L.H; 7" & 10" leads.....
9K580218	Socket, tube: 7-prong; miniature; with dummy lug.....
1A502228	Stud and Spring Wiper Assembly (dimmer control contact arm).....

CONTROL UNIT - HOUSING PARTS

61A501709	Crystal, dial: glass.....
1X502102	Escutcheon & Dial Crystal Assembly.
7B501715	Frame, dial crystal retainer.....
15D501724	Housing, front: painted white.....
15K501732	Housing, rear.....
2A485540	Nut, hex: special; 7/16-28 x 9/16; stl; cad pl (escutcheon mtg).....
2S7999	Speednut (dial crystal retainer)doz

SPEAKER AND POWER UNIT - MECHANICAL PARTS

42A501782	Clip, speed (rain shield mtg)...
42A4215	Clip, vibrator grounding.....
32B501634	Gasket, speaker: rubber.....
1X510121	Plate & Gasket Assembly, spkr mtg..
9A501887	Receptacle, 5-prong (for power cable).....
3S7457	Screw, sheet metal: #8 x 7/8 plain hex head; stl; cad pl (chassis mtg).....
3S8188	Screw, sheet metal: #10 x 1/2 plain hex head; stl; cad pl (spkr mtg).....
1X502364	Shield, rain: includes pads.....
9A70208	Socket, tube: 4-prong (for vibrator)
8A472534	Socket, tube: 7-prong; miniature...
8K580218	Socket, tube: 7-prong; miniature; with dummy lug.....

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MOUNTING HARDWARE AND ACCESSORIES

3A501915	Bolt, "J" (control unit assembly mtg).....
7B501623 or 7K501624	Bracket, spkr plate top mtg: right-hand.....

Part Number	Description
7K501626 or 7K501627	Bracket, spkr plate top mtg: left-hand.....
1X502104	Bracket and Clinch Nut Assembly (spkr & power unit mtg).....
15A485225	Cap, pushbutton: chrome pl.....
8B580014	Capacitor, radio interference.....
2K501944	Clinch Nut: 1/4-20 (lower mounting bracket support mtg).....
1X500387	Knob, tuning control: chrome pl....
36B501858	Knob, volume control: chrome pl....
4S7652	Lockwasher, ext: tooth; #10; stl; cad pl (spkr & power unit assembly mtg) .....
4S400449	Lockwasher, split: 1/4"; stl; cad pl (bracket and clinch nut assembly, lower mounting bracket support mtg & speaker plate top mounting bracket mtg).....
2S7009	Nut, hex: 10-32 x 3/8; stl; cad pl (speaker & power unit assembly mtg) .....
2S2890	Nut, hex: 1/4-20 x 7/16; stl; cad pl (speaker plate top mounting bracket mtg) .....
2K502076	Nut, wing: 10-24; stl; cad pl (control unit assembly mtg).....
3S400938	Screw, machine: 10-32 x 3/8; Phillips round head; stl; cad pl (lower mounting bracket support mtg).
4S400495	Screw, machine: 10-32 x 1/2; slotted hex head; stl; cad pl (speaker & power unit assembly mtg).....
3S7297	Screw, machine: 1/4-20 x 1/2; plain hex head; stl; cad pl (bracket & clinch nut assembly, speaker top mounting bracket and lower mounting bracket support mtg).....doz
7C502482	Support, lower mounting bracket....

Ref. No.	Part Number	Description
TUNER - MODEL AT-82		
	51D502140	Automatic Tuner Model AT-82, complete: includes 51K510170 & 51K510171.....
	51K510170	Manual Tuner Assembly only: complete; includes L-1,2,8, 15, C-1,2,3,26 & ant receptacle.....
	51K510171	Pushbutton Tuner Assembly, only: complete; includes L-3, 4,5,6,7,9,10,11,12,13,14, PB switch, C-5,6,8 & 10....

Ref. No.	Part Number	Description
Capacitors		
C-1	21K74661	Ceramic: 50 mmf 500V.....
C-2	8C4529	Paper: .006 mf 100V.....
C-3	20A501889	Variable, mica: 20-80 mmf; includes brkt.....
C-5	21K580178	Ceramic: 10 mmf 500V.....
C-6	21K502851	Ceramic: 115 mmf 500V.....
C-8	20A501888	Variable, mica: 395-470 mmf; on same bracket as C-10....
Coils		
L-1	24B580540	Choke, antenna.....
L-2	24A510162	Antenna coil, manual.....
L-3 thru L-7	-	Antenna coil, PB (part of 51K510171; not replaceable separately).....
L-8	24K510163	RF coil, manual.....
L-9	24K501921	Oscillator padder coil, manual.....
L-10 thru L-14	-	Oscillator coil, PB (part of 51K510171; not replaceable separately).....
L-15	24A510164	Oscillator coil, manual.....
Miscellaneous Tuner Parts		
	42A502507	Clip, spring (manual drive shaft retainer).....
	46A510160	Core, powdered iron: with screw (L-2, 8 & 15 tuning)
	5A501013	Grommet, rubber (L-2,8 & 15 tuning core mtg).....
	2S9647	Nut, hex: 12-28 x 5/16 (PB osc coil mtg & tracking nut) .....
	2A510167	Nut, floating: 1 ear (on manual drive shaft).....
	2A510165	Nut, lock: 2 ears (on manual drive shaft).....
	9A472148	Receptacle, antenna.....
	5A470101	Rivet, shoulder (pointer cord guide).....
	47B501910	Shaft, manual drive.....
	46A510161	Sleeve, coil: powdered iron (inside L-2, 8 & 15 coil shield cans).....
	41A510169	Spring, loading (on manual drive shaft).....
	31A502144	Strip, terminal: 1 insulated lug, #2 mtg.....
	31K590446	Strip, terminal: 2 insulated lugs, #2 mtg.....
	31A502143	Strip, terminal: 2 insulated lugs, #3 mtg.....

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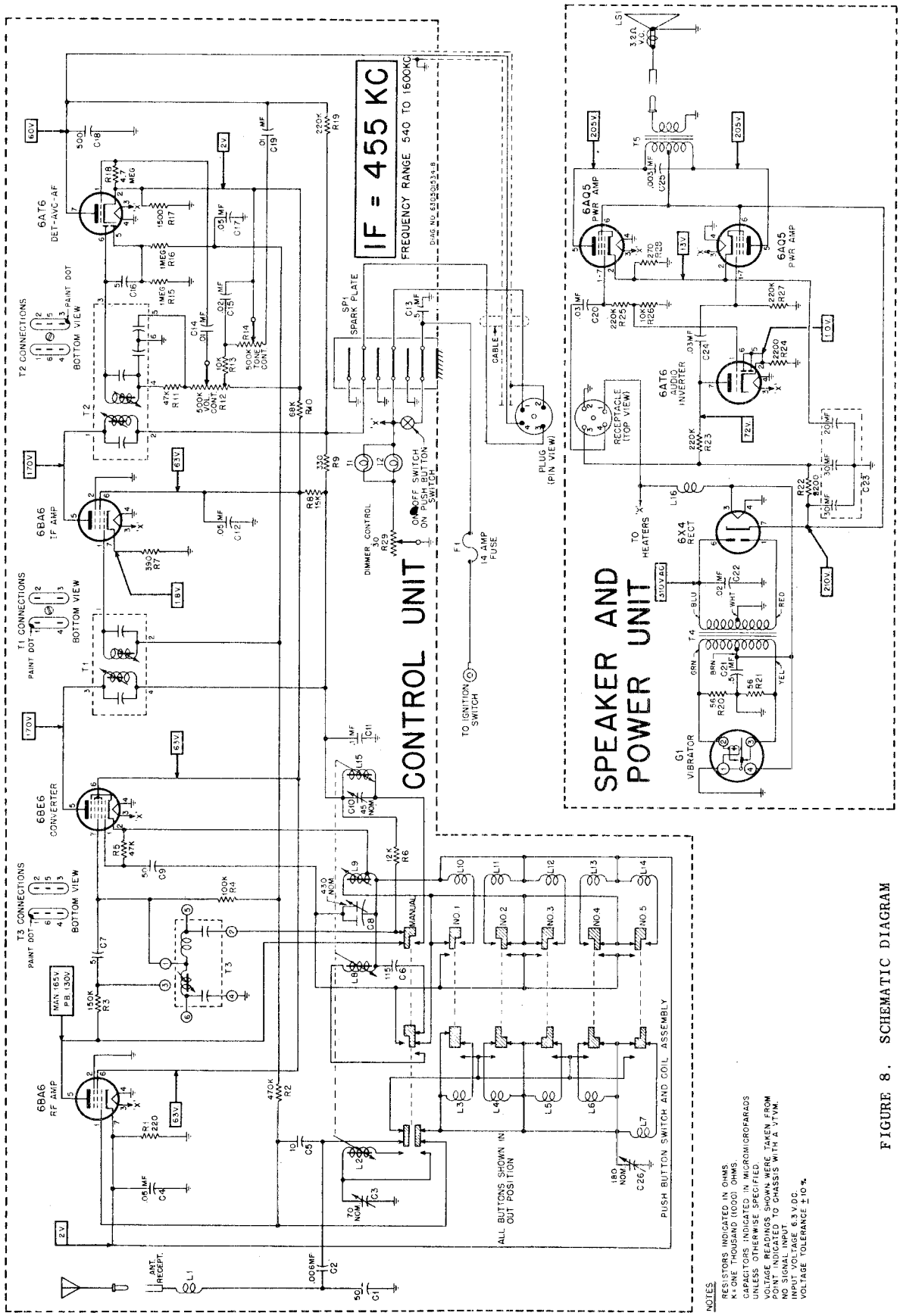


FIGURE 8. SCHEMATIC DIAGRAM

MODEL 7XM21,
Ch. HS-218

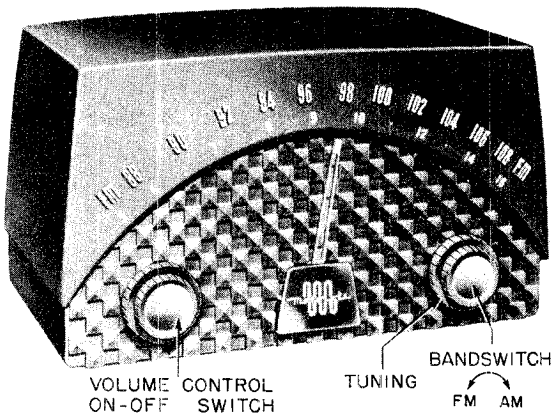
GENERAL INFORMATION

TYPE - FM-AM table model receiver

TUNING RANGE - AM 535 to 1620 Kc IF - 455 Kc
FM 88 to 108 Mc IF - 10.7 Mc

TUBE COMPLEMENT - 12BA6 - FM-AM RF Amplifier
12BA7 - FM-AM Converter
12BA6 - FM-AM IF Amplifier
12BA6 - FM IF Amplifier
19T8 - FM Ratio Detector, AM Detector & 1st Audio Amp
50C5 - Power Amplifier
Rectifier - Selenium type

POWER SUPPLY - 117V AC or DC, 40 watts



INSTALLATION & OPERATING INSTRUCTIONS

ANTENNA & GROUND

No outside antenna or ground is required for standard broadcast (AM) reception. A loop antenna for broadcast reception is located at the rear of the cabinet.

An FM antenna, built into the power cord, eliminates the need for an external FM antenna when the receiver is used in normal FM service areas such as are found in and for a few miles around metropolitan areas. In 'fringe' or weak signal areas, improved FM reception can be obtained by using an FM antenna mounted as high as possible. The FM antenna should be connected through a 300 ohm twin transmission line to the two screws on the rear of the set. Refer to the instructions on the antenna panel for proper transmission line connections. Orient the antenna so that maximum volume of FM station or stations is obtained.

NOTE: When the built-in FM antenna is used, connect the green lead from the chassis to the RIGHT-HAND terminal on the loop. Since the FM antenna is incorporated in the power line cord, stretch the line cord to its full length to obtain strong FM reception.

CAUTION: Do not connect antenna or chassis to water pipe, radiator, or other ground.

CONTROLS

POWER SWITCH & VOLUME CONTROL. The power switch and volume control are combined and are operated by the left-hand knob.

BANDSWITCH. The small (inner) right-hand knob selects FM or AM reception. Rotate the knob clockwise for AM or counterclockwise for FM.

TUNING. Tuning of both FM and AM is accomplished with the large (outer) right-hand knob. The standard broadcast dial (AM) is read in kilocycles by adding two zeros to the figures. The frequency modulation (FM) dial scale is read in megacycles (88 to 108).

Tuning of FM stations should be done very carefully, for best sound reproduction, not necessarily for strongest volume received.

SERVICE NOTES

OPERATING NOTES:

The chassis of this receiver is connected directly to the power line. When operating the chassis (from AC line) outside of its cabinet, use an isolation transformer between the power line and the receiver to reduce the possibility of electrical shock. If an isolation transformer is not available, check the AC voltage between the chassis and the bench ground. If there is any indication of voltage, reverse the line plug before handling the set.

When operating the receiver from an AC power line, reception can sometimes be improved by reversing the plug in the power outlet. If the receiver does not operate from a DC power line, after being turned on for a few minutes, reverse the plug in the power outlet.

TO CALIBRATE DIAL:

1. Turn the tuning knob counterclockwise until the end of its travel is reached.
2. Through the hole in the bottom of the cabinet, loosen the Allen head setscrew in the pointer sleeve.
3. Move the pointer until it coincides with the center of the "5" on the AM broadcast scale.
4. Tighten the setscrew.

NOTE: If the pointer is accidentally moved by hand, it will be released from a detent in the pointer collar assembly, and no damage to the tuning mechanism will result. To reset the pointer, merely move it back and forth until it again engages in the detent.

TO REMOVE POINTER:

1. Remove the two screws holding the medallion, from beneath the cabinet.
2. Turn the tuning knob until the pointer reaches the low frequency end of its range.
3. Through the hole in the bottom of the cabinet, insert an Allen head wrench into the setscrew in the pointer sleeve and hold the wrench. This keeps the sleeve from turning and breaking the dial string.
4. Remove the nut and washers from the front of the pointer.
5. Pull off the pointer.

TO REMOVE CHASSIS FROM CABINET:

1. Remove the pointer, as described above.
2. Pull off the control knobs.
3. From the rear of the cabinet, remove the two screws holding the chassis to the cabinet.
4. Remove the two split plugs at the top of the loop, which hold the loop to the cabinet.
5. Slide the chassis from the cabinet.

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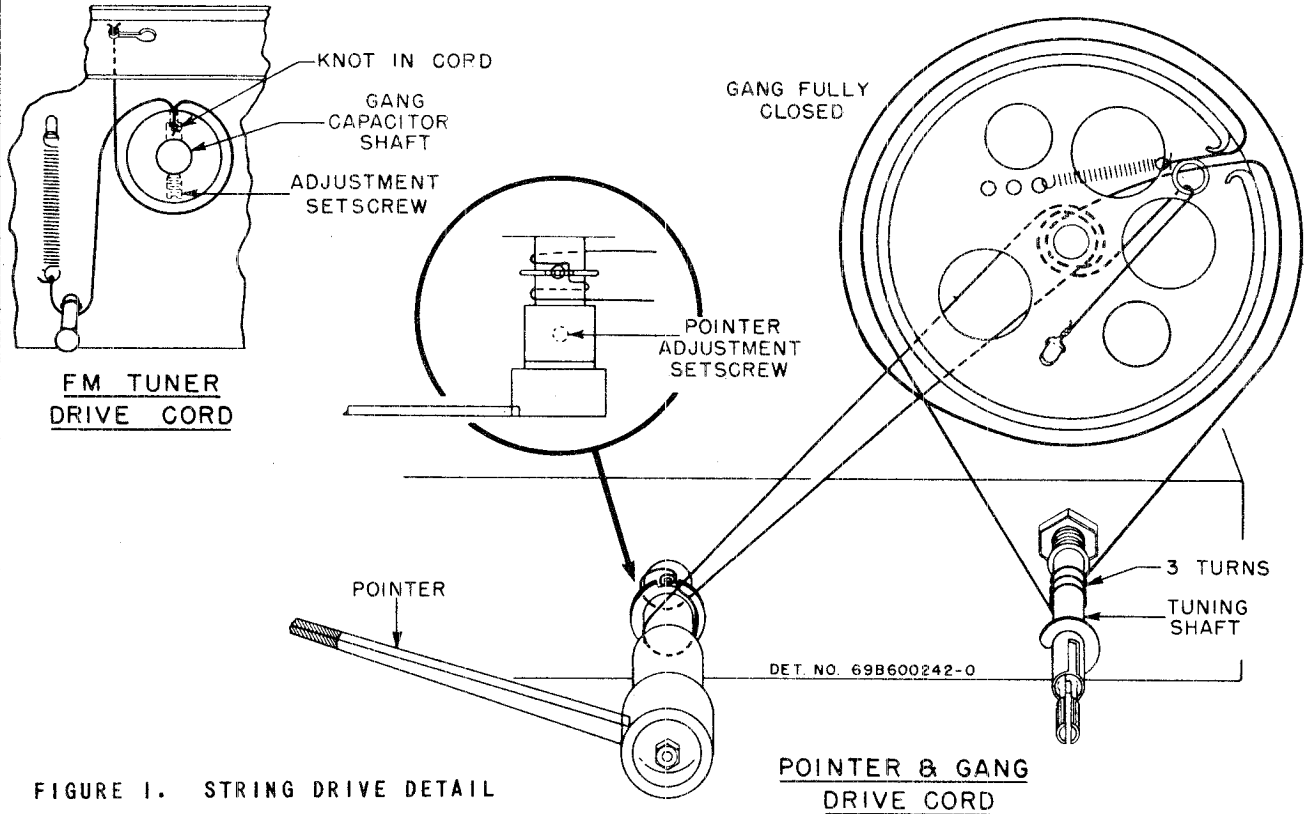

FIGURE 1. STRING DRIVE DETAIL

ALIGNMENT

GENERAL INFORMATION

1. Maximum performance can be obtained only if extreme care is exercised during alignment.

2. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver during alignment to avoid hum and electrical shocks. If an isolation transformer is not available, connect the low side of the signal generator to the receiver chassis through a .1 mf capacitor.

3. Use a small fibre screwdriver for aligning the IF transformers.

4. Refer to Figure 2 for the location of all alignment trimmers and cores.

5. As the stages are brought into alignment, reduce the signal generator output to a low value to avoid overloading the receiver.

ORDER OF ALIGNMENT AND EQUIPMENT REQUIRED

1. Broadcast Band IF & RF Alignment
   a. 455 to 1620 Kc AM signal generator
   b. Low range output meter

2 (A) FM Band IF & RF Alignment (Preferred Method)
   a. 10.7 to 108 Mc FM signal generator
   b. Oscilloscope

(B) FM Band IF & RF Alignment (Alternate Method)
   a. 10.7 to 108 Mc signal generator (unmod.)
   b. Low range DC electronic voltmeter.

BROADCAST BAND - IF & RF ALIGNMENT

1. Connect the AM signal generator as in chart below, with 400 cycle, 30% modulation.

2. Connect the output meter across the speaker voice coil. Throughout alignment reduce the generator output to a level which produces less than .40 volts across the voice coil, to avoid overloading the receiver.

3. Set the bandswitch to the AM position.

4. Turn the receiver volume control to maximum.

5. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv. V-2 (pin 7, 12BA7)	455 Kc	Fully opened	1, 2, 3 & 4 (IF cores)	Adjust for maximum.
RF ALIGNMENT						
2.	.1 mf	Grid of conv. V-2 (pin 7, 12BA7)	1620 Kc	Fully opened	5 (BC osc)	Adjust for maximum.*
3.	-	Across radiation loop**	1400 Kc	Tune in signal	8 (BC ant)	Adjust for maximum.

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4. If, after the receiver has been aligned as above, it is found to be badly off calibration, it will be necessary to adjust oscillator core (7) as follows: connect the generator to the grid of the converter tube and, with the gang fully closed, adjust core (7) at 535 Kc. It is advisable to repeat the oscillator adjustments at 1620 Kc and 535 Kc several times until the tuning range is correct. Core (7) has been pre-set at the factory and normally should require no retuning.

* If difficulty is encountered in tuning trimmer (5), adjust trimmer (6) to ½ turn from tight.

**Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

FM BAND - IF & RF ALIGNMENT (PREFERRED METHOD)

1. The following FM alignment procedure, using an FM signal generator and an oscilloscope, is to be preferred because the actual response pattern may be observed on the scope and adjusted for best symmetry and maximum amplitude.

2. Connect the vertical input terminals of the oscilloscope between the chassis and the junction of resistor R-24 (33K) and capacitor C-29 (1000 mmf).

3. Connect the FM signal generator sync voltage output terminals, through a phase shifting network, to the horizontal input terminals of the scope, as in Figure 3. (Other values of resistance and capacitance may be required, depending upon the scope). The phasing control should be adjusted to give only one trace on the scope. **NOTE:** If the FM generator has a built-in phase control, the phase shifting network is not necessary.

4. Set the bandswitch to the FM position.

5. Throughout alignment, reduce the generator output to keep the signal just above the noise level, to avoid overloading the receiver.

6. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of 2nd IF Amp V-4 (pin 1, 12BA6)	10.7 Mc ± 100 Kc dev.	Fully opened	9 (ratio det pri)	Adjust for maximum amplitude of pattern.*
2.	1000 mmf	Grid of 2nd IF Amp V-4 (pin 1, 12BA6)	10.7 Mc ± 100 Kc dev.	Fully opened	10 (ratio det sec)	Adjust for symmetrical curve, as shown in Figure 4.
3.	-	-	-	-	-	Repeat steps 1 & 2 for maximum amplitude and best symmetry.
4.	1000 mmf	Grid of 1st IF Amp V-3 (pin 1, 12BA6)	10.7 Mc ± 100 Kc dev	Fully opened	11 & 12 (2nd IF sec & pri)	Adjust for maximum amplitude of pattern.*
5.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc ± 100 Kc dev	Fully opened	13 & 14 (1st IF sec & pri)	Adjust for maximum amplitude of pattern.*
6.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc ± 100 Kc dev	Fully opened	11, 12, 13 & 14	Readjust for maximum amplitude and best symmetry.
RF ALIGNMENT						
7.	270 ohms	FM terminals on loop	87.5 Mc ± 22½ Kc dev	Fully closed	15 (osc adj nut)	Adjust for maximum amplitude of pattern.*
8.	-	-	-	Fully closed	16 (RF adj nut)	Turn counterclockwise until core is at bottom of pipe, then turn four turns clockwise.
9.	270 ohms	FM terminals on loop	90 Mc ± 22½ Kc dev	Tune in signal	17 (RF tuning plug)	Adjust for maximum amplitude of pattern.*
10.	270 ohms	FM terminals on loop	105 Mc ± 22½ Kc dev	Tune in signal	16 (RF adj nut)	Adjust for maximum amplitude of pattern.*
11.	-	-	-	-	-	Repeat steps 9 & 10 until no further adjustment is necessary.

*An output meter across the speaker voice coil will also indicate maximum amplitude. It should not be used in place of the scope, however, since it will not show symmetry of the curve.

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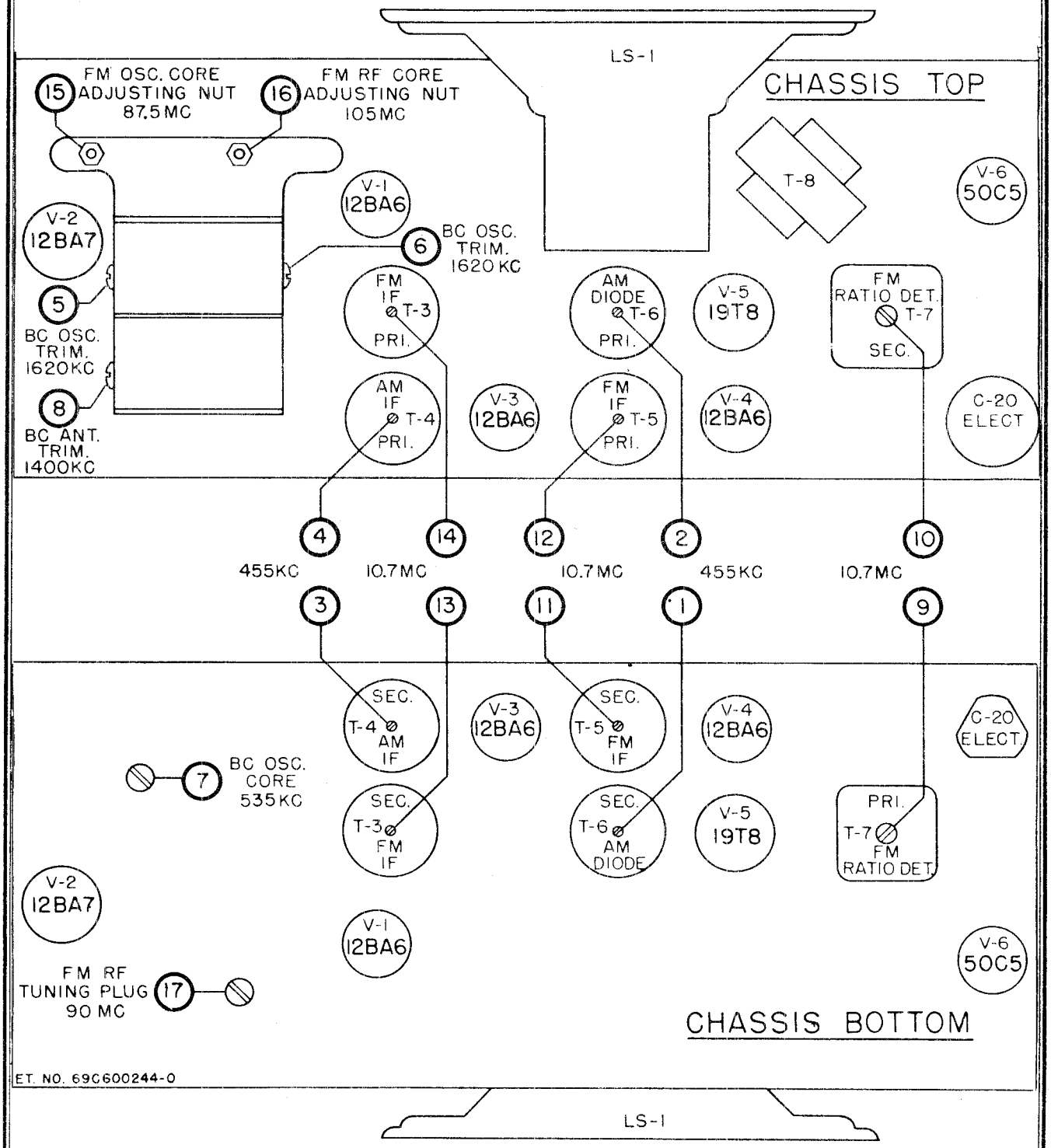

FIGURE 2. TUBE & TRIMMER LOCATIONS

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Ch. HS-218

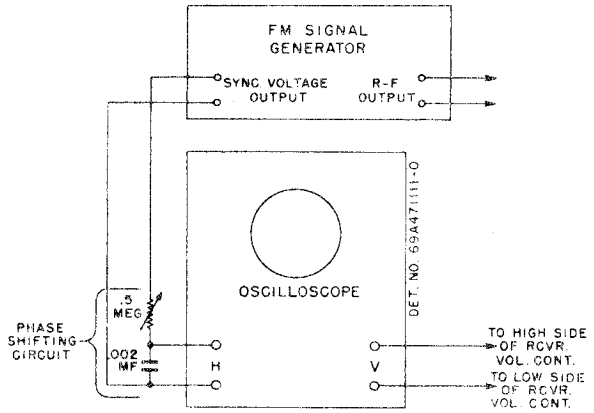

FIGURE 3.
FM SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

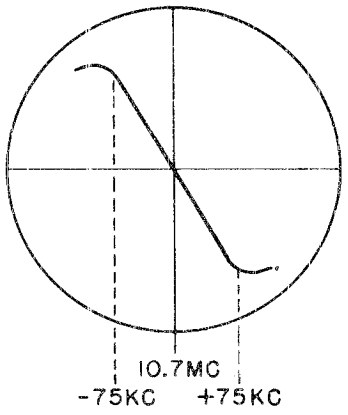

FIGURE 4.
RATIO DETECTOR WAVEFORM

FM BAND - IF & RF ALIGNMENT (ALTERNATE METHOD)

1. The following procedure for FM alignment, with an unmodulated carrier generator and a DC electronic voltmeter, is not as desirable as the preceding method; but it may be used if no FM generator is available.

2. Connect the signal generator as in chart below, with no modulation.

3. Set the bandswitch to the FM position.

4. Except in step 2 below, connect the electronic voltmeter across resistor R-23 (15K) in the ratio detector stage.

5. Throughout alignment reduce the signal generator output to a value which produces no more than a 5 volt rise above no signal voltage, to avoid overloading the receiver.

6. In step 2 below, connect two 100K ohm resistors in series across R-23. Connect the electronic voltmeter between the volume control side of resistor R-24 (33K) and the junction of the two 100K resistors, with the low side of the meter at the 100K resistors.

7. Proceed as shown in the following chart.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc	Fully opened	9, 11, 12, 13 & 14 (IF cores)	Adjust for maximum.
2.	1000 mmf	Grid of conv. V-2 (pin 7, 12BA7)	10.7 Mc	Fully opened	10 (ratio det sec)	Adjust for zero. (Connect meter as in step 6 above).
RF ALIGNMENT						
3.	270 ohms	FM terminals on loop	87.5 Mc	Fully closed	15 (osc adj nut)	Adjust for maximum.
4.	-	-	-	Fully closed	16 (RF adj nut)	Turn counterclockwise until core is at bottom of pipe, then turn four turns clockwise.
5.	270 ohms	FM terminals on loop	90 Mc	Tune in signal	17 (RF tuning plug)	Adjust for maximum.
6.	270 ohms	FM terminals on loop	105 Mc	Tune in signal	16 (RF adj nut)	Adjust for maximum.
7.	-	-	-	-	-	Repeat steps 5 & 6 until no further adjustment is necessary.

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Ch. HS-218

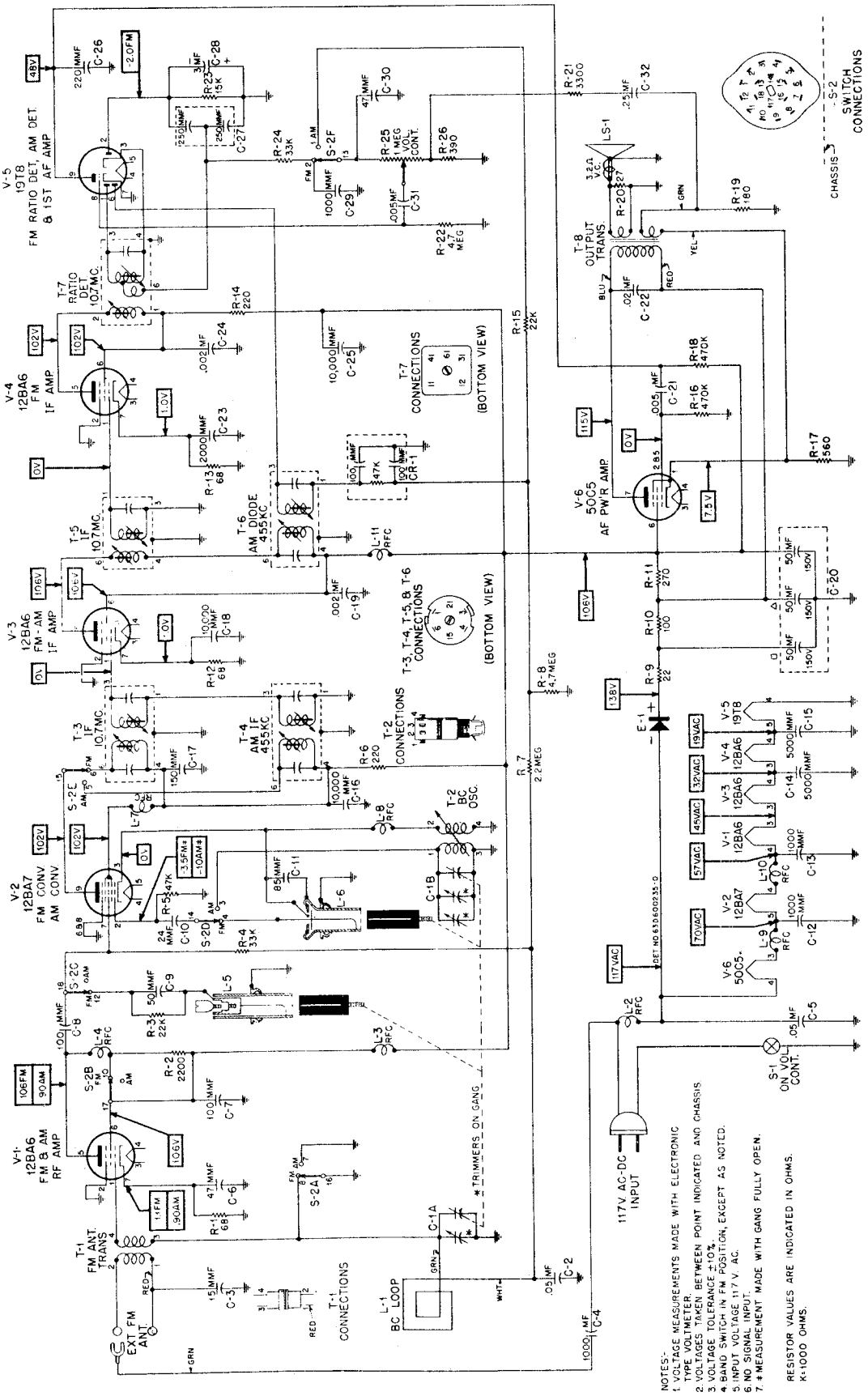

FIGURE 5. SCHEMATIC DIAGRAM

MODEL 7XM21,
Ch. HS-218

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1A,B	19B691877	Variable: 2-gang .....
C-2	8R9821	Paper: .05 mf 200V .....
C-3	21K470323	Ceramic: 15 mmf 500V .....
C-4	21K478410	Ceramic: 1000 mmf 500V .....
C-5	8K470606	Paper: .05 mf 400V .....
C-6	21K77373	Ceramic: 47 mmf 500V .....
C-7	21B77286	Ceramic: 100 mmf 500V .....
C-8	21B77286	Ceramic: 100 mmf 500V .....
C-9	21R2743	Mica: 50 mmf 5% 300V .....
C-10	21K28816	Ceramic: 24 mmf 500V .....
C-11	21A690688	Ceramic: 85 mmf 500V .....
C-12	21K478410	Ceramic: 1000 mmf 500V .....
C-13	21K478410	Ceramic: 1000 mmf 500V .....
C-14	21A470789	Ceramic, disc type: 5000 mmf 450V
C-15	21A470789	Ceramic, disc type: 5000 mmf 450V
C-16	21K482726	Ceramic, disc type: 10,000 mmf 450V
C-17	21K691948	Ceramic: 150 mmf 500V .....
C-18	21K482726	Ceramic, disc type: 10,000 mmf 450V
C-19	8K9824	Paper: .002 mf 400V .....
C-20	23B690539	Electrolytic: 50-50-50 mf/150V..
C-21	8R9813	Paper: .005 mf 600V .....
C-22	8R9802	Paper: .02 mf 400V .....
C-23	21K790912	Ceramic: 2000 mmf 500V .....
C-24	8K9824	Paper: .002 mf 400V .....
C-25	21K482726	Ceramic, disc type: 10,000 mmf 450V .....
C-26	21K77375	Ceramic: 220 mmf 500V .....
C-27	21B484337	Ceramic, dual: 250 mmf, 250 mmf.
C-28	23K690543	Electrolytic: 3 mf 50V .....
C-29	21K478410	Ceramic: 1000 mmf 500V.....
C-30	21K77373	Ceramic: 47 mmf 500V .....
C-31	8R9813	Paper: .005 mf 600V .....
C-32	8R9810	Paper: .25 mf 100V .....
CAPACITOR-RESISTOR		
CR-1	21A473040	Capacitor-Resistor: 100-100 mmf & 47,000 ohms .....
RECTIFIER		
E-1	48B482807	Rectifier, selenium: half-wave; 150 ma .....
COILS		
L-1	24C692186	Antenna Loop & Panel Assembly: complete.....
L-2	24A692148	RF Choke .....
L-3	24A692148	RF Choke .....
L-4	24A484025	RF Choke .....
L-5	24C690584	Inductor & Capacitor Assembly: FM RF; less tuning core.....
L-6	24K600519	Inductor & Capacitor Assembly: FM osc; less tuning core.....
L-7	24A691847	RF Choke .....
L-8	24A791081	RF Choke .....
L-9	24A692148	RF Choke .....
L-10	24K780128	RF Choke .....
L-11	24A692148	RF Choke .....

REF. NO.	PART NO.	DESCRIPTION
SPEAKER		
LS-1	50C600135	Speaker: 5-1/4" PM; 3.2 ohm VC exch
RESISTORS		
		Note: All resistors are insulated carbon type unless otherwise specified.
R-1	6R2039	68 10% ½W .....
R-2	6R6069	2200 10% ½W .....
R-3	6R6028	22,000 20% ½W .....
R-4	6R6012	33,000 20% ½W .....
R-5	6R6056	47,000 20% ½W .....
R-6	6R3933	220 20% ½W .....
R-7	6R3927	2.2 meg 20% ½W .....
R-8	6R2122	4.7 meg 20% ½W .....
R-9	17A690578	Wire wound: 22 10% 1.5W....
R-10	6R3963	100 10% 2W .....
R-11	6R476116	270 10% 2W .....
R-12	6R2039	68 10% ½W .....
R-13	6R2039	68 10% ½W .....
R-14	6R3933	220 20% ½W .....
R-15	6R6028	22,000 20% ½W .....
R-16	6R6032	470,000 20% ½W .....
R-17	6R6291	560 10% ½W .....
R-18	6R6032	470,000 20% ½W .....
R-19	6R5660	180 10% ½W .....
R-20	6R5683	27 10% ½W .....
R-21	6R6036	3300 20% ½W .....
R-22	6R2122	4.7 meg 20% ½W .....
R-23	6R6477	15,000 10% ½W .....
R-24	6R6012	33,000 20% ½W .....
R-25	18A690549	Volume Control: 1 meg; with on-off switch .....
R-26	6R5554	390 10% ½W .....
SWITCHES		
S-1		On-Off Switch (on vol control)..
S-2	40B690538	Bandswitch, AM-FM .....
TRANSFORMERS		
T-1	24A690544	FM Antenna Input Transformer....
T-2	24K691878	BC Oscillator Coil .....
T-3	24B690540	1st FM IF Transformer (orange dot): 10.7 mc; complete with capacitors and cores, less shield .....
T-4	24B692193	AM IF Transformer (blue dot): 455 Kc; complete with capacitors and cores; less shield....
T-5	24B690541	2nd FM IF Transformer (yellow dot): 10.7 mc; complete with capacitors and cores; less shield .....
T-6	24B692193	AM Diode Transformer (blue dot): 455 Kc; complete with capacitors and cores; less shield....
T-7	24B690542	Ratio Detector Transformer: 10.7 mc; complete with capacitors, cores, and shield.....
T-8	25B690536	Audio Output Transformer.....

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PART NUMBER	DESCRIPTION
CHASSIS PARTS - MECHANICAL	
43A4326	Ball, steel: 1/8" dia (pointer detent)
1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet & anti-backlash clip
7K692144	Bracket, loop mtg
7K692146	Bracket, rectifier mtg
7C690567	Bracket, tuner mtg (gang mtg)
43A692172	Bushing, pointer shaft: brass
42K690561	Clip, anti-backlash: single (on core mtg bracket)
42A690560	Clip, anti-backlash: double (on tuner mtg bracket)
42B482867	Clip, spring: blued finish (holds IF transformers)
1X692227	Collar Assembly, pointer detent: with pin
11M488137	Cord, dial: core drive
11M8944	Cord, dial: pointer drive
30K21859	Cord, line: with plug; 9 ft long
46K692165	Core, iron and screw (RF tuning core).
46B692164	Core, iron and screw: green dot (osc tuning core)
5S7866	Eyelet: .125 x .091 brass; nkl pl (core drive cord retainer)
5A19658	Eyelet, speaker mtg
37A12691	Grommet, rubber (spkr cushion)
14A690548	Insulator, bakelite (vol control & bandswitch mtg)
14A482844	Insulator, line cord: fibre; without lugs
14K692187	Insulator, line cord: fibre; with lugs
4S9751	Lockwasher, int-ext: #8; cad pl (pointer drive pulley mtg)
29R3036	Lug, soldering: #8 (on spkr mtg screw)
29R5285	Lug, soldering: #8 (on FM ant lead)
2S70019	Nut, hex: 4-40 x 1/4; cad pl (tuning core mtg)
2S7051	Nut, hex palnut: 3/8-32 x 9/16; cad pl (vol control & bandswitch mtg).
35K691846	Pad, rubber: 1 hole (gang mtg)
35A691845	Pad, rubber: 2 hole (gang mtg)
1X692216	Pulley Assembly, pointer drive: 3½" dia
49A690562	Pulley, core drive: brass
5S8497	Rivet: .088 x 1/8 stl; nkl pl (anti-backlash clip mtg)
5S7771	Rivet: .088 x 3/16 stl; nkl pl (min socket mtg)
5S7774	Rivet: .088 x 1/4 stl; nkl pl (noval socket mtg)
5S7707	Rivet: .122 x 5/32 stl; nkl pl (term strip mtg)
5K13896	Rivet, shoulder (on core mtg brkt)
3S7477	Screw, machine: 8-32 x 1/4 plain hex head; thread cutting type; cad pl (loop mtg)
3S7205	Screw, machine: 8-32 x 1/4 slotted locking head; cad pl (gang mtg)
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; cad pl (pointer drive pulley mtg)
3S488011	Screw, machine: 8-32 x 5/8 slotted locking hex head; cad pl (spkr mtg)
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; cad pl (tuner bracket mtg)
3S490851	Screw, sheet metal: #6 x 1/2 PKA plain hex head; cad pl (loop mtg brkt)
3S490325	Screw, sheet metal: #6 x 1-1/8 PKZ plain hex head; cad pl (selenium rectifier mtg)
3S7103	Setscrew: 8-32 x 1/8 Allen head; cad pl (core drive pulley mtg)
3S9705	Setscrew: 8-32 x 1/4 Allen head; cad pl (pointer adj sleeve mtg)
1X692225	Shaft & Pulley Assembly, pointer: complete, but less pointer
47K690573	Shaft, tuning: brass (fits over bandswitch shaft)
9K485936	Shield, coil (for IF transformers)
26A481521	Shield, tube: spring type
43K692185	Sleeve, pointer: die cast; less pointer adj setscrew
9K484167	Socket, tube: miniature; 7-prong
9B692196	Socket, tube: noval; 9-prong (for V-5)
9K692197	Socket, tube: noval; 9-prong (for V-2)
41A690598	Spring, coil: 7 turns; cosmoline dipped (FM-RF core mtg)
41K691840	Spring, coil: 8 turns; copper plated (FM osc core mtg)
41A690732	Spring, compression (in pointer sleeve)
41A14244	Spring, tension (core & pointer drive cord)
31K85348	Strip, terminal: 1 insulated lug; #2 mtg; 3/8" spacing
31K86126	Strip, terminal: 2 insulated lugs; #2 mtg; 3/8" spacing
31K37493	Strip, terminal: 2 insulated lugs; #2 mtg; 1/2" spacing
31K14655	Strip, terminal: 3 insulated lugs; #3 mtg; 3/8" spacing
31K22174	Strip, terminal: 4 insulated lugs; #4 mtg; 3/8" spacing
31K470747	Strip, terminal: 5 insulated lugs; #3 mtg; 3/8" spacing
29A70422	Terminal, screw (antenna terminal on loop back)
4A73639	Washer, 'C' (holds tuning shaft)
4K692188	Washer, 'C' (pointer shaft mtg)
4A70873	Washer, fibre (pointer drive pulley mtg)
4S7582	Washer, flat: ½ x .195 x .033; cad pl (pointer drive pulley mtg)
4S7614	Washer, flat: 11/16 x 11/64 x .036 stl; cad pl (loop mtg)
4K690571	Washer, shoulder: fibre (vol control & bandswitch mtg)
4K482859	Washer, shoulder: fibre (loop mtg brkt)
4B600149	Washer, spring (under pointer shaft pulley)
CABINET PARTS	
16E691951	Cabinet, table model: plastic; brown
36B692149	Knob, control: brown plastic (tuning knob)
36B692150	Knob, control: brown plastic (AM-FM selector)
36B692181	Knob, control: brown plastic (volume control)
4S7650	Lockwasher, internal: #6; cad pl (pointer mtg)
2S7005	Nut, hex: 6-32 x 1/4 stl; cad pl (pointer mtg)
13B692039	Medallion: brass plated
38A25507	Plug, split (mounts loop to cabinet)
52B692173	Pointer, dial
3S2999	Screw, machine: 6-32 x 5/8 slotted locking hex head; cad pl (medallion mtg)
3S3371	Screw, thread cutting: #8 x 3/8 plain hex head; cad pl (chassis mtg)
4S1720	Washer, flat: 3/8 x .156 x .030 stl; cad pl (medallion mtg)
4S1765	Washer, flat: ¼ x .147 x .015 stl; cad pl (pointer mtg)
4K485672	Washer, spring (pointer mtg)

MODEL 9MF, Ford
#8A-18805-A3

GENERAL INFORMATION

TYPE - Automotive superheterodyne receiver with external speaker.

TUNING RANGE - 540 to 1610 Kc IF - 265 Kc

TUBE COMPLEMENT - 6SK7GT - RF Amplifier
6SA7GT - Converter
6SK7GT - IF Amplifier
6SQ7GT - Detector, AVC & AF Amplifier
6V6GT - AF Output Amplifier
6X5GT - Rectifier

OPERATES FROM - 6 volt storage battery

TO SET THE PUSH BUTTONS

Automatic push button tuning is provided for selection of five favorite local stations. The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency. The push buttons should be set up during the daytime because at night, distant stations will be heard with the same intensity as local stations, making it difficult to select local stations. To set the push buttons proceed as follows:

1. Collapse the antenna.

2. Turn the receiver on and allow it to operate for at least fifteen minutes in order for each part to reach normal operating temperature.

3. Loosen the first push button on the left by turning it (with your fingers)counterclockwise one turn.

4. Select the station desired and with low volume tune it in by turning the manual tuning knob. Tune very carefully for clearest reception.

5. Press the first push button in firmly, then release and tighten (with your fingers) by turning clockwise.

The first push button is now set for this station selection. Follow the above procedure for setting each of the other four buttons.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

IF TRANSFORMER CHANGES

The Detrola 1st IF transformer T-1, Detrola Part No. D71193-1 and the Detrola 2nd IF transformer T-2, Detrola Part No. D71192-1 have been replaced by transformer of another make, Motorola Part Nos. 24B580193 and 24K580194 respectively. The above mentioned Motorola Transformers are mechanically and electrically not interchangeable with the Detrola Transformers. A 33,000 ohm resistor, which was mounted internally on the Detrola 2nd IF transformer, will be mounted externally to the transformer where the Motorola transformer Part No. 24K580194 is used.

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ALIGNMENT

Connect the receiver 'A' lead and receiver chassis to a 6 volt storage battery. Rotate volume and tone controls to maximum clockwise position. Connect an output meter across the speaker voice coil. Use an insulated screwdriver for making all adjustments. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. Remove receiver escutcheon and top & bottom covers to expose all alignment adjustments. See Figure 1.

Pointer is calibrated by tuning in a 1300 Kc signal and then set pointer to 1300 Kc after loosening its adjusting screw. See Figure 1.

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Converter grid (6SA7GT pin 8)	265 Kc	HF end stop	1,2,3 & 4	Adjust for maximum. Repeat for greater accuracy.
RF ALIGNMENT						
2.	See Fig. 1	Ant. recept	1610 Kc	HF end stop*	C-14,C-11 C-1	Adjust for maximum.
3.	See Fig. 1	Ant. recept	1400 Kc	Move carriage 'in' 5/16" from HF end stop position. See Figure 1.	L-6, L-5, L-2	Adjust for maximum.
4.	See Fig. 1	Ant. recept	1610 Kc	HF end stop	C-14 C-11 C-1	Adjust for maximum.
5.	Repeat steps 3 & 4 until no further increase is obtainable. After final adjustment is made, stake core adjustments in place with speaker cement.					
SENSITIVITY CONTROL						
6.	See Fig. 1	Ant. recept	Set to 600 Kc & 4 microvolts output	Tune for maximum	Sensitivity control	Set sensitivity control for 1 watt output (1.79 volts on output meter)
ANTENNA TRIMMER ADJUSTMENT						
7.	-	-	-	Weak station at approx. 1400 Kc	C-1	With receiver installed in car, peak antenna trimmer for maximum volume. Ant. should be fully extended.

* Tuner cores should be backed out to project 1-3/8" from end of coil forms so they will have no effect on trimmer adj.

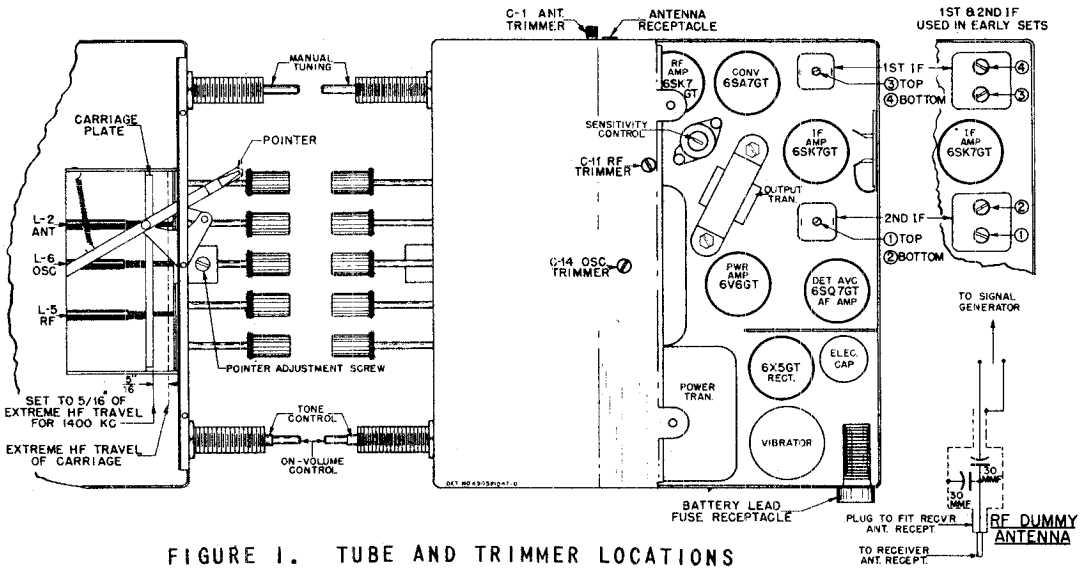

FIGURE 1. TUBE AND TRIMMER LOCATIONS

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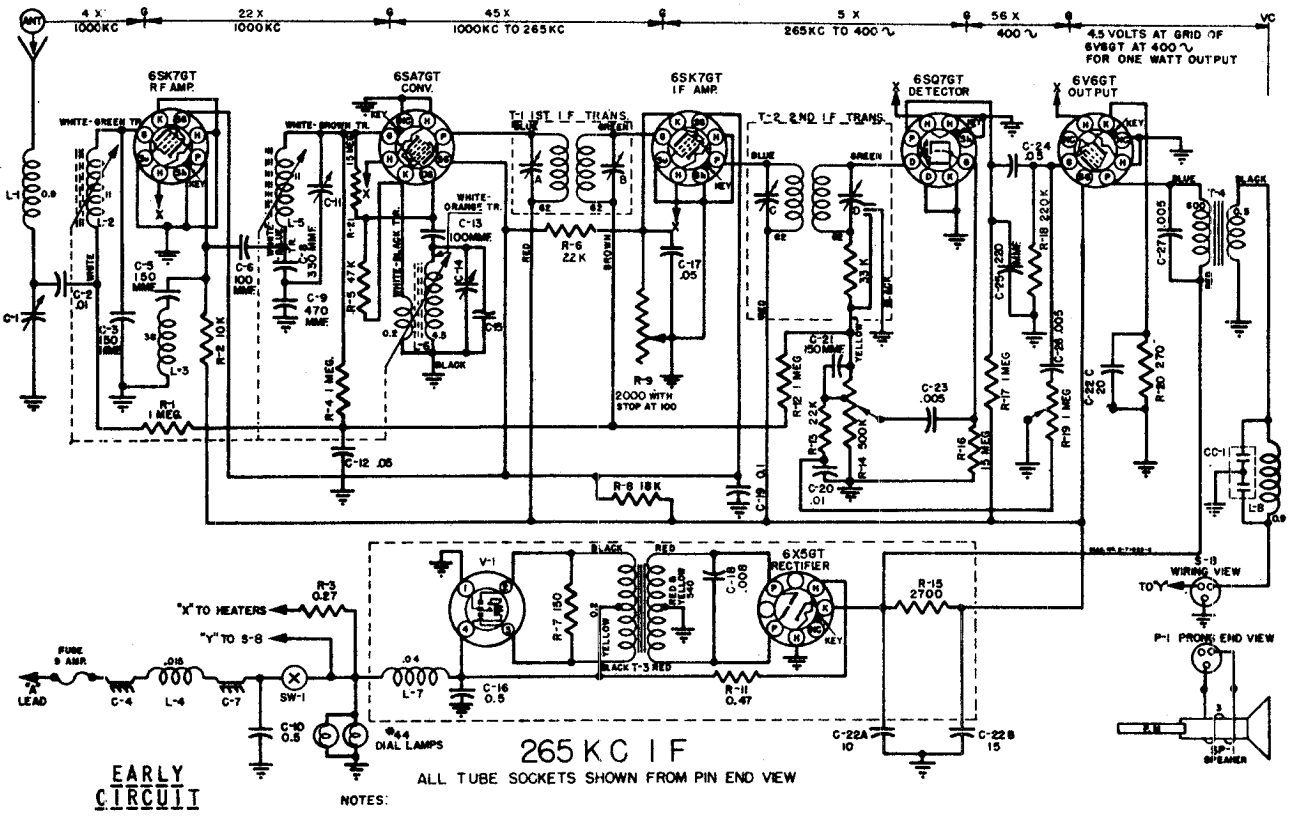

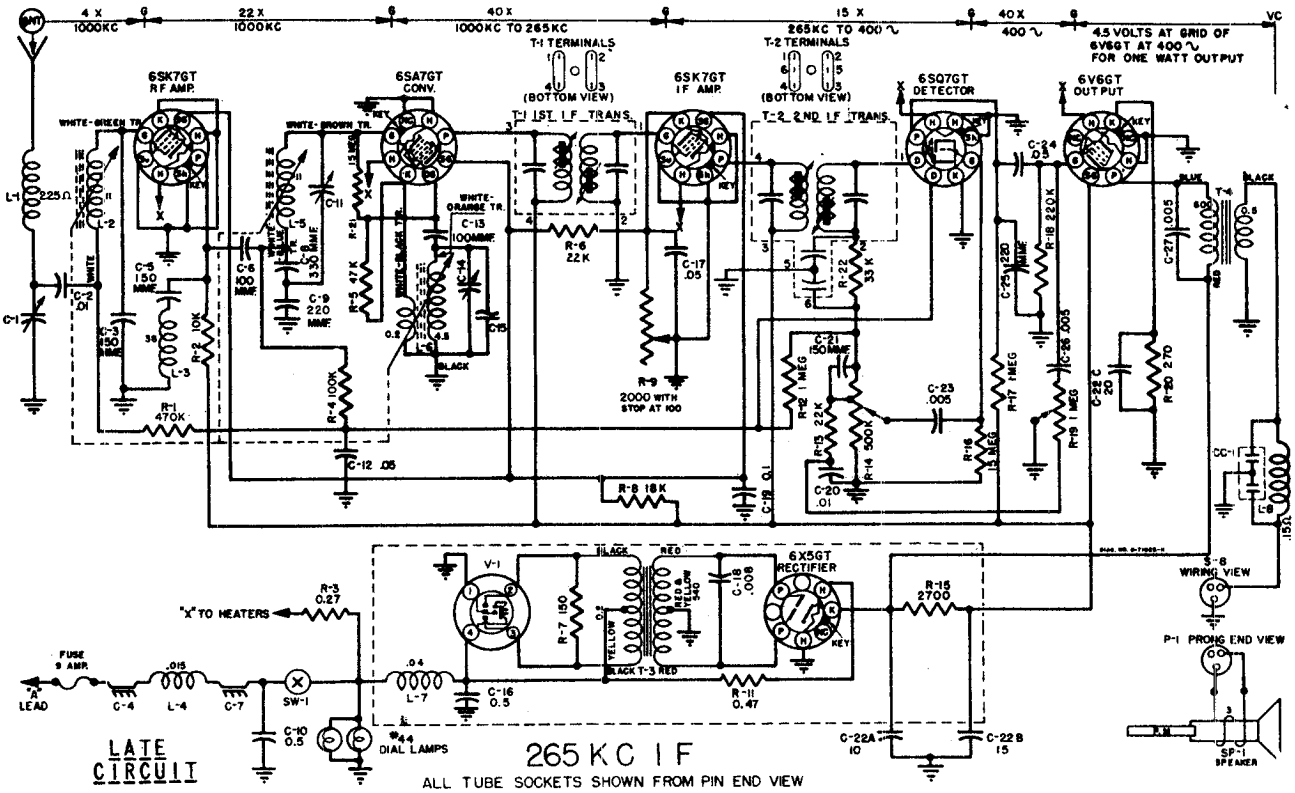

NOTES:
RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
"K" EQUALS 1,000 OHMS, "MEG" EQUALS 1,000,000 OHMS.
CAPACITY VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.

STAGE GAINS
TAKEN AT ANT. SOCKET, R.F. GRID AND CONV. GRID AT 1000 K.C.
TAKEN AT I.F. GRID AT 265 K.C. AUDIO MEASUREMENTS TAKEN AT 400 ∿.
DUMMY ANTENNA
30 MMFD. SERIES & 30 MMFD. SHUNT AT ANT. SOCKET & 0.1 MFD. SERIES AT TUBE GRIDS.
BATTERY CONDITIONS
7.2 VOLTS MEASURED BETWEEN END OF "A" LEAD AND CHASSIS

FIGURE 2. SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

REF. NO.	FORD PART NO.	DETROLA PART NO.	MOTOROLA PART NO.	DESCRIPTION
CAPACITORS				
C-1		B-55481	B-912124	Mica, variable: includes bracket
C-2		BD430103	X910013	Paper: .01 mf 400V; tubular
C-3		BM64A151	21R6649	Mica: 150 mmf 10% 500V
C-4				Spark Plate Assembly consists of:
				One A-70255 plate, capacitor
				One A-70282 disc, mica: silvered
				One A-71048 washer, shoulder
				Two BF12HJ02 washer
				One BV321HO2 rivet
C-5		B-58906	B-912152	Mica: 150 mmf 5% 300V
C-6		BM64A101	21R6554	Mica: 100 mmf 10% 500V
C-7				Same as C-4
C-8		BM74A331	21R2744	Mica: 330 mmf 20% 500V
C-9		BM74A221	21R2745	Mica: 220 mmf 20% 500V
C-10		A-55528	A-912100	Paper: .5 mf 100V; tubular
C-11		B-55525	B-912125	Mica: variable; includes bracket
C-12		BD230503	X910008	Paper: .05 mf 200V; tubular
C-13		BM64A101	21R6554	Mica: 100 mmf 10% 500V
C-14		B-55523-4	B-912126	Trimmer: 100 mmf-160 mmf (Part of Tuner Assembly)
C-15		A-55495	A-912101	Compensating: 180 mmf 5% 500V (Part of Tuner Assembly).
C-16		A-55528	A-912100	Paper: .5 mf 100V; tubular same as C-10
C-17		BD230503	X910008	Paper: .05 mf 200V; tubular
C-18		A-55383	A-912102	Paper: .008 mf 1600V; tubular
C-19		BDB30104	X910009	Paper: .1 mf 200V; tubular
C-20		BD430103	X910013	Paper: .01 mf 400V; tubular
C-21		B-58816-2	B-912127	Ceramic: 150 mmf
C-22		B-71011	B-912128	Electrolytic: 10-15-20 mf; 350-350-25V
A,B,C				
C-23		BD630502	X910010	Paper: .005 mf 600V; tubular
C-24		BD430503	X910011	Paper: .05 mf 400V; tubular
C-25		BM74A221	21R2745	Mica: 220 mmf 20% 500V
C-26		BD630502	X910010	Paper: .005 mf 600V; tubular
C-27		BD630502	X910010	Paper: .005 mf 600V; tubular
CC-1		A-55526	A-912103	Dual Filter
COILS				
L-1			24B580540	Choke, antenna spark
L-2		X-71258	A-912153	Ant. coil (Part of Tuner Assembly)
L-3		A-71097	A-912104	Choke, IF trap
L-4		A-71046	A-912105	Choke, "A" spark
L-5		X-71257	A-912154	RF coil (Part of Tuner Assembly)
L-6		X-71259	A-912155	Osc. coil (Part of Tuner Assembly)
L-7		A-70242	A-912106	Choke, hash
L-8		A-71047	A-912107	Choke, antenna spark
DIAL LIGHT				
	8A-18828	A-9285	65X10867	Bulb, pilot: 6.3V; .25A tubular, bayonet base: #44
FUSE				
	8M15608	B-55541-1	B-912129	Fuse, 9 amp

RESISTORS
Note: All resistors are insulated carbon type, 20% unless otherwise specified.

R-1	BR17B474	6R6032	470,000 1/2W
R-2	BR17E103	6R5570	10,000 1W
R-3	BR46E27B	17K488267	Wire wound: .27 10% 1W (molded)
R-4	BR17B104	6R6075	100,000 1/2W
R-5	BR17B473	6R6056	47,000 1/2W
R-6	BR17B223	6R6028	22,000 1/2W
R-7	BR17E151	6R488265	150 1W
R-8	B-55511-4	6R476014	18,000 10% 2W
R-9	A-71069	A-912108	Control, sensitivity: 2000 ohms
R-11	BR46C47B	17K488266	Wire wound: .47 10% 1/2W (molded)
R-12	BR17B105	6R6004	1 meg 1/2W
R-13	BR17B223	6R6028	22,000 1/2W
R-14	B-71013-1	B-912130	Control, volume tone & switch: tapped at 500K
R-15	B-55511-3	6R5764	2,700 10% 2W
R-16	BR17B156	6R488264	15 meg 1/2W
R-17	BR17B105	6R6004	1 meg 1/2W
R-18	BR17B224	6R6015	220,000 1/2W
R-19			See R-14 (tone control)
R-20	BR16E271	6R6336	270 10% 1W
R-21	BR17B156	6R488264	15 meg 1/2W
R-22		6R6012	33,000 1/2W

SPEAKER

SP-1	D-71060-1	50C580855	Speaker, PM: 6 x 9"

SWITCH

SW-1			Part of R-14, ON-OFF switch: SPDT

TRANSFORMERS

T-1		24B580193	1st IF Transformer: iron core tuning
	D71193-1		1st IF Transformer: trimmer tuning .
T-2		24K580194	2nd IF Transformer: iron core tuning
	D71192-1		2nd IF Transformer: trimmer tuning .
T-3	C-71014	C-912144	Transformer, power
T-4	C-71012	C-912143	Transformer, output

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REF. NO.	FORD PART NO.	DETROLA PART NO.	MOTOROLA PART NO.	DESCRIPTION
TUBES				
		A-54514-2		Tube, vacuum: 6SA7GT (Converter)
		A-54517-2		Tube, vacuum: 6SK7GT (RF Amplifier)
		A-54517-2		Tube, vacuum: 6SK7GT (IF Amplifier)
		A-54518-2		Tube, vacuum: 6SQ7GT (Detector)
		A-54519-3		Tube, vacuum: 6V6GT (Output)
		A-54577-2		Tube, vacuum: 6X5GT (Rectifier)
VIBRATOR				
V-1	51A18885	B-70347	B-912131	Vibrator, 4-prong
CHASSIS PARTS - MECHANICAL				
		A-71086-1	A-912109	Bracket, front cover mounting
		B-71088	B-912132	Bracket, dial scale
		A-71191	A-912110	Clip, pointer retaining
		A-55261	A-912111	Clip, vibrator ground
		C-71062-1	C-912145	Cover, bottom front
		B-71035	1X580306	Cover, power supply
		B-71039	B-912133	Crystal, dial
		X-71230	1X580303	Escutcheon Assembly: includes bracket & grounding spring.
		A-71076	30K580711	Housing, fuse
		A-55247	A-912112	Insulator, armite (volume control mounting)
	8A-18824-A2	B-71090-1	1X580525	Knob, manual: includes spring; chrome plated
	8A-18830-A2	B-71057-1	B-912134	Knob, tone control: chrome plated
	8A-18817-A2	X-71235	1X580521	Knob, volume control: includes spring; chrome plated
		BK122E02	4S7666	Lockwasher, external: #6; steel; cad pl (filter capacitor mounting)
		A-54901	29R3025	Lug, soldering: hot tin
		BN141T02	2A590913	Nut, hex: 1/2-28 x 11/16-1/8 thick; stl; cad pl (vol. cont mtg)
		BN111T02	2S2876	Nut, hex: 1/2-28 x 3/4; steel; cad pl
		BH1A120A	2S488296	Nut, speed
		B-71189	B-912135	Pointer, dial
		BR393C03	5S8497	Rivet: .088 x 1/8 steel; nkl plated (dial scale brkt mtg
		BV321C05	X910007	Rivet: .122 x 1/8 steel; black dip (spring grounding mtg)
		BV321C02	X910022	Rivet: .122 x 1/8 steel; cad pl (power supply cover spring mounting)
		BV321D02	X910002	Rivet: .122 x 5/32 steel; cad pl (tube socket mtg, dial light socket mtg, filter capacitor mtg, sensitivity control mtg, terminal strip mtg and antenna socket mtg)
			5S7703	Rivet: .122 x 7/32 steel; pol nkl (vib. clip mtg., soldering lug mounting)
		BV321H02	X910006	Rivet: .122 x 9/32 steel; cad pl (spark plate mtg)
		D-71045	D-912146	Scale, dial
		BSF14C02	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; steel; cad pl (power transformer mounting and variable capacitor bracket mounting)
		BP928C02	3S488298	Screw, sheet metal: #8 x 1/4 PKZ slotted hex head; steel; cad pl (output transformer mounting, shield mounting, etc.)
		B-71089	B-912136	Shield, dial
		B-71044	B-912137	Shield, interference
		A-70302	A-912113	Socket, antenna connector
		B-71074-1	B-912138	Socket, dial light & lead (4")
		B-71074-2	B-912139	Socket, dial light & lead (12")
		A-71079	A-912114	Socket, speaker: 3-prong
		A-55366	9A590099	Socket, tube: octal; molded
		A-70301	A-912116	Socket, tube: 4-prong, wafer
		A-71096	A-912150	Spring, grounding (used on escutcheon)
	51A18847	A-70300	41A485380	Spring, knob retaining (used on manual and volume cont).
		A-70277	A-912115	Spring, shield (used on power supply cover)

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	BY510101	X910003	Strip, terminal: 1 insulated lug, #1 mtg, 3/8" spacing...
	BY520102	X910004	Strip, terminal: 2 insulated lugs, #2 gnd; 3/8" spacing..
	BY550104	X910005	Strip, terminal: 4 insulated lugs, #2 mtg, 3/8" spacing..
	A-54901	29R3025	Terminal, ground .....
	BF12HJ02	4S1719	Washer, flat: 3/8-9/64-1/32; steel; cad pl (spark plate mounting) .....
	A-70311	A-912149	Washer, flat: armite (fuse housing) .....
	A-71048	A-912117	Washer, shoulder: nylon (spark plate mounting) .....

HOUSING, MOUNTING PARTS & ACCESSORIES

		51A580607	Bracket, replacement rear mounting (to be used when welded stud on back of housing breaks off) .....
		30K580703	Cable, fuse .....
8C18801	B-71078	B-912140	Capacitor, distributor: .5 mfd .....
51AF-18827	B-70323	B-912141	Capacitor, generator: .1 mfd .....
	D-71063-1	D-912147	Cover, bottom: rear .....
	D-71061-1	D-912148	Cover, top .....
	A-71211	A-912118	Folder, operating instructions .....
	BK202K02	4S7693	Lockwasher, split: 1/4" steel; cad pl (rear mtg) .....
	BN121B02	2S7022	Nut, hex: 1/4-20 x 7/16 steel; cad pl (rear brkt mtg)...
	BN141202	2S8397	Nut, hex: 1/2-28 x 5/8 steel; cad pl (rear mtg).....
	BN141T02	2A590913	Nut, hex: 1/2-28 x 11/16,-1/8 thick; steel; cad pl (volume control mtg, escutcheon mtg) .....
	A-55243-1	A-912119	Nut, wing: 8-32 steel; cad pl (speaker mounting) .....
	C-71059	32C580584	Screen and Gasket Assembly, speaker .....
	B-55207-1	B-912151	Screw, machine: 10-32; hex head special (bottom cover mounting) .....
	BP928C02	3S488298	Screw, sheet metal: #8 x 1/4 PKZ slotted hex head; steel; cad pl (top cover mounting) .....
	BP238G02	3S7463	Screw, sheet metal: #8 x 1/2 PKZ slotted round head; steel; cad pl (hood bonding strap mtg) .....
8A-18888	B-71040	A-912142	Bracket, rear support .....
8A-18870	A-71091	A-912120	Strap, hood bonding .....
1GA18811-A	A-70259	A-912121	Suppressor, distributor .....
	A-71083	1X580308	Suppression kit .....
	A-71082	1X580307	Installation kit .....

G. I. TUNER UNIT & PARTS - MECHANICAL - 8072

X-71280	B-912080	Bracket - Shaft Supported .....
X-71276	B-912043	Bushing & Disc Assembly Clutch .....
X-71275	B-912037	Clutch Disc Assembly (Crown Gear) .....
X-71277		Clutch Pressure Spring .....
X-71256		Grommet - Coil Mtg - Osc .....
B-51427-12		Grommet - Coil Mtg RF & Ant .....
B-71240	B-912065	Push Button & Screw Assembly 8-32 thd .....
X-71278	B-912013	Shaft & Bush. Assembly - Manual Drive .....
X-71279	B-912044	Spring - Tension Drive Shaft .....
A-71198	41A912090	Spring - Pointer .....
X-71285	B-912084	Spring - Pointer Link .....
X-71281	B-912033	Pinion & Shaft Assembly .....

SANTAY TUNER UNIT & PARTS - MECHANICAL - 8072

B-71160		Bushing & Disc Assembly Clutch .....
B-71150		Clutch Disc Assembly (Crown Gear) .....
A-71137		Clutch Pressure Spring .....
B-51427-12		Grommet - Coil Mounting Osc. .....
B-51427-8		Grommet - Coil Mtg. RF & Ant .....
A-71198	41A912090	Pointer Spring .....
B-71145	B-912160	Push Button & Screw Assembly 8-40 thd .....
B-71195		Shaft & Bushing Assembly, Man. Drive .....
A-71251	A-912123	Spring Tension Drive Shaft .....
B-71168		Spring Tension .....
B-71155		Pinion & Shaft Assembly .....

G. I. OR SANTAY TUNER UNIT & PARTS - ELECTRICAL - 8072

A-55495	A-912101	Capacitor - Compensating 180 mmfd .....
B-55523-4	A-912158	Capacitor - Trimmer .....
X-71258	A-912153	Coil - Antenna .....
X-71259	A-912155	Coil - Osc. .....
X-71257	A-912154	Coil - RF .....
X-71262	A-912156	Cores .....
X-71286	X-912159	(Cores Kit - Hardware .....
		(T-nut
		(Core Spring
		(Flat Washer

THE HRO-50-1 RADIO RECEIVER

SECTION 1. DESCRIPTION

1-1. GENERAL

The HRO-50-1 is a deluxe radio receiver featuring performance and versatility. Sixteen tubes, including a rectifier and a voltage regulator tube, are utilized in a superheterodyne circuit for the reception of code and phone signals throughout its frequency range of 50 to 430 kilocycles and 480 to 35,000 kilocycles. The HRO type receivers have long been outstanding and proven performers in Communication and Amateur services. This new series of HRO-50-1 receivers feature many desirable innovations emanating from the latest advances in receiver circuitry and mechanical design. It is housed in a new and enlarged cabinet styled in an attractive gray finish with a self-contained power supply adequately isolated from the R.F. circuits. A calibrated, illuminated slide-rule dial provides direct reading in megacycles for each of the General Coverage coil sets as well as an additional bandspread scale for those coil sets incorporating this feature. A front-panel mounted oscillator trimmer control is provided to assure precise calibration. Of course, the dial-driving mechanism still features the micrometer dial. Temperature compensation and voltage regulation of the high-frequency oscillator as well as utilization of ceramic insulation in the coil sets and associated connecting brush blocks provide stable operation and freedom from drift. A single front-panel mounted Control switch selects any one of the four modes of operation, C.W., Phone, Narrow-Band F.M. or Phono. Sockets are mounted on the receiver chassis to accommodate the National Type NFM-83-50 FM adaptor and the National Type XCU-50-2 Crystal Calibrator Unit. These accessories may be permanently installed and switched On and Off by means of the front-panel switches. At the rear of the receiver sockets are available for external use of the National Type SOJ-3 Select-O-Ject and National Type 650S Vibrator Power Supply or battery power supply. The S-Meter circuit is designed so that the operator may adjust the sensitivity of the S-Meter. A push-pull audio system delivers the utmost in audio frequency response and undistorted power output from the built-in output transformer. Other highlights include a six-position crystal filter, maximum bandspreading of the amateur bands, a quick-acting bandspread switch and a dimmer control for the slide-rule dial and S-Meter lamps.

A standard equipment consists of a receiver, loudspeaker and coil sets A, B, C and D. Coil sets Type E, F, G, H, J, AA, AB and AC may be obtained as desired. Accessories available include the National types NFM-83-50 Narrow-Band F.M. adaptor, XCU-50-2 Crystal Calibrator, SOJ-3 Select-O-Ject and 650S Vibrator Power Supply.

1-2. CIRCUIT

For all frequency ranges the circuit utilizes two tuned stages of radio frequency amplification, a tuned mixer stage, a high-frequency oscillator employing a tube separate from the mixer tube, a first intermediate frequency amplifier stage employing a variable-selectivity crystal filter and two additional I.F. amplifier stages all operating at 455 kilocycles, a combined second detector-automatic volume control stage, an S-Meter amplifier, a double-action adjustable threshold double-diode noise limiter, a first audio amplifier, a phase inverter, a push-pull audio amplifier and a beat frequency oscillator coupled to the second detector to provide for C.W. reception.

All voltages required by the receiver are supplied by a built-in power supply. A voltage regulator tube is used to regulate the plate supply to the high-frequency oscillator and the S-Meter amplifier stages.

1-3. ANTENNA INPUT

Antenna input terminals are provided at the rear of the receiver. The input circuit is suitable for operation with a single-wire antenna, a balanced feed line or a low impedance 72-ohm unbalanced concentric transmission cable. The actual antenna input impedance is between 300 and 600 ohms depending on the frequency of the input signal.

1-4. TUBE COMPLEMENT

The HRO-50-1 receiver is supplied complete with tubes which are tested in the receiver at the time of alignment.

The tubes employed are as follows:

First R.F. Amplifier	6BA6
Second R.F. Amplifier	6BA6
Mixer	6BE6
High-Frequency Oscillator	6C4
First I.F. Amplifier	6K7
Second I.F. Amplifier	6SG7
Third I.F. Amplifier	6SG7
Second Detector - A.V.C.	6H6
Noise Limiter	6H6
S-Meter Amplifier - Phase Inverter	6SN7GT
First A.F. Amplifier	6SJ7
Audio Output (2)	6V6GT
Beat Frequency Oscillator	6J7
Voltage Regulator	0B2
Rectifier	5V4G

1-5. TUNING SYSTEM

The frequency coverage of the HRO-50-1 is covered in twelve bands as follows:

COIL SET	GENERAL COVERAGE	BANDSPREAD
A	14.0 - 30.0 Mc.	27.0 - 30.0 Mc.
B	7.0 - 14.4 Mc.	14.0 - 14.4 Mc.
C	3.5 - 7.3 Mc.	7.0 - 7.3 Mc.
D	1.7 - 4.0 Mc.	3.5 - 4.0 Mc.
E	900 - 2050 Kc.	
F	480 - 960 Kc.	
G	180 - 430 Kc.	
H	100 - 200 Kc.	
J	50 - 100 Kc.	
AA		27.5 - 30 Mc.
AB	25 - 35 Mc.	
AC		21.0 - 21.5 Mc.

As shown above plug-in coil set types AA, AC, A, B, C and D provide bandspread coverage of the 10-11, 15, 20, 40 and 80 meter amateur bands. The AA, AC, B, C, and D bands are spread out so as to cover 400 dial divisions while the A band is spread 430 divisions on the 500-division main tuning dial. This is accomplished by switching a small variable capacitor in series with each section of the main tuning capacitor, thus reducing its effective capacity range. All of the coil sets are factory aligned in the receiver using accurate crystal-controlled test oscillators thus assuring precise alignment.

The micrometer type dial drives the main tuning capacitor through a worm drive having a reduction ratio of approximately 20 to 1. Backlash is eliminated by the use of a spring-loaded split worm wheel which assures positive drive in either direction at all times. This dial has an effective scale length of approximately twelve feet and is calibrated from zero to 500.

A slide-rule type dial is synchronized with the micrometer dial by means of an anti-backlash gear and an efficient string drive arrangement to the main tuning dial. A dial drum provides a

means of mounting eight scales. Each of these scales is calibrated in megacycles for the general coverage and/or bandspread frequencies depending on the coil set. Mounted on the front panel is a band selector switch for ease in rotating the dial drum to select the proper band scale to correspond to the coil set in use. Each scale is clearly marked with the band designation. Two pilot lamps are used, one at each end of the dial scale drum, for illumination. The degree of illumination is controlled by the front-panel mounted Dimmer control.

1-6. CRYSTAL FILTER

The selectivity characteristics of the HRO-50-1 are made adjustable by means of a crystal filter. Located in the first intermediate frequency amplifier this crystal filter is designed for extreme flexibility and efficiency of operation. A six-position Selectivity switch and a crystal Phasing control are front-panel mounted for adjustment of the filter. Figure Number 1 shows the selectivity characteristics of the rec-iver for each of the six degrees of selectivity.

The crystal filter may be used for either C.W. or phone reception; any degree of selectivity from true single-signal to wide band A.M. broadcast reception being available. Operation of the Phasing control provides for efficient suppression of interfering C.W. signals or M.C.W. signals which may produce objectionable heterodynes.

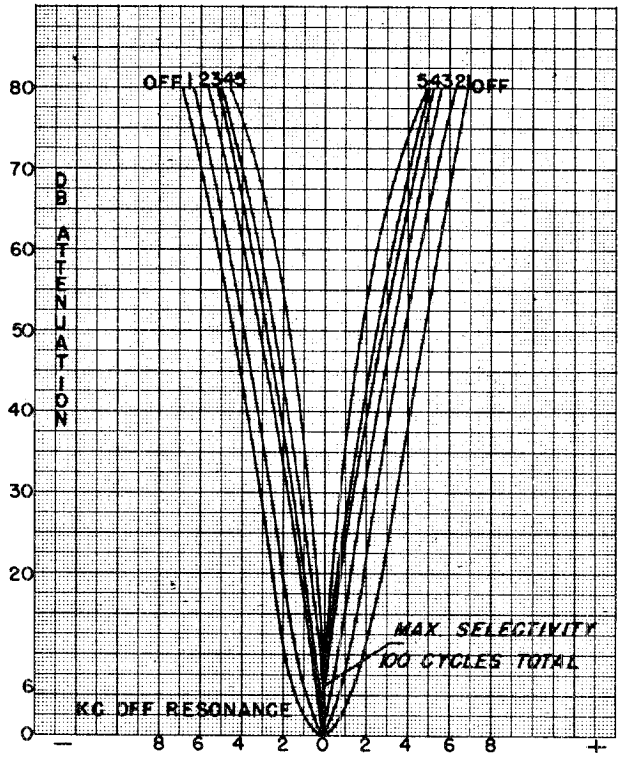


Figure No. 1. Crystal Filter Selectivity Curves

1-7. NOISE LIMITER

The noise limiter in the HRO-50-1 receiver uses an automatic type double-action circuit resulting in the limiting of noise pulses on both the positive and negative peaks. It is equally effective on both C.W. and phone reception. The usefulness of this limiter will be most appreciated on the higher frequency bands of the receiver where automobile ignition noise and other high frequency disturbances are effectively suppressed. A threshold control on the front panel permits adjustment of the level at which limiting action starts.

1-8. TONE CONTROL

The Tone control circuit has been especially designed to provide a versatile variance of the frequency characteristics of the audio amplifier output. In the extreme counter-clockwise position the greatest degree of high audio frequency response is obtained. Rotating the control clockwise until the switch mounted on the control just closes provides a comparatively flat response over the entire usable audio frequency range. Further clockwise rotation will result in the high audio frequencies being attenuated as illustrated in Figure Number 2. This control is particularly helpful when receiving weak signals through interference. If a signal is weak and partially obscured by background noise or static, an improvement in signal-to-noise ratio will be obtained by rotating the Tone control in a clockwise direction thereby attenuating the higher audio frequencies.

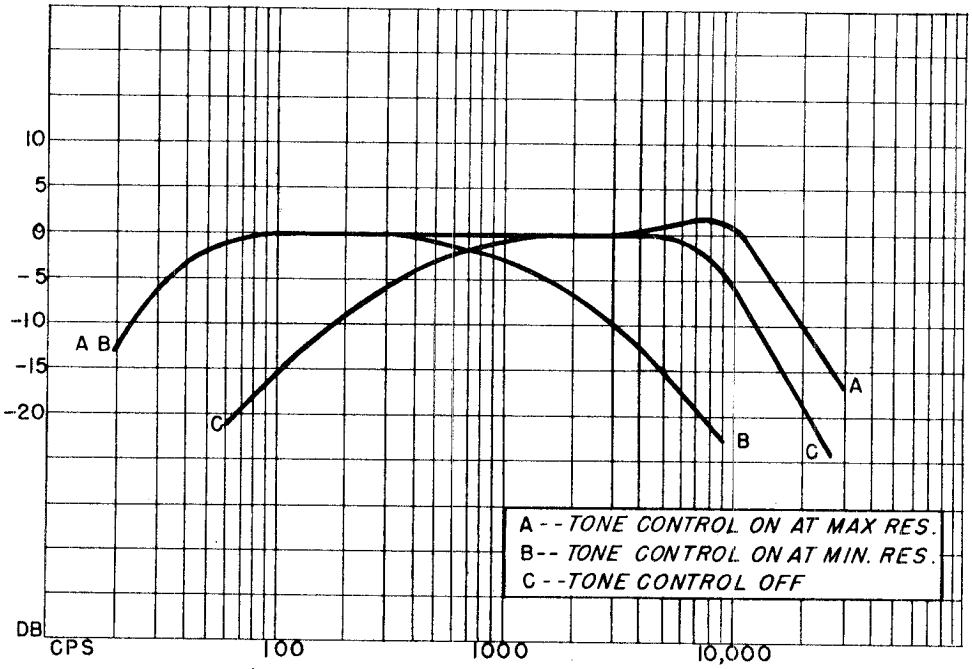


Figure No. 2. Audio Amplifier Response

1-9. TEMPERATURE COMPENSATION

The HRO-50-1 is compensated for frequency drift due to temperature changes which may detune the receiver from the desired signal over long or short periods of reception. The most objectionable cause of frequency drift is the change of inductance of the high-frequency oscillator coil as heat from the tubes causes the interior of the receiver to increase in temperature. This undesirable heating effect in the R.F. coils is minimized by the position of the plug-in coil sets in that they are placed at the bottom of the receiver underneath the chassis in a separately shielded compartment. A further safeguard against frequency drift is provided for on bandspread operation. The heat which is dissipated in the high-frequency oscillator may change the inter-electrode capacity of the tube and thus cause frequency drift. To offset this effect a small negative temperature coefficient capacitor is placed adjacent to the high-frequency oscillator tube to compensate for any change caused by the internal heating of the tube.

The coil set terminal connecting boards of each shielded coil can as well as their mating brush blocks have been made of ceramic type material. As a result freedom from any possible leakage due to poor insulation assures a low degree of drift. This will be found especially true of the coils operating at the higher frequencies.

1-10. SIGNAL STRENGTH METER

Signal input readings are indicated in S-units from 1 to 9 and in decibels above S-9 from zero to 40 db. on the panel-mounted signal strength meter. A reading of S-9 is obtained with an input signal of approximately 25 microvolts. The meter employs a zero to 1 milliampere movement with its mechanical zero at 40 db. on the dial scale. The S-Meter is connected in series with the plate input of the S-Meter Amplifier tube V-8A and measures the plate current of this tube. With the A.C. supply switch On and the A.V.C. switch set at A.V.C. the S-Meter will read zero in the absence of signal input. A variable resistor is shunted across the meter and with no antenna connected this resistor allows correct adjustment of the pointer to its electrical zero. Any increase in A.V.C. voltage caused by signal input will give a corresponding increase in the meter reading. At the 40 db. meter reading the A.V.C. grid voltage applied reaches the cut-off point of the amplifier tube. Therefore the pointer cannot be harmed by violent contact with the full-scale meter pin. For the purpose of comparing strong signals (which cause the meter to contact the full-scale meter pin) with other stronger and/or weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. Gain control. The meter dial lamp illumination is regulated by a Dimmer control mounted on the front panel of the receiver.

1-11. NARROW-BAND F.M. SOCKET

A standard octal socket, X-1, is mounted inside the receiver on the center portion of the power supply compartment chassis. It is designed to mount the National Type NFM-83-50 Narrow-Band F.M. adaptor. A control switch is front-panel mounted to provide a means of switching the adaptor into the output of the intermediate amplifier circuit. With the Control switch set at the N.F.M. position the receiver is adjusted for the reception of narrow-band F.M. signals. With the A.V.C. switch set at A.V.C. the S-Meter is operative in the N.F.M. position and the receiver should be tuned for maximum meter reading to assure efficient operation. Further information concerning the NFM-50 unit is contained in a separate data sheet at the rear of this manual.

1-12. CRYSTAL CALIBRATOR SOCKET

The Crystal Calibrator socket, X-2, is of the standard octal type mounted on top of the power supply compartment chassis inside the receiver. It is designed to accommodate a National Model XCU-50-2 Crystal Calibrator. The Model XCU-50-2 is compactly constructed and furnished with a drive screw clamping arrangement to hold it firmly in place. A double-pole, three-position toggle type front-panel mounted Calibrate switch marked 100-Off-1000 provides a means of connecting B-plus to the unit for instantaneous use. At the same time by using this toggle switch a resonant crystal-controlled frequency of either 100 or 1000 kcs. may be selected. The output of this unit is loosely coupled to the first R.F. amplifier stage through the socket wiring. Further information concerning the Model XCU-50-2 unit is covered by a separate data sheet included at the rear of this manual.

1-13. SELECT-O-JECT SOCKET

The Select-O-Ject socket, X-3, is a standard octal type socket accessible at the rear of the receiver. It is primarily designed to accommodate a National Model SOJ-3 Select-O-Ject unit. The mating plug attached to the SOJ-3 permits a direct connection into this socket in place of the audio jumper plug originally plugged into the Select-O-Ject socket. By proper adjustment of the controls any single audio frequency selected in the range of approximately 80 to 10,000 cycles may be boosted or rejected. Detailed instructions for proper operation of the Select-O-Ject are contained with the unit.

For convenience a source of 6.3 V.A.C. filament voltage, a 240 V.D.C. high voltage as well as the 105 V.D.C. regulated voltage is available for operation of external apparatus. The Schematic diagram, Figure Number 13, shows a pin view of the Select-O-Ject socket thus providing the information necessary for making the proper connections. External equipment MUST NOT be utilized if the Narrow-Band F.M. adaptor, Crystal Calibrator and Select-O-Ject units are all operated at the same time Consideration must also be given to the fact that the 105-volt regulated power supply cannot

be switched off by the B+ On-Off switch.

1-14. PHONO INPUT JACK

A Phono jack is mounted at the rear of the Receiver and can be used for connecting auxiliary apparatus, such as a record player pick-up or microphone into the audio system of the receiver. This input circuit is of high-impedance providing a suitable match for such external equipment into the high-gain first audio amplifier stage. The front-panel mounted Control switch must be set at the Phono position when using the Phono jack. Both the A.F. Gain and Tone controls are operative with this type of operation.

The majority of record player pick-ups are terminated in a single shielded wire. The Phono jack on the HRO-50-1 is the type that accommodates a standard phono tip plug and if the record player to be used is not fitted with such a plug one can easily be attached. If the output circuit of the record player is of low impedance (less than 100,000 ohms) improved efficiency will be obtained if a suitable resistor, with a value as specified for the particular record player, is connected across the phono tip plug or its mating jack to properly load the record player output circuit.

1-15. AUDIO OUTPUT

The HRO-50-1 features a push pull output amplifier using inverse feed-back. See Figure No. 2 for the audio system response characteristic. The matching transformer located inside the receiver provides two audio output circuits as follows:

(1) The transformer secondary leads are brought to a three-terminal Output board located at the rear of the receiver, having both 8 and 500-ohm terminals and a common ground terminal. The eight-ohm terminal provides output for the speaker voice coil. The 500-ohm terminal is available for connection to a 500-ohm line. Approximately 8 watts of undistorted audio output power is available at the output terminal board and a maximum power of 10 watts is obtainable.

(2) A headphones jack is front-panel mounted and is wired so as to silence the Loudspeaker upon insertion of the headphones plug. The headphones output load impedance is not critical and varying types of headphones may be used including crystal types, as no direct current flows through the headphones.

1-16. POWER SUPPLY

The power supply is built in a separate compartment inside the receiver cabinet incorporating a heat-resistant shielded barrier isolating it from the R.F. chassis portion. It is designed for operation from a 110/120 or 220/240-volt, 50/60 cycle A.C. supply source. A toggle switch is mounted on top of the chassis for selection of either 110/120 or 220/240-volt operation. Normal power consumption is approximately 115 watts. The built-in power unit supplies all of the voltages required by the heater and B supply circuits, 5.1 amperes at 6.3 volts and 145 milliamperes at 240 volts respectively. In addition this supply is also capable of furnishing all voltages required by the accessories such as the NFM-83-50, XCU-50-2 and SOJ-3. A 2-ampere fuse is connected in one side of the A.C. input supply to protect the receiver circuits against possible voltage surges in the power line or short circuits in the receiver. It is located at the rear of the receiver and is easily removed for examination or replacement.

A Power Socket, X-4, is provided at the rear of the receiver so that either a battery or vibrator power supply may be utilized for portable or emergency service. The National Type 650S Vibrator Power Supply is designed to provide efficient operation of the receiver with the use of a 6-volt storage battery input. Further information concerning the 650S is contained at the rear of this manual on a separate data sheet.

1-17. LOUDSPEAKER

The HRO-50TS of HRO-50RS loudspeakers in table or rack mounting styles respectively are designed for use with the receiver. These are both permanent-magnet type loudspeakers furnished with a shielded connecting cable from the 8-ohm voice coil for connection to the output terminal board located at the rear of the receiver. If desirable a 500-ohm shielded line may be used from the receiver output terminals to the speaker and/or externally operated equipment. In the event a dynamic type loudspeaker is used external means for supplying field excitation voltage will be necessary.

A cabinet finished to match the receiver design houses the HRO-50TS loudspeaker for table mounting. The cabinet is lined with sound absorbent material to avoid mechanical resonance.

SECTION 2. INSTALLATION

2-1. GENERAL

All HRO-50-1 receivers are supplied with the following eight scales mounted on the slide-rule dial drum, irrespective of the type of coil sets ordered, A, B, C, D, E-F, AA, AB and AC. If a coil set or coil sets are ordered with the receiver and the corresponding scale does not appear on the dial drum it will be found packed with the coil set. The new scale is installed in place of any one of the unused scales previously mounted on the dial drum. A Phillips head type screw at one end and a spring clip at the other end of the scale hold it properly in place. The drum scales for the A, B, C and D coil sets are frequency calibrated in megacycles for both of the available ranges i.e., General Coverage and Bandspread. The E and F coil set ranges are on the same scale, while the remaining scales carry just the one frequency range calibrated in megacycles. Each scale is clearly marked with the band designation.

2-2. LOCATION

The receiver should not be installed in small, unventilated or warm spaces. Wherever practicable placement should be made to allow freedom of air circulation on all four sides. The loudspeaker may be located in any desirable position although it is not recommended that it be placed on top of the receiver as undesirable microphonics may result. The loudspeaker should not be placed near the antenna terminals.

2-3. ANTENNA RECOMMENDATIONS

The radio frequency input of the receiver is designed for operation from either a single-wire antenna or other types employing transmission lines having impedances of 70 ohms or more. There is an antenna terminal panel at the rear of the receiver with three screw-type terminals marked A, A and G respectively. A link is provided on the antenna terminal panel to allow connection of two-wire or single-wire type antennae to the receiver.

For best impedance matching to the receiver input circuit an antenna with a 300 to 600 ohm transmission line is recommended. The antenna should be cut to the proper length for the most used frequency. The antenna transmission line feeders should be connected to the two antenna terminals marked A; the grounding link is not used. It must be remembered, however, that an antenna installation of this type will have maximum efficiency over a band of frequencies near that frequency for which it is designed and will be most useful in installations where the receiver is tuned to one frequency or band of frequencies. For other frequencies, it would be desirable to connect the two transmission line leads together at the antenna terminal at the left of the antenna terminal panel, grounding the other terminal by means of the link. The antenna is thus utilized as a single wire type.

The most practicable antenna for use in installations where the receiver is to be used over a wide range of frequencies is the single-wire type. An antenna length of from 50 to 100 feet is recommended. The antenna lead-in should be connected to the antenna terminal marked A at the left of the antenna terminal panel; the other terminal marked A should be grounded by means of the link.

When a doublet is used, the antenna feeders or balanced transmission line are connected to the two terminals marked A. The grounding link is not used.

The inner conductor of a concentric transmission line should be connected to the terminal marked A at the left of the antenna terminal panel. The outer conductor should be connected to the other terminal marked A and grounded by means of the link to G.

In some cases where a doublet antenna is used with a low impedance concentric or other type transmission line it may be necessary to re-trim the first R.F. amplifier stage at the high end of each band to provide a better impedance match between antenna and receiver input circuit. Paragraph 4-6 describes this procedure.

In an installation where the receiver is to be used as the receiving unit in a transmitting station the most efficient operation will result from use of the transmitting antenna as receiving antenna also. This is especially true if the transmitting antenna is of the multi-element, directional type since the same antenna gain is available for both receiving and transmitting - a very desirable condition. For switching the antenna from the receiver to transmitter, an antenna change-over relay should be used. A double-pole, double-throw relay possessing good high-frequency insulation is suitable. A second relay and a three position switch may be used to control the transmitter plate supply and the receiver B+ circuits. This second relay should be a single-pole, single-throw type having one normally open pair of contacts. The schematic diagram of this type of control circuit is shown in Figure 3. With S-1 in the receive position the antenna transmission line is connected to the receiver by contacts 2, 3, 5 and 6 on relay RY-1; the B+ circuit of the receiver is completed by the switch. (The B+ switch on the receiver should be at B+ Off). With the switch in the transmit position RY-1 contacts 1, 3, 4 and 6 are closed transferring the antenna transmission line to the transmitter; contacts 7 and 8 of relay RY-2 close to complete the plate supply circuit to the transmitter. Contacts 7 and 8 of relay RY-2 should be in series with the primary of the transmitter plate supply transformer. Thus, the station is in the receiving condition with switch S-1 in the receive position and in the transmitting condition with S-1 in the transmit position. With S-1 in the mid-position the receiver B+ circuit and transmitter plate supply circuit are both open thus permitting coil set changing in the receiver and transmitter. In the mid-position the receiver B+ circuit is controlled by the B+ switch on the front panel of the receiver.

NOTE

The high-frequency oscillator, C.W. oscillator, S-Meter amplifier and the push-pull audio output amplifier are not affected by the external relay connection to the B.S.W. terminal block. Unless the A.C. On-Off switch is set at Off these circuits will obtain an uninterrupted B-plus supply.

2-4. A.C. OPERATION

After unpacking the HRO-50-1 receiver and associated equipment proceed as follows:

(1) Make sure that all tubes are firmly seated in their sockets, tube clamps are properly in place and all grid clips securely fastened.

(2) Make sure the plug-in coil set used in the receiver is firmly in position by pressing down the lever type handles on the front panel to their maximum vertical position.

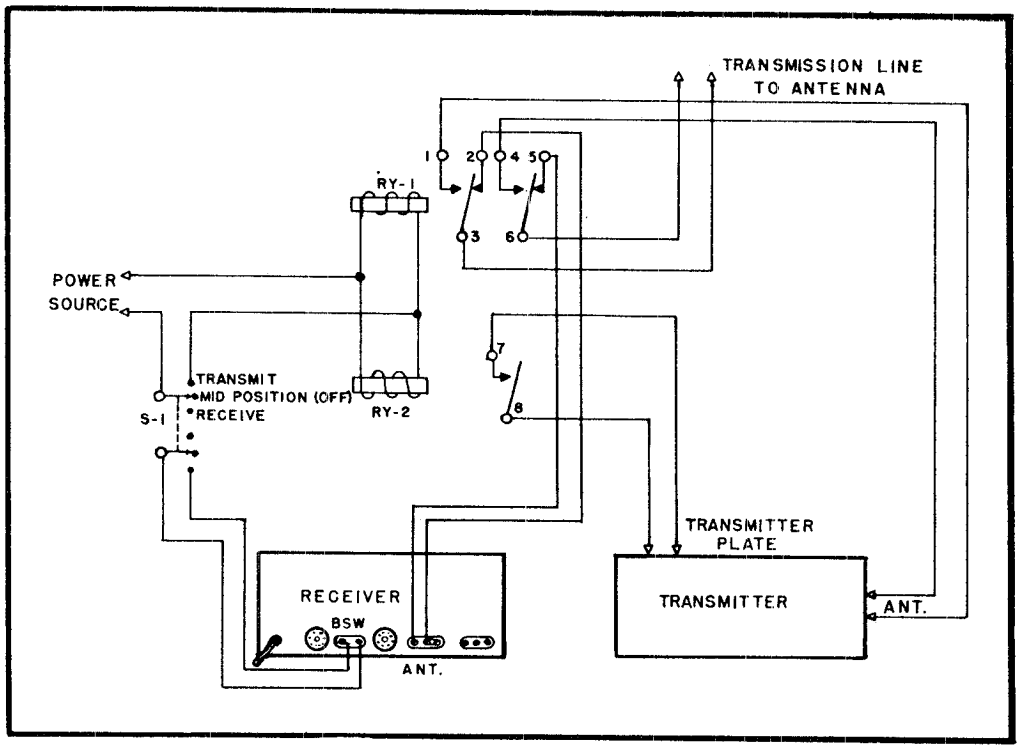


Figure No. 3. Typical Antenna Switching System

(3) Connect the antenna as recommended in Section 2-2.

(4) Connect the loudspeaker cable to the Output terminal board at the rear of the receiver This is accomplished by connecting the outer shield lead to the common terminal and the other to the 8-ohm terminal. A 500-ohm terminal is also available on the Output terminal board in cases where a 500-ohm line is utilized for loudspeaker connection.

(5) Connect the receiver A.C. line cord to the proper source of voltage. The Primary switch, S-10, must be set at the position corresponding to the line voltage to be used i.e., 110/120 or 220/240 volts, 50/60 cps.

(6) Set the controls as recommended in Section 3 for reception of signals.

NOTE

Where the receiver is located in the R.F. field of a relatively powerful transmitter, it is advisable to provide some means of preventing damage to the receiver R.F. coil. If a separate receiving antenna is used a means of disconnecting or grounding it during transmission periods should be provided.

2-5. BATTERY OPERATION

The HRO-50-1 is readily adaptable for emergency, portable operation or operation in localities where a 115 or 230-volt A.C. power source is not available. It may be operated directly from batteries or a National Type 650S Vibrator Power Supply designed for operation from a 6-volt storage battery. The Type 650S power unit draws 9.5 amperes at 6-volts when furnishing power to the receiver if the Narrow-Band F.M. Adaptor, Crystal Calibrator and Select-O-Ject units are not used. If these plug-in units are utilized typical operating conditions and power consumption data will be found in Section 6.

The Schematic Diagram Figure Number 13 illustrates pin connections of the receiver Power Socket X-4. This provides the information necessary for wiring the octal type battery plug which is used to place of the regular A.C. jumper plug. To conserve battery power the battery plug must be disconnected when the receiver is not being used. For stand-by operation in all cases it is recommended that a switch be placed in the battery B-plus lead as the B-plus switch in the receiver does not open the B-plus circuit supplying the high-frequency oscillator, C.W. oscillator, S-Meter Amplifier or the push-pull audio output tubes. A suggested refinement is to include a switch in the A-plus input lead so that the tube heaters may be turned off when the receiver is not in use without the necessity of removing the battery plug from the Power socket.

2-6. ACCESSORY SOCKETS

Three octal type sockets are available for additional accessories as follows:

(1) A N.B. F.M. socket, X-1, is mounted on top of the chassis inside the power supply compartment. A National Type NFM-83-50 Narrow-Band F.M. adaptor is designed to fit into this socket and is supplied with a mounting bracket and drive screws to hold it firmly in place. The front-panel mounted Control switch, S-7, provides a means of switching the NFM-50 unit into instant service, as required.

(2) A Crystal Calibrator socket, X-2, is top chassis mounted in the power supply compartment. This socket is wired to accommodate a National plug-in Type XCU-50-2 Crystal Calibrator unit. A slotted head screw arrangement bolts the unit firmly in place. The front panel Calibrate switch provides a means of applying B-plus to the unit as well as the selection of either a 100 or 1000 kc. marker signal.

(3) A Select-O-Ject socket, X-3, of the standard octal type is mounted so as to be accessible from the rear of the receiver. This socket is designed primarily for the use of a National Model SOJ-3 Select-O-Ject unit. The SOJ-3 is fitted with an interconnecting cable and plug for direct connection to the Select-O-Ject socket.

Reference to the Schematic Diagram will show the various connections made to the socket if it is desired to use the voltages available for accessories other than the Select-O-Ject. It will be noted that B+ (240 V.D.C. and 105 V.D.C. regulated) and filament voltages are available. There is a definite limitation on the drain permissible at this socket. The total permissible drain (if the NFM-83-50, XCU-50-2 and SOJ-3 are not used) is 1.8 amps at 6.3 V.A.C., 10 milliamperes at 240 V.D.C. and 5 milliamperes at 105 V.D.C. If the 105-volt supply is used it must be remembered that it cannot be switched Off by the B+ On-Off switch or external switching devices connected to the B.S.W. panel unless an additional relay is used.

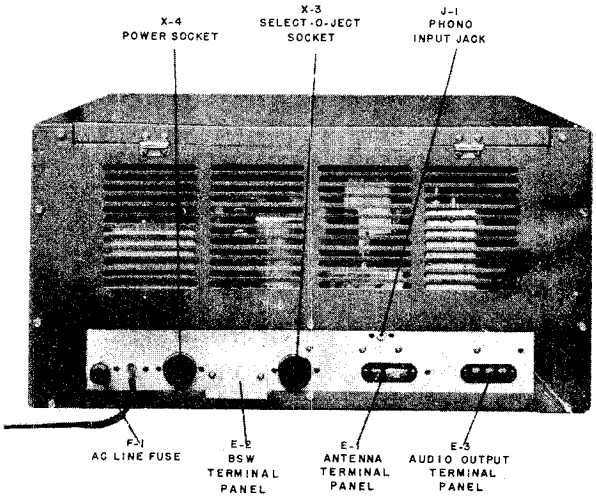


Figure No. 4. Rear View of Receiver

SECTION 3. OPERATION

3-1. CONTROLS

All controls are identified by front-panel markings for ease of identification. The controls are located in a symmetrical manner and are arranged for ease of operation.

The main tuning HRO type micrometer dial is arranged so that the frequency to which the receiver tunes increases as the dial reading increases. The slide-rule dial pointer mechanism is synchronized with the main tuning dial using an anti-backlash gear plus an efficient string-drive arrangement to provide an accurate relationship between the main tuning dial and the direct frequency calibrated scales on the slide-rule drum assembly. Front-panel mounted is a Band selector switch for switching the proper scale in place for the coil set to be used.

The R.F. Gain control serves to adjust the amplification of the second R.F., first, and second and third I.F. amplifier stages. Maximum sensitivity is obtained by rotating the control knob to the extreme clockwise position (10 on its circular scale). At the extreme clockwise position all tubes are operating at maximum gain with minimum bias. As the control is rotated counter-clockwise, increasing bias is applied to the cathodes of the second R.F., first, second and third I.F. tubes, thus reducing their amplification.

The A.C. On-Off switch is associated with the A.F. Gain control and A.C. power is turned on as the A.F. Gain control is advanced from A.C. Off to zero on its scale.

The B+ On-Off switch is connected in the positive lead of the power supply circuit and its purpose is to disconnect the B-plus during periods of transmission or WHEN CHANGING COIL SETS. This last function is important. The B+ circuits are completed when the switch is set at On. However, the B-plus circuits of the high-frequency oscillator, S-Meter amplifier, C.W. oscillator and push-pull audio output tubes remain On at all times regardless of the position of the B+ On-Off switch providing the A.C. On-Off switch is set at On.

Connected in parallel with the B+ switch and mounted at the rear of the chassis is a pair of contacts marked B.S.W. intended for use with relay control of the receiver. The B.S.W. panel is covered by a metal shield to prevent accidental contact with the terminals by the operator. Two slots are provided in this shield to bring out wires to connect to an external switch or relay. Care should be taken that these wires for external connection do not short to the B.S.W. shield.

The Phasing control and Selectivity switch are part of the crystal filter. When the Selectivity switch is set at Off the crystal is switched out of the circuit. With the crystal switched out the Phasing control has no influence on receiver performance. With the Selectivity switch set at any point between 1 and 5, inclusive, the crystal filter is in operation, selectivity increasing as the switch is progressively advanced to position 5. The Phasing control is then used to balance the crystal bridge circuit and eliminate interfering signals or heterodynes. It is recommended that the Tone control be rotated counter-clockwise until the switch is turned Off. This will provide optimum reception of the high audio frequencies when using the crystal filter for A.M. reception. The resultant boost of the higher frequencies tends to compensate for the side-band cutting action of the crystal filter.

The C.W. oscillator is turned on by setting the front-panel mounted Control switch at the C.W. position. The C.W.O. control provides a vernier tuning adjustment for the C.W. oscillator transformer. This oscillator is used to produce an audible beat note when receiving C.W. signals or to locate the carrier of a weak phone station. With the Control switch set at the C.W. position, B-plus is applied to the C.W. oscillator tube providing a constant B-plus supply regardless of the B+ On-Off switch setting or the B.S.W. external control devices. Normally the C.W.O. control is set at zero, however by rotating it either to the right or left of zero the operator can select an audio tone suitable to the ear, or he may set the control for best reception. The C.W. code characters are made audible through the heterodyning action of the C.W. oscillator with that of the incoming signal. Care

MODEL HRO-50-1

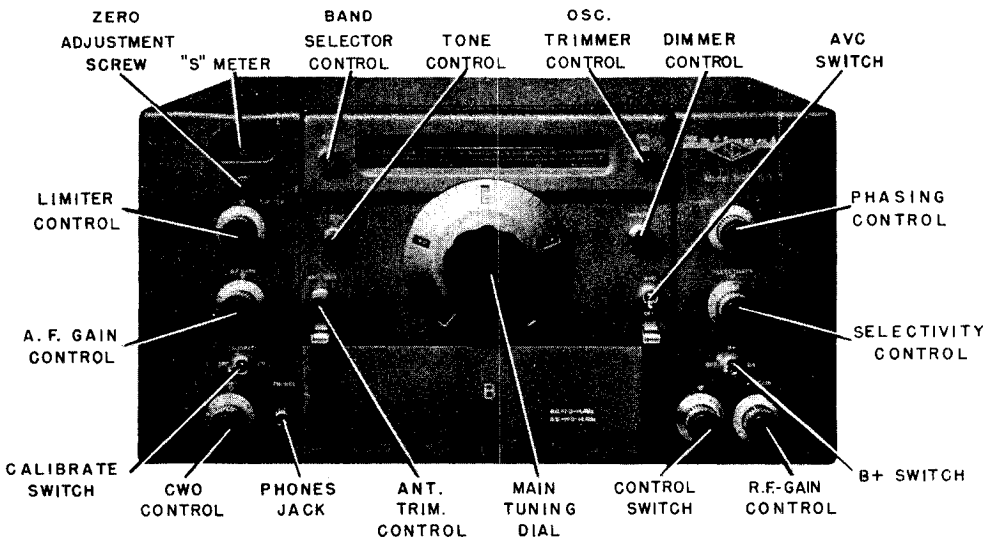


Figure No. 5. Front View of Receiver

should be taken to retard the R.F. Gain control to a point where the receiver does not overload.

The Limiter control serves to switch on the limiter and following this, to adjust the threshold at which limiting action starts. With the Limiter control turned on (at position 0 on the dial scale) limiting action automatically takes place at a relatively high percentage modulation. Rotating the control clockwise progressively lowers the threshold, or percentage modulation, at which limiting action starts until maximum clipping is achieved at 10. This limiter is double-acting in that limiting is accomplished by clipping of both positive and negative peaks. Limiting action is equally effective for both phone or C.W. reception.

The Tone control is used to vary the audio frequency characteristic of the audio system. In the extreme counter-clockwise position the greatest degree of high audio frequency response is obtained. Rotating the control clockwise until the switch mounted on the control just closes provides a comparatively flat response over the entire usable audio frequency range. Rotating the control further in a clockwise direction will attenuate the high audio frequencies as shown in Figure Number 2. If a signal is weak and partially obscured by background noise or static an improvement in signal-to-noise ratio is possible by the attenuation of the higher audio frequencies. Excessive attenuation of these frequencies, however, may result in an impairment of A.M. speech intelligibility. When receiving C.W. signals it will be possible to advance the Tone control considerably further than is possible in A.M. reception since audio distortion is relatively unimportant.

The A.V.C. switch is a two-position toggle marked A.V.C.-Off. The automatic volume control circuits are operative with the toggle switch in the A.V.C. or upper position.

The A.F. Gain control adjusts the volume level of the signal at both the Phones jack and loudspeaker terminals. Clockwise rotation of this control increases the signal applied to the grid of the first audio amplifier tube. The A.F. Gain control is operative when an audio signal is applied to the Phono input jack with the Control switch set at the Phono position.

A Bandspread switch is mounted on the A, B, C and D coil sets. Inspection of the coil set ceramic terminal panel will show a silver-plated spring metal strip with a slotted center screw. Four silver-plated contacts are provided on the terminal panels; two for each type of reception i.e., General Coverage or Bandspread. The metal strip may be turned either to the right or left thereby selecting the type of reception required. A spring tension detent arrangement provides for proper placement and a firm trouble-free electrical contact in each position. It is only necessary to switch this from the right to the left hand side to change from General Coverage to Bandspread. The

lower calibrated scale on the slide rule dial is used when operating in the Bandspread position. A typical coil set showing adjustment locations is illustrated in Figure Number 7 contained in Section 4.

The Ant. Trim. control operates a tuning capacitor which is connected across the first R.F. amplifier section of the main tuning capacitor. This trimmer control is used to tune the first R.F. amplifier stage properly under a wide variety of antenna loading conditions over the entire frequency range of the receiver.

The Dimmer control is a variable resistor actuated by a front-panel mounted dial. It is connected in series with one of the filament supply wires to the S-Meter and slide-rule dial pilot lamps and furnishes a means of varying the degree of illumination as desired by the operator.

The front-panel mounted Osc. trimmer control drives a variable air capacitor connected in parallel with the oscillator main tuning capacitor. Assuming that the receiver is properly aligned this compensating trimmer may be used for minor calibration adjustments. Calibration can be checked by the use of accurate crystal-controlled test oscillators or by using the National Model XCU-50-2 Crystal Calibrator. Use of the Osc. trimmer should not be attempted until the receiver has had a warm-up period of at least five minutes.

A four position Control switch is mounted on the front panel of the receiver. In the C.W. position the C.W. oscillator is placed in operation. The A.M. position provides normal reception of phone or broadcast signals. In the N.F.M. position the reception of narrow-band F.M. signals is possible provided a National Type NFM-83-50 adaptor is plugged into the N.B.F.M. socket. With the Control switch in this position the adaptor is connected between the output of the intermediate amplifier and the input of the audio system. When the Control switch is set in the Phono position the Phono jack is connected to the input of the audio amplifier. In the Phono position all of the receiver circuits except the audio system are rendered inoperative. The A.F. Gain and Tone controls remain operative. If it is so desired the record player may remain connected to the receiver and normal receiving operation resumed by setting the Control switch to any of the other positions.

3-2. PHONE RECEPTION

After the HRO-50-1 is properly installed as outlined in Section 2, it is placed in operation by the following adjustments:

1. Set the Control switch at A.M.
2. Set the A.V.C. switch at A.V.C.
3. Set the Selectivity switch at Off.
4. Set the Phasing control at zero.
5. Set the Limiter control at Off.
6. Set the R.F. Gain control at 10.
7. Check the position of the Osc. trimmer control pointer. It is aligned at the factory so that proper calibration is obtained with the pointer in a vertical position with the arrow head pointed to the "S" in the Osc. panel engraving.
8. Turn the A.C.-On-Off switch mounted on the A.F. Gain control to On i.e., zero on the dial scale.
9. Set the receiver B+ switch at On.
10. Adjust the Band control to select the scale corresponding to the plug-in coil set in use.
11. Turn the A.F. Gain control to the position giving the desired audio volume.
12. Adjust the Ant. Trim. control for a maximum S-Meter reading after the desired station has been selected. Alternately in the absence of a signal the Ant. Trim. control may be set for maximum receiver background noise.
13. Turn the Tone control to a position giving the desired audio output response.

The receiver is now adjusted for the reception of phone signals and will tune to the frequency

corresponding to the plug-in coil set in use and the setting of the main tuning dial. If a dual-coverage plug-in coil set is used the position of the Bandspread switch,, as previously described in paragraph 1 of this section, will determine the frequency coverage i.e., General Coverage or Bandspread.

The settings given above are for the reception of signals of average strength. Exceptionally strong or weak signals may require modification of the above settings. Very strong signals may cause overload or distortion in the receiver with the R.F. Gain control at 10. In this case retarding this control slightly until the overload or distortion disappears is recommended. However, the operator must remember that automatic volume control action will be restricted unless the R.F. Gain control is fully advanced. Audio output should be adjusted entirely by means of the A.F. Gain control.

The A.V.C. - Off switch may be set at the Off position to provide increased sensitivity in some cases. With such a setting the operator must be careful not to advance the R.F. Gain control to a point where I.F. or audio amplifier overload occurs. Such overload is indicated by distortion.

Various types of interference which may be encountered due to adverse receiving conditions can be minimized by utilization of the following controls in the manner described.

Noise Limiter -- When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, the best signal-to-noise ratio will be obtained by turning On the Limiter control. In general, it will be found that turning the Limiter control On to 0 on the dial scale will effectively minimize interference caused by external noise pulses. In cases where the noise pulses are extremely pronounced a higher degree of noise suppression will be realized by advancing the Limiter control to a higher dial setting.

Tone control -- An improvement in signal-to-noise ratio can be realized by setting the Tone control to attenuate the high audio frequencies. When receiving weak signals which are partially obscured by background noise or static an improvement in reception will be noticed by rotating the Tone control in a clockwise manner. However, too much attenuation of the high audio frequencies may impair the intelligibility of speech.

Selectivity and Phasing -- The selectivity of the receiver is adjusted by means of the crystal filter Selectivity switch. The normal setting of the Selectivity switch in phone or broadcast reception is at one of the positions affording broad selectivity. Positions marked Off, 1 or 2 are recommended. Selectivity may be progressively increased by turning the Selectivity switch to position 3 4 or 5. Increasing selectivity will result in the attenuation of the higher audio frequency tones of the signal as well as sharper tuning. If the selectivity is increased too much these higher frequency audio tones will be attenuated to such an extent that phone or broadcast signals may become unintelligible due to excessive side-band cutting. The Phasing control is part of the crystal filter and is used to eliminate or attenuate interfering heterodynes. The Phasing control is inoperative with the Selectivity switch set in the Off position but is operative in all other settings. The normal setting of the Phasing control with the crystal filter On (i.e., the Selectivity switch set at 1, 2, 3, 4 or 5) in phone reception is at zero on its scale. If, after a desired signal has been tuned in, an interfering signal causes a heterodyne or whistle the Phasing control should be adjusted until this interference is reduced to a minimum. The setting of the Phasing control should be that which provides a maximum attenuation of the objectionable heterodyne. If the heterodyne is below 1,000 cycles the optimum Phasing control setting will be near either one or the other end of the dial scale, depending upon whether the interfering signal has a higher or lower frequency than the desired signal.

3-3. C.W. RECEPTION

The initial adjustment of the receiver controls for C.W. reception is the same as given in Section 3-2 except that the Control switch must be set at C.W.

For the reception of C.W. signals the action of the crystal filter is similar to that for phone reception except that full use of the sharp selectivity position may be used without the loss of intelligibility experienced in phone reception. When maximum selectivity is used, (Selectivity switch at position 5) care must be exercised since tuning is very critical. When the receiver is slowly tuned across the carrier at the received signal the beat-note produced will be very sharply peaked in output at a particular audio pitch. This peak in response indicates the correct receiver dial setting. The setting of the C.W.O. control must be such that the beat-note peak is well within the audible range so that the receiver peak response may be readily observed. A C.W.O. dial setting near zero is recommended. After the receiver has been correctly tuned, the pitch of the beat-note peak may be adjusted by means of the C.W.O. control to provide an audio tone which is pleasing to copy or coincides with any response peaks in the speaker or headphones. Under these conditions the receiver will exhibit pronounced single-signal properties which may be demonstrated by tuning the receiver to the other side of "zero-beat" so that the pitch is the same as before and observe the marked reduction in output. This dial setting is not recommended for use other than to demonstrate the single-signal properties of the receiver. With the receiver tuned to "crystal peak", an interfering signal may be attenuated by proper setting of the Phasing control since this control has little effect on the desired signal.

Similar to phone reception the Limiter control can be used to great advantage in C.W. reception for the reduction of interference due to external noise pulses. For C.W. reception, however, the Limiter control may be set at a well advanced position on the dial scale as excessive clipping of the modulation peaks will not be experienced as might be the case in phone reception. Also the Tone control may be advanced considerably further for C.W. reception since audio distortion is relatively unimportant.

3-4. N.B.F.M. OPERATION

The HRO-50-1 receiver is adaptable for Narrow-Band F.M. reception by utilizing a National Type NFM-83-50 Narrow-Band F.M. adaptor. Operating instructions as given in paragraph 3-2 of this section are applicable for the reception of narrow-band F.M. signals except that the Control switch must be set at N.F.M. It is recommended when the operator is scanning a band for signals that the Control switch is set at A.M. An F.M. signal is indicated by the presence of an audio null in the center of the signal carrier. When an F.M. signal is encountered the Control switch should then be set at N.F.M. and with the A.V.C. switch set at A.V.C. the signal tuned for maximum S-Meter reading.

3-5. MEASUREMENT OF SIGNAL STRENGTH

To measure the strength or intensity of a signal the R.F. Gain control must be advanced to 10, the Control switch set at A.M. and the A.V.C.-Off switch at A.V.C. The crystal filter should be turned Off by means of the Selectivity switch and the Phasing control set at zero. The Ant. Trim. control should be adjusted for a maximum S-Meter reading after a signal has been tuned in. The Limiter, Tone and A.F. Gain controls do not affect the S-Meter reading.

Tuning the receiver to a signal will cause the S-Meter to read, indicating the signal input in S-units from 1 to 9 and in decibels above the S-9 level from zero to 40 db. With no R.F. input to the receiver, or with the antenna disconnected, the S-Meter should read zero plus or minus one-half an S-unit. If it does not the S-Meter circuit compensator requires adjustment. See Section 4-7 for adjustment procedure.

Design of the S-Meter actuating circuit is such that a signal stronger than 40 db. above S-9 cannot cause the meter pointer to come in violent contact with the full-scale meter stop pin thus preventing the possible bending of the meter pointer.

For the purpose of comparing strong signals, which cause the meter pointer to read full scale, with other stronger and/or weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. Gain control.

Measurements of the signal strength of C.W. signals cannot be made with the C.W. oscillator in operation.

With the receiver A.C.-On-Off switch set at Off the meter pointer will return to its mechanical zero located on the right hand or 40 db. end of the meter.

SECTION 4. ALIGNMENT DATA

4-1. GENERAL

All circuits in the HRO-50-1 receiver are carefully aligned before shipment using precision test equipment insuring accurate conformability to the alignment frequency. No realignment of the various adjustments will be required unless the receiver is tampered with or component parts or tube replacements have been necessary.

A definite need for realignment can be determined by checking the performance of the receiver against its normal operation as outlined in Section 3. A simple check to assure the need of realignment of the I.F. Amplifier is provided in paragraph 4-2 of this section. In no case should realignment be attempted unless tests indicate that such realignment is necessary. Even then it must be remembered that the HRO-50-1 is a communications receiver and should not be serviced or realigned by by any individual who does not have a complete understanding of the functioning of the equipment and who has not had previous experience adjusting receivers of this type.

Complete alignment of the receiver can be divided into three steps as follows:

(a) Intermediate Frequency Amplifier alignment including crystal filter adjustments.
(b) General Coverage Alignment
(c) Bandspread Alignment

All circuits must be tuned in the above order when complete alignment is required. All alignment adjustments and controls are shown on Figure Numbers 6, 7 and 10.

4-2. I.F. AMPLIFIER CHECK

The making of any adjustment indiscriminately is cautioned against and no circuit should be realigned unless tests definitely indicate that realignment is necessary.

The alignment of the intermediate frequency amplifier may be easily checked in the following manner:

1. Adjust the receiver for normal operation with the antenna disconnected.
2. Connect a pair of headphones to the Phones jack.
3. Set the A.V.C. switch at Off.
4. Set the Control switch at C.W.
5. Set the Phasing control at zero.
6. Set the Selectivity switch at 5.
7. Set the R.F. Gain control at 10.

The setting of the A.F. Gain control does not affect the measurement and may be adjusted to provide sufficient headphone output to make the required observations. Adjust the C.W.O. control

until a point is found where the predominant pitch of the background noise is lowest and a distinct crystal ring is heard. Note this setting of the C.W.O. control. Disconnect the crystal filter from the circuit by turning the Selectivity switch to the Off position Once more adjust the C.W.O. control for the lowest predominant pitch of background noise and note the setting. If the I.F. amplifier is correctly aligned to the crystal filter frequency the setting of the C.W.O. control will be the same for both tests outlined above. If the two settings differ perform the complete I.F. amplifier alignment procedures in the following paragraph 4-3.

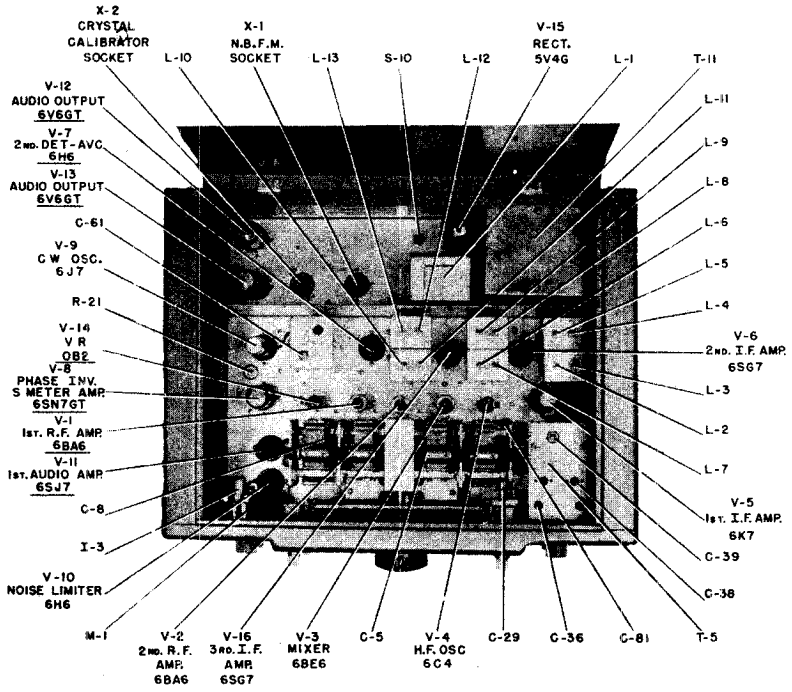


Figure No. 6. Top View of Receiver

4-3. I.F. AMPLIFIER ALIGNMENT

The intermediate frequency of the HRO-50-1 is 455 kilocycles plus or minus 2 kilocycles. The exact frequency is determined by the quartz crystal resonator, Y-1, used in the crystal filter.

The crystal filter and C.W. oscillator transformer are fitted with air-type variable trimmer capacitors for alignment purposes. The I.F. transformers are aligned by means of variable iron cores. These adjustments are located on Figure Numbers 6 and 10.

The preliminary alignment procedure is as follows:

(1) Connect the high output lead of an accurately calibrated signal generator to the stator portion of the mixer section of the main tuning capacitor, C-5C, and the grounded lead to any convenient point on the chassis. This is a direct connection.

(2) Connect an output meter having an 8 or 500 ohm resistive load to the matching output terminals on the receiver. As an alternative a high-impedance A.C. voltmeter may be connected to the phones jack.

(3) Set the Control switch at C.W.

(4) Set the A.V.C. switch at Off.

(5) Set the Phasing control at zero.

(6) Set the Selectivity switch at 5.

(7) Set the A.F. Gain control at 10.

(8) Set the R.F. Gain control at 9.

(9) Turn the modulation of the signal generator off to provide a steady C.W. test signal

tuned to approximately 455 kilocycles.

Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts. The C.W.O. control must be set to provide an audio beat-note at some frequency between 400 and 1000 cycles per second. The presence of this beat note can readily be determined by temporarily connecting headphones or a loudspeaker to the receiver. If difficulty is encountered in obtaining such a beat-note an adjustment of the C.W.O. transformer trimmer capacitor, C-61, must be made.

Vary the tuning control of the signal generator very slowly between the frequencies of 453 and 457 kilocycles. At one frequency between these limits the I.F. amplifier of the receiver will show a very definite sharply peaked response, as indicated on the output meter. This frequency is that of the crystal filter crystal, Y-1, and I.F. alignment, as outlined below, is made at this frequency.

While making I.F. amplifier adjustments it will be necessary to retard the attenuator of the signal generator if I.F. amplifier gain increases to a point where overload occurs. Without altering the frequency setting of the signal generator set the Selectivity switch at Off, the Control switch at A.M. and turn the modulation of the signal generator On. Capacitors C-33, C-39 and inductors L-2 through L-13 should at this point each be carefully adjusted to give a maximum reading on the output meter. The order in which these adjustments are performed is not important.

Upon completion of the above adjustments set the Selectivity switch at 1. Set the frequency of the signal generator 2 kilocycles higher and adjust the crystal filter trimmer capacitor C-39 for a maximum output meter indication. After making this adjustment set the Selectivity control at Off and return the signal generator to the exact crystal frequency (2 kilocycles lower). Tune the Selectivity compensating trimmer capacitor C-38 for a maximum reading on the output meter.

The Phasing control as set at the factory should need no further attention. When correctly set a predominant decrease in background level will be found with the Selectivity switch at position 5 and the Phasing control set at zero. This same null point should be found by rotating the Phasing control exactly 180 degrees. If not, a slight adjustment of the phase balancing capacitor C-36 will provide the proper setting.

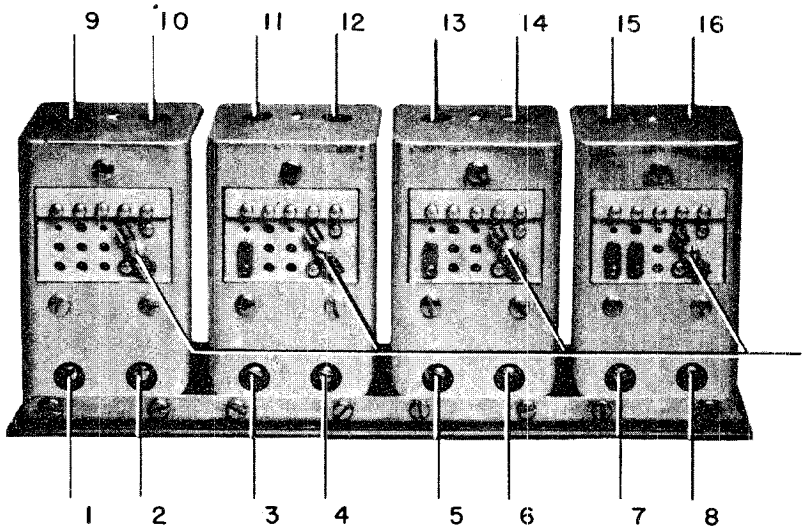
Turn the modulation of the signal generator Off and set the Control switch at C.W. Rotate the C.W.O. control to its full clockwise position. If in this position the dial control does not coincide with 5 on its scale loosen the dial knob and reset it at 5. Set the C.W.O. control to zero beat with the signal generator signal. If zero beat does not occur at 0 on the control dial carefully readjust the air trimmer capacitor C-61 of the C.W. oscillator transformer T-8.

4-4. GENERAL COVERAGE ALIGNMENT

The data given in this section applies to the General Coverage alignment of the H.F. oscillator and R.F. amplifier stages of all coil sets. The original alignment at the National Laboratories is accomplished by the use of precision, crystal-controlled test oscillators. No realignment should be attempted unless a reliable test signal source is available. In the case of General Coverage H.F. oscillator alignment, a test signal source with an accuracy of 1% or better is required. For Bandspread alignment the calibration accuracy demands that the test signal source have the accuracy of precision-calibrated crystals. The entire range of test frequencies required may be obtained by the use of nine crystals operating at their fundamental and harmonic frequencies. The frequency of these crystals is as follows: 0.05, 0.1, 1.0, 2.0, 3.5, 5.0, 6.0, 7.0, 7.3, 14.4 and 15 megacycles.

The need for realignment of the H.F. oscillator of any band is indicated when the frequency calibration of the receiver dial is in error by more than 1% at the high frequency end of the band in question. If it is determined that realignment is necessary proceed as follows:

(1) Connect an output meter to the receiver as described in paragraph 4-3 of this Section and disconnect the antenna.



NOTE: INDUCTANCE ADJUSTMENTS AT POSITION NO. 16 ARE AS FOLLOWS:

1. A, B & C COIL SETS---LOOP OF WIRE INSIDE COIL FORM---BENDING THE LOOP ONE WAY OR THE OTHER ADDS OR SUBTRACTS TO THE INDUCTANCE.
2. D COIL SET---ADJUSTABLE DISC INSIDE COIL FORM---MOVING THE DISC TOWARD THE CENTER OF THE COIL DECREASES INDUCTANCE.
3. E, F, G, H & J COIL SETS---A SHORT-CIRCUITED TURN OF WIRE AROUND THE OUTSIDE OF THE COIL---MOVING THIS TURN UP OR DOWN VARIES THE INDUCTANCE.

INDUCTANCE ADJUSTMENT AT POSITION NOS. 9, 11 & 13 OF COIL SETS A, B, C, D, AA, AB & AC IS A LOOP OF WIRE INSIDE COIL FORM---BENDING THE LOOP ONE WAY OR THE OTHER VARIES THE INDUCTANCE.

Figure No. 7. Typical Coil Set Showing Alignment Adjustment Locations

(2) Set the Control switch at A.M.
(3) Set the A.V.C. switch at Off.
(4) Set the Selectivity switch at Off.
(5) Set the R.F. Gain control at 10.
(6) Set the Bandspread switch in the General Coverage position.
(7) Set the A.F. Gain control to provide a suitable output level.
(8) Check the position of the Ant. Trim. and Osc. trimmer controls. Alignment should be made with both of the pointers on these controls in a vertical position with the arrow-head pointed towards the top of the receiver.

The following Alignment chart gives the step-by-step procedure to follow in effecting the General Coverage alignment of each coil set. It is important that the chart of adjustments is adhered to in the order shown. It will be noted that General Coverage alignment affects Bandspread alignment, but that adjustment of Bandspread alignment does not affect General Coverage.

Particular care must be taken when adjusting the high-frequency oscillator trimmer C-26 in each coil set. It is imperative that the high-frequency oscillator is set to operate at a frequency above the R.F. amplifier frequency and not below. This can be checked by tuning in the image of the test signal which must appear 910 kilocycles lower on the receiver dial. If it is found that the image does not appear at this dial setting the H.F. oscillator is incorrectly adjusted and the capacity of the trimmer capacitor C-26 must be decreased until the image and fundamental signals appear at the proper points on the dial. After the high-frequency oscillator is correctly calibrated the R.F. amplifier trimmers C-2 and C-15 and the mixer trimmer C-21 should be adjusted for maximum receiver gain as measured by the output meter. Coil sets A and D do not use a first R.F. amplifier trimmer but are peak-tuned by the use of the Ant. Trim. control over the full frequency range of each

coil set. It may be desirable to align the R.F. Amplifier trimmers C-2 and C-15 and the mixer trimmer C-21 using receiver background noise as an indication of maximum gain, rather than the signal source. If this alternate method of alignment is used the point of maximum gain is that setting of the trimmers which provides the loudest receiver background noise. However, it is possible to align the R.F. amplifier and mixer stages to the image frequency using background noise as an indicator. A check of this possibility is to tune in the image signal — if the image is weaker than the fundamental signal the R.F. amplifier and mixer stages are correctly aligned.

Correction of tracking errors of the R.F. amplifier and mixer stages at the low frequency limit of each coil set is accomplished by the adjustments listed on the Alignment Chart. The actual tracking of these stages may be checked by pressing the outside rotor plates of the main tuning capacitor section toward or away from the stator in a manner assuring that the rotor plates will spring back to their original position. Any change in capacity should decrease the receiver gain if the stage is tracking properly.

The locations of the adjustments referred to on the General Coverage Chart are shown on Figure Number 7. Each variable on the chart is followed by a number in parenthesis to identify its position on the respective coil set. Schematic diagrams of each of the plug-in coil sets are furnished on Figure Numbers 11 and 12.

GENERAL COVERAGE CHART

Step	Coil Set	Adjust Signal Source and Receiver To:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	A	30,0 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6). C-15 (Pos. 4).
2	A	14.4 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	A	30.0 Mc.		Check step 1. Repeat steps 1 and 2. if necessary.
1	B	14.4 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6) C-15 (Pos. 4), C-2 (Pos. 2).
2	B	7.0 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	B	14.4 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.
1	C	7.3 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	C	3.5 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
3	C	7.3 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.
1	D	4.0 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	D	1.8 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11 9.
3	D	4.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary.

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GENERAL COVERAGE CHART (CONT'D)

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	E	2.0 Mc	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6) C-15 (Pos. 4).
2	E	1.0 Mc.	Padder capacitor C-100 (Pos. 7).	
3	E	1.4 Mc.	Inductance at Pos. No. 16.	
4	E	2.0 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	F	0.9 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	F	0.5 Mc.	Padder capacitor C-100 (Pos. 7).	
3	F	0.7 Mc.	Inductance at Pos. No. 16.	
4	F	0.9 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	G	400 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4).
2	G	200 Kc.	Padder capacitor C-100 (Pos. 7).	
3	G	300 Kc.	Inductance at Pos. No. 16.	
4	G	400 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	H	200 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	H	100 Kc.	Padder capacitor C-100 (Pos. 7).	
3	H	150 Kc.	Inductance at Pos. No. 16.	
4	H	200 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	J	100 Kc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6). C-15 (Pos. 4), C-2 (Pos. 2).
2	J	50 Kc.	Padder capacitor C-100 (Pos. 7).	
3	J	75 Kc.	Inductance at Pos. No. 16.	
4	J	100 Kc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.

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GENERAL COVERAGE CHART (CONT'D)

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	AA	30 Mc.	Trimmer capacitor C-26 (Pos. 7).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AA	27.2 Mc.	Padder capacitor C-100 (Pos. 8).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AA	28 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AA	30 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary.
1	AB	35 Mc.	Trimmer capacitor C-26 (Pos. 8).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AB	25 Mc.	Padder capacitor C-100 (Pos. 7).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AB	30 Mc.	Inductance at Pos.No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AB	35 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary. Check step 1.
1	AC	21.5 Mc.	Trimmer capacitor C-26 (Pos. 7).	Trimmer capacitors C-21 (Pos. 6), C-15 (Pos. 4), C-2 (Pos. 2).
2	AC	21 Mc.	Padder capacitor C-100 (Pos. 8).	Padder capacitors C-99 (Pos. 5), C-98 (Pos. 3), C-97 (Pos. 1).
3	AC	21.3 Mc.	Inductance at Pos. No. 16.	Inductance at Pos. Nos. 13, 11, 9.
4	AC	21.5 Mc.		Check step 1. Repeat steps 1, 2 and 3 if necessary. Check step 1.

4-5. BANDSPREAD ALIGNMENT

The data given in this section applies to the Bandspread Alignment of the high-frequency oscillator, R.F. amplifier and mixer stages of coil sets A, B, C and D. It is important that no Bandspread adjustments are made until after completion of General Coverage alignment as General Coverage adjustments affect Bandspread alignment.

The need for realignment of the H.F. oscillator of any band is indicated when the frequency calibration of the main tuning dial is in error by more than ±5 divisions. To effect alignment the receiver controls are adjusted the same as outlined in Section 4-4. except that the Bandspread switch on each of the plug-in coils must be in the right-hand or Bandspread position.

The procedure in effecting Bandspread alignment is accomplished by adhering to the instructions given in the Bandspread Alignment Chart. The procedure is similar to that for General Coverage except for the method followed in checking tracking errors of the R.F. amplifier and mixer stages at the low-frequency limit of each coil set. To secure an indication of proper tracking, check the setting of the Bandspread trimmer capacitors C-3, C-16 and C-22 for the position of maximum receiver gain. Any change in capacity should decrease the receiver gain indicating proper tracking. The use of the trimmer capacitors C-3, C-16 and C-22 for a tracking check may destroy their proper settings therefore they must be carefully rechecked at the high-frequency limit of the coil set. The location

BANDSPREAD ALIGNMENT CHART

NOTE: Do not effect Bandspread Alignment until after completion of General Coverage.

Step	Coil Set	Adjust Signal Source and Receiver to:	Adjust to Receive Test Signal	Adjust for Maximum Output
1	A	30.0 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5), C-16 (Pos. 3), C-3 (Pos. 1).
2	A	27.2 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14), C-14 (Pos. 12), C-1 (Pos. 10).
3	A	30.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.
1	B	14.4 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5), C-16 (Pos. 3), C-3 (Pos. 1).
2	B	14.0 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14), C-14 (Pos. 12), C-1 (Pos. 10).
3	B	14.4 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.
1	C	7.3 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5), C-16 (Pos. 3), C-3 (Pos. 1).
2	C	7.0 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14), C-14 (Pos. 12), C-1 (Pos. 10).
3	C	7.3 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.
1	D	4.0 Mc.	Trimmer capacitor C-27 (Pos. 7).	Trimmer capacitors C-22 (Pos. 5), C-16 (Pos. 3), C-3 (Pos. 1).
2	D	3.5 Mc.	Padder capacitor C-25 (Pos. 15).	Padder capacitors C-20 (Pos. 14), C-14 (Pos. 12), C-1 (Pos. 10).
3	D	4.0 Mc.		Check step 1. Repeat steps 1 and 2 if necessary. Check step 1.

of the adjustments referred to in this section are shown on Figure Number 7. Each variable on the chart is followed by a number in parenthesis to identify its position on the respective coil set. Schematic diagrams of each of the four combination Bandspread and General Coverage coil sets A, B, C and D are furnished on Figure Number 11.

4-6. FIRST R.F. STAGE ALIGNMENT WITH LOW IMPEDANCE TRANSMISSION LINE

If a low impedance transmission line is to be used with the receiver, it may be necessary to re-align the first R.F. amplifier at the high-frequency end of each band. The tracking of the first R.F. amplifier stage on each of the coil ranges may be checked by rotating the Ant. Trim. control. If two definite peaks in output are observed while rotating the Ant. Trim. control, the first R.F. amplifier stage is tracking correctly and the setting at either peak is correct. The lack of a peak in output or the presence of only one peak indicates the stage is not tracking properly and correction should be made. The General Coverage adjustments affect the Bandspread adjustments and must therefore be performed first. The following procedure should be adhered to:

(a) GENERAL COVERAGE

(1) Set the Bandspread switch on each coil to the left-hand side or General Coverage position. Adjust the receiver for normal operation as follows: Control switch at A.M., Selectivity switch at Off, Ant. Trim. control pointer set in a vertical position with the arrow head towards the top of the receiver, A.F. Gain control set at 10 and the R.F. Gain control set to provide a suitable signal level.

(2) Connect the antenna feeders to the receiver antenna terminals and tune the receiver to the signal shown in step 1 on the General Coverage Alignment Chart for the coil set to be aligned. Adjust the trimmer capacitor C-2 for maximum signal output. Coil sets A and D do not use a first R.F. amplifier General Coverage trimmer but are peak-tuned by the Ant. Trim. control over the full frequency range of each coil set.

(b) BANDSPREAD

(1) With the receiver adjusted in the same manner as for General Coverage shift the Bandspread switch on each coil terminal panel to the right-hand side or Bandspread position.

(2) Connect the Antenna feeders to the receiver antenna terminal and tune the receiver to the signal shown in Step 1 on the Bandspread Alignment Chart for the coil set being aligned. Adjust the Bandspread trimmer capacitor C-3 for maximum signal output. If no signal can be received the trimmer may be adjusted for maximum background noise.

4-7. S-METER ADJUSTMENT

The S-Meter balancing resistor R-21 is used to obtain a zero meter reading in the absence of signal input to the receiver. To make this adjustment set the controls as follows: set the R.F. Gain control at 0, A.V.C. switch at A.V.C., Control switch at A.M. and the A.C. switch at On. Adjust the S-Meter balancing resistor R-21 for a zero reading on the S-Meter. This is a screwdriver type adjustment located on the top of the chassis.

SECTION 5. MAINTENANCE

5-1. GENERAL MAINTENANCE DATA

Any repairs in the HRO-50-1 receiver which necessitates resoldering of joints must be made with care. A good mechanical connection must be made before the solder is applied.

Failure of a vacuum tube in the receiver may reduce the sensitivity, produce intermittent operation or cause the equipment to be completely inoperative. In such cases, all tubes should be checked either in an analyzer or similar tube testing equipment or by replacement with tubes of proven quality. When any tube is tested, it should be tapped or jarred to make sure that it has no internal loose connection or intermittent short circuit.

Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind when replacements become necessary. The C.W. oscillator, high-frequency oscillator and I.F. tubes should be chosen with care to select a replacement which most nearly approaches the characteristic of the original tube. A replacement high frequency oscillator tube can be readily checked by noting any change in dial calibration, particularly on the amateur bandspread bands. Substitution of new I.F. amplifier tubes may possibly alter overall gain and selectivity characteristics. The necessity for realignment as well as alignment procedures is discussed in Section 4.

In case of breakdown or failure of the receiver, the fault must first be localized. This can

often be accomplished by observation of some peculiar action of one of the controls Reference to the circuit diagram will aid in checking voltages at the various tube elements. Measurement of voltages in accordance with Section 5-4. will most likely indicate where failure has occurred.

5-2. CIRCUIT FAILURES

All components parts in the HRO-50-1 receiver have been selected to assure an ample factor of safety. Failure may occur in individual cases and the most common cause of failure, excluding tubes, will probably be due to breakdown of a capacitor or resistor.

Bypass or filter capacitors which develop poor connections internally, or which become open-circuited, will cause decreased sensitivity, oscillation or poor stability. The defective unit can be located by temporarily connecting a good capacitor in parallel with each capacitor that is under suspicion.

Failure of any bypass or filter capacitor may seriously overload resistors in associated circuits. Overload of sufficient magnitude to permanently damage a resistor will cause the surface of the resistor to be scorched, making the defective unit easy to locate by visual inspection.

Open or short-circuited resistors can be definitely located by measuring the resistance of each individual resistor. The schematic diagram should be consulted to make sure that any particular resistor under test is not connected in parallel with some other circuit element which might produce a false measurement

Loose connections which cause intermittent or noisy operation can often be found by tapping or shaking any component under suspicion with the receiver adjusted for normal operation.

5-3. STAGE GAIN MEASUREMENTS

The sensitivity measurements listed herein are made with the receiver set up as specified in Section 3-2 except that the A.F. Gain control is set at 10. Connect an output meter with an impedance to match the receiver output circuit i.e., 8 or 500 ohms to the output terminal panel in place of the loudspeaker. It is important that the proper output impedance match be observed.

Connect the high output lead of the signal generator through a 0.1 mf coupling capacitor to the grid of each tube as specified in the following table. The ground lead of the generator is connected to any convenient chassis point.

The signal generator, using modulation, is varied between 453 and 457 kilocycles until a pronounced peak reading is obtained on the output meter.

With the generator attenuated to provide a one watt reading on the output meter the signal generator attenuator should read within the limits specified on the following table:

TERMINAL	TEST SIGNAL
Mixer Grid	60 ± 20 Microvolts
First I.F. Grid	530 ± 50 Microvolts
Second I.F. Grid	2800 ± 250 Microvolts
Third I.F. Grid	48,000 ± 5000 Microvolts

5-4. VOLTAGE TABULATION

All voltage measurements should be made using a high-impedance vacuum tube voltmeter. Readings taken with any other type of instrument will differ somewhat depending upon the input resistance of the meter. Voltmeter resistance should be ten times larger than the resistance of the circuit across which the voltage is measured otherwise the voltmeter will indicate a voltage lower than the

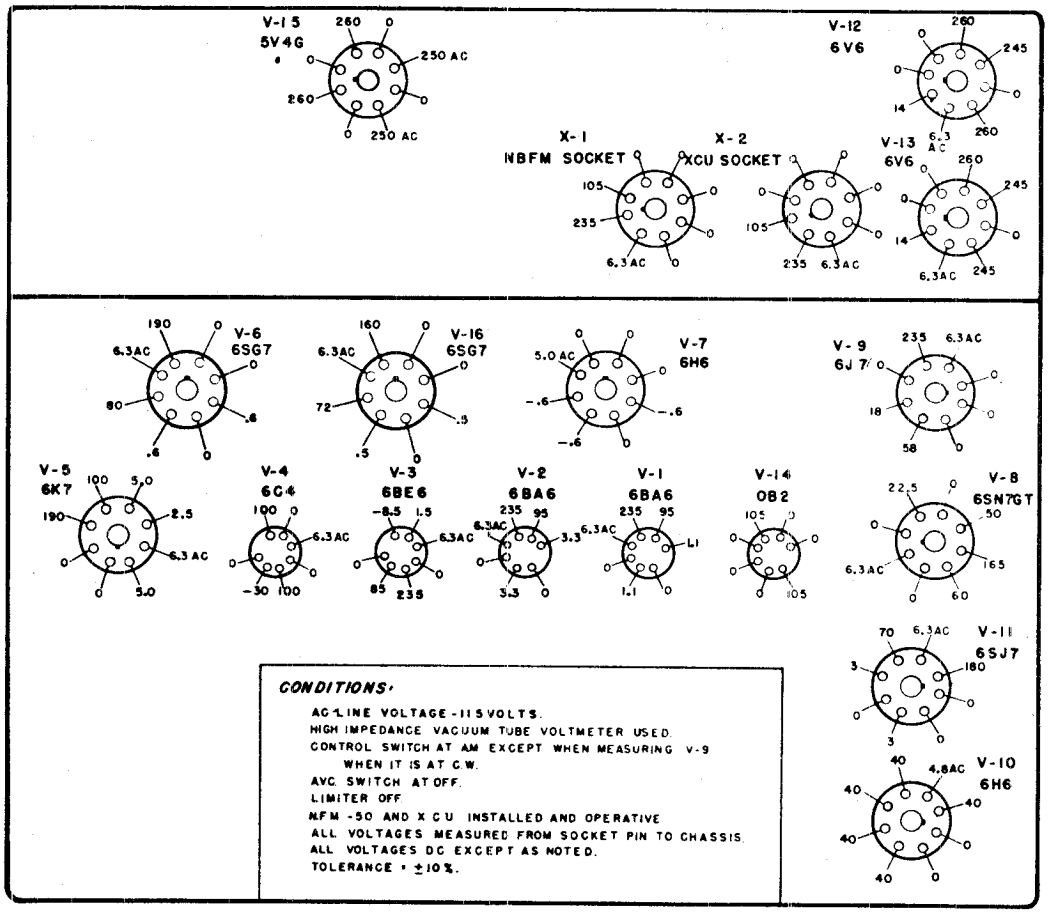

Figure No. 8. Tube Socket Voltages

actual voltage present. The tube socket voltage tabulations contained in Figure Number 8 were taken using a vacuum tube voltmeter with an input resistance of 11 megohms. All voltages are measured between specified socket terminals and chassis. The control settings to be observed are shown on Figure Number 8.

5-5. MAIN TUNING DIAL

The main tuning dial should normally give no trouble. If, however, the dial should become removed from the receiver it must NOT be operated until mounted on the capacitor shaft WITH SET-SCREWS TIGHT. This is because the dial is only designed to rotate for ten revolutions (0 to 500) and if turned farther than this the mechanism will be damaged. When mounted on the capacitor, limit stops protect the dial provided the assembly is made properly. The procedure for re-mounting the dial is as follows:

(a) Place the dial on the capacitor shaft, tighten set-screws and turn the dial counter-clockwise to fully mesh capacitor rotor plates so that the tips of the rotor plates are flush with the edge of the stator plates.

(b) Loosen set-screws and rotate dial slowly until the dial reading has decreased to zero.

(c) Tighten the set-screws.

(d) Check position of rotor plates at zero. The tips of the rotor plates must be flush with the edge of the stator plates. A slight adjustment may be necessary and this is done by loosening the set-screws, adjusting the position of the dial and tightening the set-screws again.

If it is necessary to remove the dial at any future time, turn to 250 before removing the dial

and do not disturb the setting of either the dial or capacitor until reassembled. If in doubt about the correct position, inspect the springs on the back of the dial. When the dial reads 250 these springs should be straight-up-and-down, they must not be tipped to one side.

It is important that the backplate and dial do not become separated. The backplate is held in place by two springs so that its gear teeth mesh with the dial gear teeth in correct relationship for proper dial operation. If this backplate should be sprung out of place, it may return to an incorrect position and the proper dial numbers will not appear in the windows when the dial is used. To ascertain that the two parts are in correct position proceed as follows:

(a) Locate small window near outer periphery of dial backplate and also locate dial number window on face of dial which is 180° removed from the small backplate window.

(b) Hold dial so backplate lies flat in palm of left-hand and with right hand rotate dial knob until 250 appears in previously located dial window.

(c) If dial is properly adjusted it will be noted that the pointer at the outer edge of the small window lines up with a marked tooth on the dial itself. It will be found that the dial and backplate can be moved so that the backplate pointer will mesh between teeth at points equidistant from marked tooth in either direction.

(d) If by checking as in paragraph (c) the dial is found not properly adjusted, it will be necessary to separate the backplate from the dial far enough to bring the two gears out of mesh and then re-mesh the two parts until the proper setting is found. A number of trial settings may be required before the correct mesh is found.

5-6. SLIDE-RULE TUNING DIAL

The slide-rule tuning dial assembly has been adjusted at the factory for accurate synchronization with the micrometer dial. If not tampered with this mechanism will provide complete freedom of mechanical trouble over a long period of continuous use. It is driven by an anti-backlash tuning gear ganged with the main tuning dial. The slide-rule dial pointer is controlled by a string-drive assembly.

If replacement of the string-drive cord is required it will be necessary to remove the receiver chassis from its cabinet or wraparound. Before removing the micrometer dial reference should be made to Paragraph 5 of this section for proper method of removal. Figure Number 9 illustrates the proper method of replacing the cord. After the cord has been replaced and before the receiver is returned to its cabinet the micrometer dial should temporarily be replaced (See Paragraph 5-5) and the slide-rule pointer correctly set in the following manner:

NOTE

This procedure may also be used if a check is desired to assure that the slide-rule dial pointer is properly synchronized with that of the main tuning dial.

(a) Check the main tuning dial at zero on its dial scale. The tips of the rotor plates should be flush with the edge of the stator plates.

(b) Set the Band Selector control so that the D coil set scale appears.

(c) Set the main tuning dial at 490 on its dial scale. Correct setting of the slide-rule dial pointer is 4 megacycles on the dial scale. Draw the slide-rule pointer along the cord to its proper position being careful not to disturb the setting of the micrometer dial. After the correct setting has been obtained use a small amount of glyptol or household cement to fasten the dial pointer securely in place on the cord.

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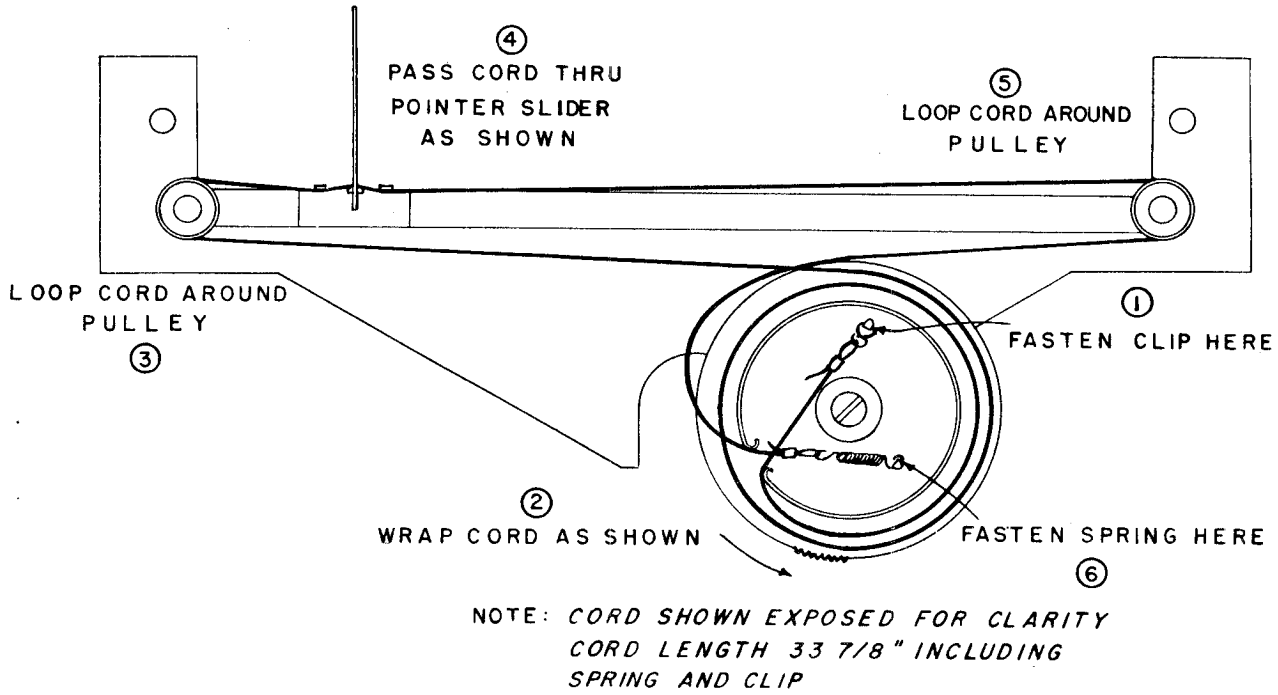

Figure No. 9. Instructions for Dial Cord Replacement

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS	
C-1	T-1 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 - 35 mmf	D832-2
C-2	T-1 General Coverage Trimmer used on B, C, F, H, J, AA, AB, AC coil sets	Variable, air dielectric	
C-3	T-1 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-4	Antenna Trimmer	Variable, air dielectric	SA:6577
C-5	Main Tuning	Four section ganged	SA:6592
C-5A	V-1 Tuning	Air dielectric, 225 mmf. max.	
C-5B	V-2 Tuning	Air dielectric, 225 mmf. max.	
C-5C	V-3 Tuning	Air dielectric, 225 mmf. max.	
C-5D	V-4 Tuning	Air dielectric, 225 mmf. max.	
C-6	V-1 Grid Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-7	Not Used		
C-8	V-1 Grid Filter	Mica, .01 mfd. 300 vdcw	J666-56
C-9	V-1 Cathode Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-10	V-1 Screen Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-11	V-1 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-12	V-1 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-13	V-2 Grid Return Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-14	T-2 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 - 35 mmf.	D832-2
C-15	T-2 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-16	T-2 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-17	V-2 Cathode Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-18	V-2 Screen Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-19	V-2 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-20	T-3 Bandspread Padder used on A, B, C, D coil sets	Mica, variable, 3.5 - 35 mmf.	D832-2
C-21	T-3 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-22	T-3 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-23	V-3 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-24	V-3 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-25	T-4 Bandspread Padder used on A, B, C, D coil sets	Variable, air dielectric	
C-26	T-4 General Coverage Trimmer used on all coil sets	Variable, air dielectric	
C-27	T-4 Bandspread Trimmer used on A, B, C, D coil sets	Variable, air dielectric	
C-28	T-4 General Coverage Padder:		
	A coil set	Mica, .0012 mfd. 300 vdcw	J666-63
	B coil set	Mica, .003 mfd. 500 vdcw	J666-30
	C coil set	Mica, .0016 mfd. 500 vdcw	J666-21
	D coil set	Mica, .0009 mfd. 500 vdcw	J666-62
	E coil set	Mica, 470 mmf. 500 vdcw	H500-18
	F coil set	Mica, 330 mmf. 500 vdcw	H500-22
	G coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
	J coil set	Ceramic, 50 mmf. 500 vdcw	D825D-417
	AA coil set	Ceramic, 10 mmf. 500 vdcw	D825D-402
	AB coil set	Ceramic, 120 mmf. 500 vdcw	D825C-340
C-29	Osc. Trimmer	Variable, air dielectric	
C-30	V-4 Grid	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-31	V-4 Plate	Paper, .1 mfd. 400 vdcw	D827-12
C-32	V-4 to V-3 coupling	Mica, .01 mfd. 300 vdcw	J666-56
C-33	T-5 Primary Trimmer	Variable, air dielectric	
C-34	Bridge Balancing	Ceramic, 62 mmf. 500 vdcw	J695-3
C-35	Bridge Balancing	Ceramic, 47 mmf. 500 vdcw	J695-1
C-36	Phasing Balance Adjustment	Mica, variable, 3.5 - 35 mmf.	D832-2
C-37	Phasing Control	Variable, air dielectric	SA:3655
C-38	Selectivity Compensator	Mica, variable, 3.5 - 35 mmf.	D832-2
C-39	T-5 Output adjustment	Variable, air dielectric	SA:1841
C-40	Selectivity Adjusting	Ceramic, 5 mmf. 500 vdcw	D825D-401
C-41	Selectivity Adjusting	Ceramic, 10 mmf. 500 vdcw	D825D-426
C-42	Selectivity Adjusting	Ceramic, 10 mmf. 500 vdcw	D825D-426
C-43	V-5 A.V.C. Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-44	V-5 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2

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PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-45	L-2 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-46	L-3 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-47	L-4 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-48	L-5 Tuning	Mica. 510 mmf. 500 vdcw	H500-5
C-49	V-6 A.V.C. Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-50	V-6 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-51	V-6 Screen Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-52	V-6 Plate Filter	Ceramic, .01 mfd. 450 vdcx	K946-2
C-53	V-7 Load	Ceramic, 270 mmf. 500 vdcw	J633-2
C-54	V-7 Coupling	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-55	A.V.C. Filter	Paper, .01 mfd. 600 vdcw	D827-7
C-56	V-9 to V-7 Coupling	Ceramic, 3 mmf. 500 vdcw	J695-4
C-57	V-9 Screen Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-58	C.W. Osc. Control	Variable, air dielectric	SA:6580
C-59	V-9 Grid	Mica, .001 mfd. 500 vdcw	J666-14
C-60	T-9 Fixed Tuning	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-61	T-9 Tuning	Variable, air dielectric	
C-62	D.C. Bypass	Paper, .01 mfd. 600 vdcw	D827-7
C-63	A.C. Line Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-64	A.C. Line Bypass	Mica, .01 mfd. 300 vdcw	J666-56
C-65	Power Supply Filter	Electrolytic,40 + 40 mfd. 475 vdcw	K945-3
C-65A	Power Supply Input Filter	Part of C-65	
C-65B	Power Supply Output Filter	Part of C-65	
C-66	V-7 to V-10 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-67	V-10 Threshold Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-68	V-10 Plate Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-69	V-10 to X-3 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-70	Tone Compensator	Electrolytic, 25 mfd. 50 vdcw	E338-4
C-71	V-11 Cathode Bypass	Paper, .5 mfd. 100 vdcw	D827-49
C-72	V-11 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
C-73	V-11 Plate Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-74	Tone	Paper, .01 mfd. 600 vdcw	D827-7
C-75	V-8B to V-11 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-76	V-8B Grid	Ceramic, 100 mmf. 500 vdcw	D825D-421
C-77	V-8B to V-12 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-78	V-8B to V-13 Coupling	Paper, .01 mfd. 600 vdcw	D827-7
C-79	V-12 and V-13 Cathode Bypass	Electrolytic, 25 mfd. 50 vdcw	E338-4
C-80	Tone Compensator	Mica, .0024 mfd. 1000 vdcw	J667-68
C-81	Temperature Drift Compensator	Ceramic, 5 mmf. 500 vdcw	H872-3
C-82	T-1 Fixed Bandspread Padder:	Ceramic	
	A coil set	12 mmf. 500 vdcw	D825D-404
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412
C-83	T-2 Fixed Bandspread Padder:	Ceramic	
	A coil set	21 mmf. 500 vdcw	D825D-410
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
C-84	T-3 Fixed Bandspread Padder:	Ceramic	
	A coil set	21 mmf. 500 vdcw	D825D-410
	B coil set	5 mmf. 500 vdcw	D825D-401
	C coil set	12 mmf. 500 vdcw	D825D-404
	D coil set	25.7 mmf. 500 vdcw	D825D-412
C-85	T-4 Bandspread Padder used on A coil set	Ceramic, 10 mmf. 500 vdcw	D825D-437
C-86	T-4 Fixed Divider used on D coil set	Ceramic, 21 mmf. 500 vdcw	D825D-410
C-87	T-4 Fixed General Coverage Trimmer:	Ceramic	
	A coil set	20 mmf. 500 vdcw	D825D-446
	B coil set	5 mmf. 500 vdcw	D825D-440
	AA coil set	10 mmf. 500 vdcw	D825D-402
	AB coil set	35 mmf. 500 vdcw	D825D-413
	AC coil set	68 mmf. 500 vdcw	D825D-439
C-88	T-1 Fixed General Coverage Padder:		
	A coil set	Mica, 1200 mmf. 500 vdcw	J666-16
	AB coil set	Ceramic, 120 mmf. 500 vdcw	D825C-305
C-89	T-4 Fixed Temperature Compensator:	Ceramic	
	B coil set	5 mmf. 500 vdcw	D825D-440
	A coil set	5 mmf. 500 vdcw	D825D-440
C-90	T-2 Primary Trimmer used on H coil set	Ceramic, 21 mmf. 500 vdcw	D825D-410
C-91	T-1 General Coverage Trimmer:	Ceramic	
	AA coil set	5 mmf. 500 vdcw	D825D-401
	AB coil set	21 mmf. 500 vdcw	D825D-410
	AC coil set	50 mmf. 500 vdcw	D825D-417
C-92	T-2 coupling used on AB coil set	Mica, 470 mmf. 500 vdcw	J665-56
C-93	T-2 General Coverage Padder used on AB coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-94	T-3 Coupling used on AB coil set	Mica, 470 mmf. 500 vdcw	J665-56
C-95	T-3 General Coverage Trimmer:		
	AB coil set	Ceramic, 10 mmf. 500 vdcw	D825D-402
	AC coil set	Ceramic, 68 mmf. 500 vdcw	D825D-429
C-96	V-2 Cathode Bypass	Ceramic, .005 mfd. 450 vdcw	K946-1
C-97	T-1 General Coverage Padder used on AA, AB and AC coil sets	Variable, air dielectric	
C-98	T-2 General Coverage Padder used on AA and AB coil sets	Variable, air dielectric	
C-99	T-3 General Coverage Padder used on AA, AB and AC coil sets	Variable, air dielectric	
C-100	T-4 General Coverage Padder used on E, F, G, H, J and AA, AB, AC coil sets	Variable, air dielectric	
C-101	T-3 General Coverage Padder used on AB coil set	Ceramic, 100 mmf. 500 vdcw	D825C-304
C-102	T-2 General Coverage Trimmer:	Ceramic	
	AC coil sets	68 mmf. 500 vdcw	D825D-439
	AB coil sets	10 mmf. 500 vdcw	D825D-402
C-103	I.F. coupling to X-1	Ceramic, 100 mmf. 500 vdcw	D825D-402

MODEL HRO-50-1

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		CAPACITORS (CONT'D)	
C-104	T-4 General Coverage Padder used on A coil set	Ceramic, 20 mmf. 500 vdcw	D825D-446
C-105	V-5 Plate Filter	Paper, .25 mfd. 600 vdcw	D827-19
C-106	L-8 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-107	L-9 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-108	V-16 AVC Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-109	V-16 Cathode Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-110	R.F. Filter	Paper, .25 mfd. 200 vdcw	D827-15
C-111	V-16 Screen	Ceramic, .01 mfd. 450 vdcw	K946-2
C-112	V-16 Plate Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-113	L-10 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-114	L-11 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-115	L-12 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-116	L-13 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-117	V-2 Plate Filter	Ceramic, .005 mfd. 450 vdcw	K946-1
C-118	V-15 Plate Filter	Paper, .1 mfd. 600 vdcw	D827-13
C-119	Osc. Padder	Ceramic, 10 mmf. 500 vdcw	D825D-437
C-120	L-6 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-121	L-7 Tuning	Mica, 510 mmf. 500 vdcw	H500-5
C-122	V-5 Screen Bypass	Ceramic, .01 mfd. 450 vdcw	K946-2
C-123	V-3 Plate Filter	Ceramic, .01 mfd. 450 vdcw	K946-2
C-124	V-5 Screen Bypass	Paper, .1 mfd. 400 vdcw	D827-12
		RESISTORS	
R-1	V-1 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-2	V-1 Cathode	Fixed, 100 ohms, 1/2 W	J569-13
R-3	V-1 and V-2 Screen	Fixed, 2,200 ohms, 1/2 W	J569-29
R-4	V-2 Grid	Fixed, 470,000 ohms, 1/2 W	J569-57
R-5	V-2 Cathode	Fixed, 560 ohms, 1/2 W	J569-22
R-6	RF Gain Control	Variable, W.W. 10,000 ohms	K349-3
R-7	V-3 Injector Grid	Fixed, 22,000 ohms, 1/2 W	J569-41
R-8	V-3 Cathode	Fixed, 220 ohms, 1/2 W	J569-17
R-9	V-3 Screen	Fixed, 33,000 ohms, 1 W	J571-43
R-10	V-4 Grid	Fixed, 22,000 ohms, 1/2 W	J569-41
R-11	V-4 Plate	Fixed, 22 ohms, 1/2 W	J569-5
R-12	V-5 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-13	V-1, V-2, V-5 Screen Bleeder	Fixed, 27,000 ohms, 2 W	J572-42
R-14	V-5 Cathode	Fixed, 220 ohms, 1/2 W	J569-17
R-15	V-5 Cathode	Fixed, 330/1000 ohms, 1/2 W	
R-16	V-1, V-2, V-5 Screen Dropping	Fixed, 15,000 ohms, 2 W	J572-39
R-17	V-5 Plate Filter	Fixed, 2,200 ohms, 1/2 W	J569-29
R-18	V-6 Grid Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-19	V-6 Cathode	Fixed, 68 ohms, 1/2 W	J569-11
R-20	V-8A Plate Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-21	"S" Meter Zero Adjustment	Variable, W.W. 1000 ohms, 1 W	D831-2
R-22	V-7 Plate Load	Fixed, 1.5 meg. 1/2 W	J569-63
R-23	AVC Filter	Fixed, 1.5 meg. 1/2 W	J569-63
R-24	V-9 Plate	Fixed, 220,000 ohms, 1/2 W	J569-53
R-25	V-9 Screen Filter	Fixed, 100,000 ohms, 1/2 W	J569-49
R-26	V-9 Screen Bleeder	Fixed, 100,000 ohms, 1/2 W	J569-49
R-27	V-9 Grid	Fixed, 47,000 ohms, 1/2 W	J569-45
R-28	Dimmer Control	Variable, W.W. 25 ohms	K915-13

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		RESISTORS (CONT'D)	
R-29	V-7 Filament Dropping	Fixed, 4.3 ohms, 1 W	K098-48
R-30	V-10 Filament Dropping	Fixed, 4.3 ohms, 1 W	K098-48
R-31	V-14 Dropping	Fixed, 5,000 ohms, 10 W	E959-10
R-32	V-7 Load	Fixed, 22,000 ohms, 1/2 W	J569-41
R-33	V-7 Load	Fixed, 470,000 ohms, 1/2 W	J569-57
R-34	V-10 Plate	Fixed, 220,000 ohms, 1/2 W	J569-53
R-35	V-10 Cathode	Fixed, 220,000 ohms, 1/2 W	J569-53
R-36	Limiter Threshold control	Variable, 500,000 ohms	J681-2
R-37	Limiter Threshold Filter	Fixed, 220,000 ohms, 1/2 W	J569-53
R-38	Limiter Plate Filter	Fixed, 820,000 ohms, 1/2 W	J569-60
R-39	V-10 Plate Load	Fixed, 470,000 ohms, 1/2 W	J569-57
R-40	Audio Gain Control	Variable, 500,000 ohms	K347-1
R-41	Limiter Output Divider	Fixed, 220,000 ohms, 1/2 W	J569-53
R-42	V-11 Cathode	Fixed, 2200 ohms, 1/2 W	J569-29
R-43	V-11 Cathode Divider	Fixed, 150 ohms, 1/2 W	J569-15
R-44	Degeneration Feedback	Fixed, 6800 ohms, 1/2 W	J569-35
R-45	V-11 Screen Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-46	V-11 Plate Load	Fixed, 100,000 ohms, 1/2 W	J569-49
R-47	V-11 Plate Filter	Fixed, 47,000 ohms, 1/2 W	J569-45
R-48	Tone control	Variable, 500,000 ohms	K347-1
R-49	V-8B Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-50	V-8B Cathode Bias	Fixed, 4700 ohms, 1/2 W	J569-33
R-51	V-8B Cathode Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-52	V-8B Plate Load	Fixed, 47,000 ohms, 1/2 W	J569-45
R-53	V-13 Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-54	V-12 Grid	Fixed, 220,000 ohms, 1/2 W	J569-53
R-55	V-12 and V-13 Cathode Bias	Fixed, 220 ohms, 2 W	J572-17
R-56	Output Load	Fixed, 470 ohms, 2 W	J572-21
R-57	T-1 Ant. Load used on A coil set	Fixed, 22 ohms. 1/2 W	J569-5
R-58	V-6 Screen Dropping	Fixed, 47,000 ohms, 1/2 W	J569-45
R-59	V-16 AVC Filter	Fixed, 470,000 ohms, 1/2 W	J569-57
R-60	V-16 Cathode	Fixed 68 ohms, 1/2 W	J569-11
R-61	V-16 Screen Dropping	Fixed, 47,000 ohms, 1/2 W	J569-45
R-62	V-16 Plate Filter	Fixed, 2200 ohms, 1/2 W	J569-29
		MISCELLANEOUS	
E-1	Antenna Input Terminal	Screw type, three terminals	E261-3
E-2	B+ Switch Terminal	Screw type, two terminals	E265-19
E-3	Audio Output Terminal	Screw type, three terminals	E259-2
F-1	Fuse 3AG	2 Amps at 250 V	F135-4
I-1	Dial Lamp	#47	F136-6
I-2	Dial Lamp	#47	F136-6
I-3	"S" Meter Lamp	#47	F136-6
J-1	Phono Jack	Single Circuit	J993-1
J-2	Phone Jack	Multi-Circuit	F316-1

MODEL HRO-50-1

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	BRAWING NO.
		MISCELLANEOUS (CONT'D)	
L-1	Filter Choke	17 Henries	SA:1694
L-2	T-6 Tuning	Variable iron-core inductor	SA:3905
L-3	T-6 Tuning	Variable iron-core inductor	SA:3366
L-4	T-6 Tuning	Variable iron-core inductor	SA:3905
L-5	T-6 Tuning	Variable iron-core inductor	SA:3366
L-6	T-7 Tuning	Variable iron-core inductor	SA:3905
L-7	T-7 Tuning	Variable iron-core inductor	SA:3366
L-8	T-7 Tuning	Variable iron-core inductor	SA:3905
L-9	T-7 Tuning	Variable iron-core inductor	SA:3366
L-10	T-8 Tuning	Variable iron-core inductor	SA:3905
L-11	T-8 Tuning	Variable iron-core inductor	SA:8951
L-12	T-8 Tuning	Variable iron-core inductor	SA:3905
L-13	T-8 Tuning	Variable iron-core inductor	SA:8951
L-14	T-6 Coupling	R.F. choke, 1.1 uh.	SA:6072
L-15	T-7 Coupling	R.F. choke, 1.1 uh.	SA:6072
L-16	T-8 Coupling	R.F. choke, 1.1 uh.	SA:8952
M-1	"S" Meter	0-1 ma. W/S scale	J984-5
P-1	Select-O-Ject Plug	Octal	SA:6569
P-2	A.C. Jumper Plug	Octal	SA:3731
S-1	T-1 B.S. - G.C. Switch	Twist Type, Two position	SA:6748
S-2	T-2 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-3	T-3 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-4	T-4 B.S. - G.C. Switch	Twist Type, Two position	SA:6749
S-5	Selectivity Switch	Six Position, Double Pole	E195-3
S-6	A.V.C. ON-OFF switch	SPST Bat Handle, Toggle	E230-2
S-7	Control Switch	Double-Wafer, four-position	SA:6564
S-8	Calibrator Switch	DPDT Bat Handle, Toggle center position open	P738-1
S-9	A.C. Line Switch	Part of R-40	
S-10	T-10 Primary Selector Switch	DPDT, Toggle	H340-4
S-11	B+ Switch	SPST, Bat Handle, Toggle	E230-2
T-1	First R.F. Amplifier Transformer		
	A Band	14.0 - 30 Mc.	SA:6654
	B Band	7.0 - 14.4 Mc.	SA:6755
	C Band	3.5 - 7.3 Mc.	SA:6759
	D Band	1.7 - 4.0 Mc.	SA:6635
	E Band	900 - 2050 Kc.	SA:6513
	F Band	480 - 960 Kc.	SA:6660
	G Band	180 - 430 Kc.	SA:6665
	H Band	100 - 200 Kc.	SA:6803
	J Band	50 - 100 Kc.	SA:6806
	AA Band	27 - 30 Mc.	SA:6814
	AB Band	25 - 35 Mc.	SA:6675
	AC Band	21 - 21.5 Mc.	SA:8073
T-2	Second R.F. Amplifier Transformer		
	A Band	14.0 - 30 Mc.	SA:6751
	B Band	7.0 - 14.4 Mc.	SA:6650
	C Band	3.5 - 7.3 Mc.	SA:6641
	D Band	1.7 - 4.0 Mc.	SA:6637

PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		MISCELLANEOUS (CONT'D)	
T-2	Cont'd		
	E Band	900 – 2050 Kc.	SA:6540
	F Band	480 – 960 Kc.	SA:6662
	G Band	180 – 430 Kc.	SA:6667
	H Band	100 – 200 Kc.	SA:6669
	J Band	50 – 100 Kc.	SA:6809
	AA Band	27 – 30 Mc.	SA:6673
	AB Band	25 – 35 Mc.	SA:6818
	AC Band	21 – 21.5 Mc.	SA:8074
T-3	Mixer Transformer		
	A Band	14.0 – 30 Mc.	SA:6752
	B Band	7.0 – 14.4 Mc.	SA:6756
	C Band	3.5 – 7.3 Mc.	SA:6642
	D Band	1.7 – 4.0 Mc.	SA:6638
	E Band	900 – 2050 Kc.	SA:6789
	F Band	480 – 960 Kc.	SA:6794
	G Band	180 – 430 Kc.	SA:6800
	H Band	100 – 200 Kc.	SA:6804
	J Band	50 – 100 Kc.	SA:6810
	AA Band	27 – 30 Mc.	SA:6815
	AB Band	25 – 35 Mc.	SA:6676
	AC Band	21 – 21.5 Mc.	SA:8075
T-4	H.F. Oscillator Transformer		
	A Band	14.0 – 30 Mc.	SA:6656
	B Band	7.0 – 14.4 Mc.	SA:6678
	C Band	3.5 – 7.3 Mc.	SA:6760
	D Band	1.7 – 4.0 Mc.	SA:6776
	E Band	900 – 2050 Kc.	SA:6631
	F Band	480 – 960 Kc.	SA:6795
	G Band	180 – 430 Kc.	SA:6785
	H Band	100 – 200 Kc.	SA:6805
	J Band	50 – 100 Kc.	SA:6811
	AA Band	27 – 30 Mc.	SA:6816
	AB Band	25 – 35 Mc.	SA:6819
	AC Band	21 – 21.5 Mc.	SA:8076
T-5	Crystal Filter	455 kc.	SA:3654
T-6	2nd. I.F. Amp. Transformer	455 kc.	SA:8448
T-7	3rd. I.F. Transformer	455 kc.	SA:8448
T-8	Det. Input Transformer	455 kc.	SA:8948
T-9	C.W. Osc. Transformer	455 kc.	SA:3361
T-10	Audio Output Transformer	Pri. 10,000 ohms Sec. 8/600 ohms 10 watts	P187-1
T-11	Power Transformer	Primary: #4 and #5, 115 volts #4 and #7, 230 volts Secondary: #1 and #3, 6.3 V at 6.5 A. Secondary: #8, #9 and #10, 275-0-275 V. Secondary: #11 and #12, 5 V. at 2 A. #2 electrostatic shield	SA:6566
V-1	First R.F. Amplifier	6BA6	
V 2	Second R.F. Amplifier	6BA6	

MODEL HRO-50-1 PARTS LIST (CONT'D)

SYMBOL	FUNCTION	DESCRIPTION	DRAWING NO.
		MISCELLANEOUS (CONT'D)	
V-3	Mixer	6BE6	
V-4	H.F. Oscillator	6C4	
V-5	First I.F. Amplifier	6K7	
V-6	Second I.F. Amplifier	6SG7	
V-7	Second Detector and A.V.C.	6H6	
V-8A	"S" Meter Amplifier	1/2 6SN7GT	
V-8B	Phase Inverter	1/2 6SN7GT	
V-9	C.W. Oscillator	6J7	
V-10	Noise Limiter	6H6	
V-11	Audio Amplifier	6SJ7	
V-12	Audio Output	6V6GT	
V-13	Audio Output	6V6GT	
V-14	Voltage Regulator	0B2	
V-15	Rectifier	5V4G	
V-16	Third I.F. Amplifier	6SG7	
X-1	Accessory Connector Socket	Octal	J625-2
X-2	Crystal Calibrator Socket	Octal	J625-2
X-3	Select-O-Ject Socket	Octal	J625-2
Y-1	Crystal Resonator	Quartz, 455 kc.	E979-1

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS	
Flexible coupling on Control switch shaft	SA:22
Flexible coupling on C.W.O. control shaft	SA:22
Knurled nut to mount Calibrate Switch	Q163-2
Knurled nut to mount B+ and AVC switches (2)	J703-2
Knurled nut to mount phones jack	J704-2
Knob for Tone control, Ant. trimmer and Dimmer controls	SA:7021
Main Tuning dial control knob	SA:6586
Spring washer to ground main tuning knob	L087-1
Shaft extension for Selectivity switch	SA:3664
Coupling on phasing control shaft	D694-2
Set screws for mounting above coupling (4)	G879-2
Shaft extension for Phasing control	C696-4
Cast aluminum hub on main tuning capacitor shaft	SA:8800
Window for dial scales	P211-1
Bracket for dial scale window	P539-1
Base plate for mounting tuning capacitor	SA:6581
Spacer plate between base plate and tuning capacitor	P106-1
Triangular bracket for main tuning capacitor shaft	SA:6582
Dial drum supporting assembly (includes pointer, pointer rail, pulleys and drum positioning spring)	SA:6594

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS (CONT D)	
Drum positioning spring	P131-1
Gear assembly for driving dial pointer (includes pulley and gears)	SA:6595
Loading spring for above gears (2)	P216-1
Bearing for pulley	P226-1
Washer to mount pulley and bearing to dial drum supporting assembly	M953-2
Spring washer to position pulley and gears	J728-7
Shaft, for rotating dial scale drum	P221-2
Rubber "O" ring on above shaft	L792-3
Retaining washer on above shaft	E229-3
Snap ring on above shaft	L936-1
Dial cord	SA:6596
Spring to maintain tension on dial cord	P223-1
Dial scale drum stop, mounted on Osc. control shaft	P472-1
Tension spring for above stop	P471-1
Dial light socket (2)	SA:6600
Dial scale drum assembly (no scales included)	SA:7922
Dial scale for Band A	P136-1
Dial scale for Band B	P136-2
Dial scale for Band C	P136-3
Dial scale for Band D	P136-4
Dial scale for Band A (bandspread calibration only)	P136-5
Dial scale for Band B (bandspread calibration only)	P136-6
Dial scale for Band C (bandspread calibration only)	P136-7

PARTS LIST (CONT'D)

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS (CONT'D)	
Dial scale for Band D (bandspread calibration only)	P136-8
Dial scale for Band E-F	P136-9
Dial scale for Band G-H	P136-10
Dial scale for Band J	P136-11
Dial scale for Band AA	P136-12
Dial scale for Band AB	P136-13
Dial scale for Band AC	P136-14
End bearing for main tuning capacitor rotor shaft	SA:2127
Ceramic brush insulators on main tuning capacitor (4)	D679-1
Ceramic brush insulator with cutaway surface (5)	D680-1
Rotor brush (5)	SA:8675
Worm for driving main tuning capacitor	M939-2
Worm loading spring	Q544-1
Ball bearing used with worm loading spring	F150-2
Spring thrust collar used with worm loading spring	P112-1
Coil set levers	SA:7001
Nut to mount coil set levers (2)	P207-2
Coil set brush board (4)	SA:6575
Fibre washer for mounting brush-board (16)	E181-3
Bakelite slide for coil sets (2)	D393-1
Shield cap for type 6K7 and 6J7 tubes (2)	E726-1
Shield for miniature tubes (3)	SA:3387
Shield base for miniature tubes (3)	SA:3847
Socket for miniature tubes (5)	SA:4916
Fibre washer for mounting miniature sockets (10)	H285-2
Octal tube sockets (15)	J625-2
Spring clamp for type 6C4 tube	L532-3
Spring clamp for type 0B2 tube	L532-2
Nut for mounting miniature sockets	B111-2
Ceramic standoff insulated terminals (2) (one top of chassis one on bottom of chassis)	B425-1
Insulation between chassis and heat shield	P942-1 (short) P942-2 (long)
Heat shield (with grommets and lugs)	SA:6563
Plate, heat shield	P202-1
R.F. Gain control knob	SA:6867
Phasing and C.W.O. control knob (2)	SA:6868

DESCRIPTION	NAT. CO. TYPE
MECHANICAL PARTS USED ON TABLE MODEL ONLY	
Selectivity control knob	SA:6869
Limiter control knob	SA:6870
CW - AM - NFM - Phono switch knob	SA:6587
A.F. Gain control knob	SA:6871
End bearing for main tuning capacitor	SA:8669
Cover, gear housing	C898-4
1/4" length of rubber tubing on capacitor stop	F234-2
Stop washer (10)	P149-3
Stop	Q543-1
Spacer, stop	Q541-1
Spring washer in stop	J728-4
Stop washer	P149-4
Collar in stop with set screws	Q542-2
Set screws in above	G879-4 G879-2
Balls in capacitor bearing (6)	H613-3
C.W.O. shaft	Q534-1
Washer on above	D802-4
Retaining ring on above	Q102-1
Bracket from chassis to dial support plate	Q538-1
Chassis mounting angle bracket (left)	P244-1
Chassis mounting angle bracket (right)	P244-2
National Co. insignia	J791-4
Rubber mounting foot (4)	K499-1
S-Meter bracket	J970-2
Band or Osc. control knob (2)	SA:7021
Cover hinge (2)	J825-2
Cover stop angle (2)	K788-1
Socket assembly for S-Meter lamp	K377-4
Cabinet wraparound	SA:8663
Cabinet back	SA:8664
Cabinet cover	J701-8
Cabinet bottom	SA:6588
MECHANICAL PARTS USED ON RACK MODEL ONLY	
Front panel	SA:8716
Blister for front panel	SA:6765
Side plate (left)	P302-1
Side plate (right)	P302-3
National Co. insignia	J791-3
Band control knob	SA:7470
Osc. control knob	SA:7469
Dust cover	SA:8717
Thumb screw for dust cover (2)	L309-2

MODEL HRO-50-1

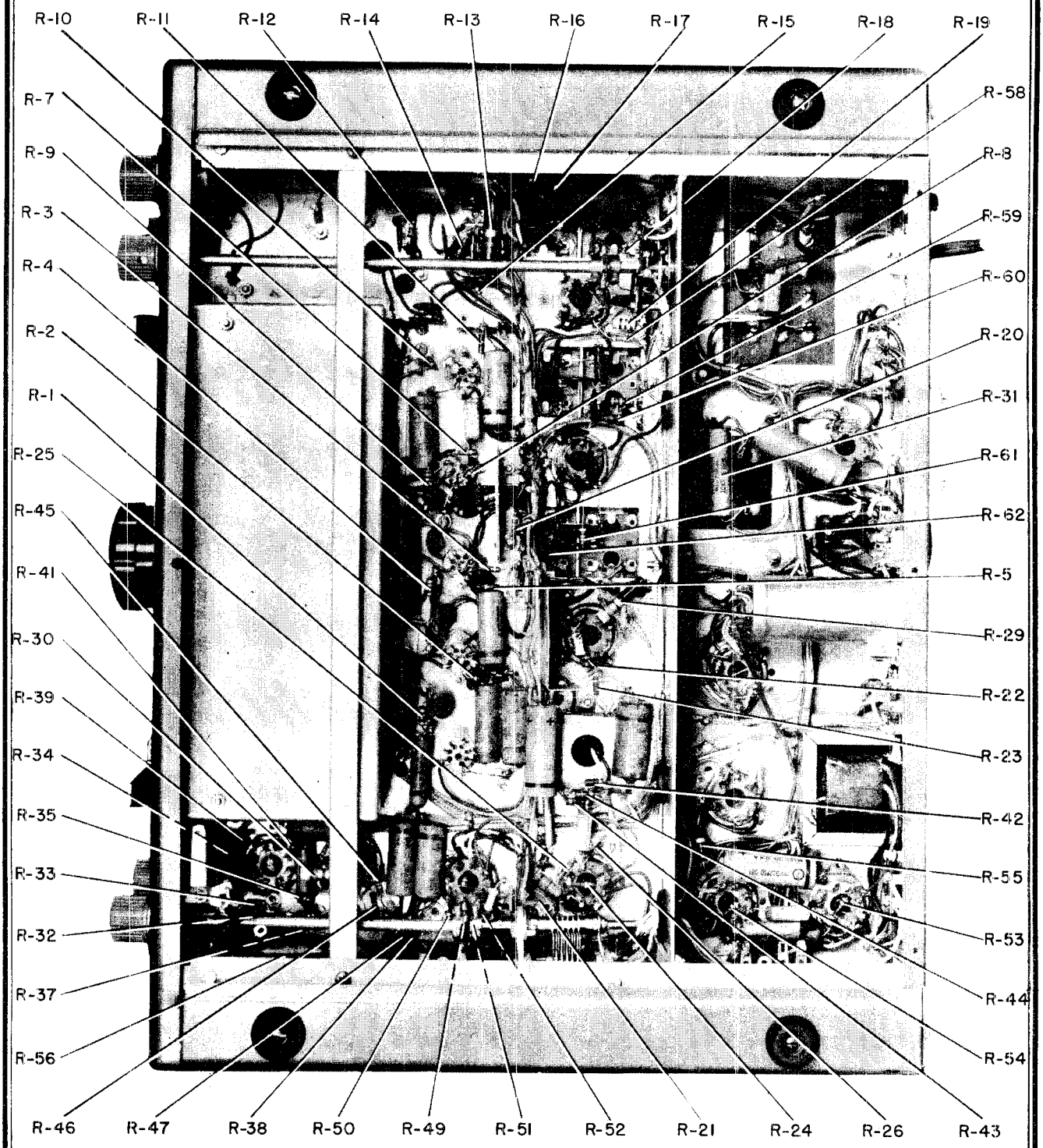


Figure No. 10A. Resistor Locations, Bottom View of Receiver

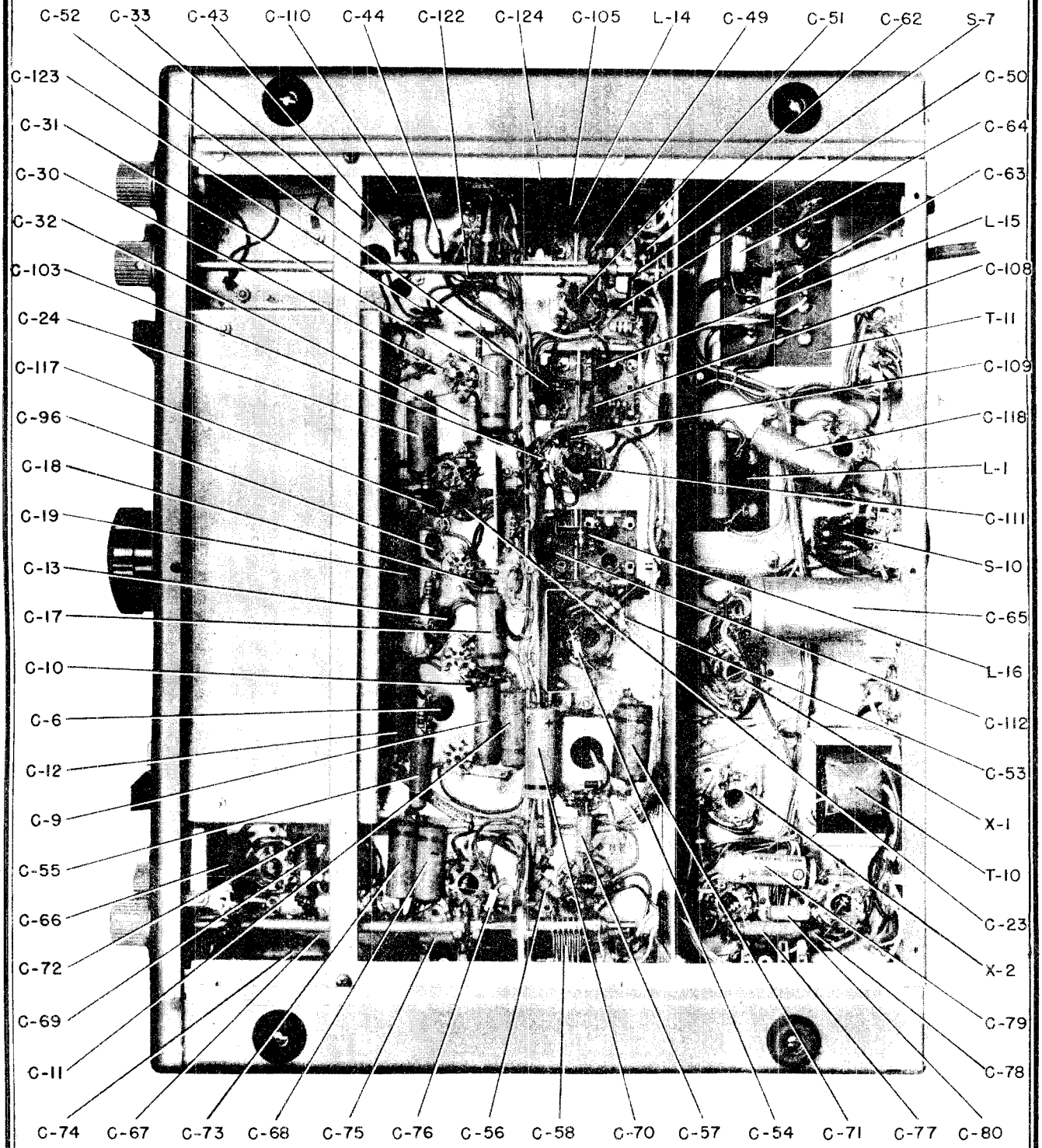


Figure No. 108. Capacitor and Miscellaneous Component Locations, Bottom View of Receiver

MODEL HRO-50-1

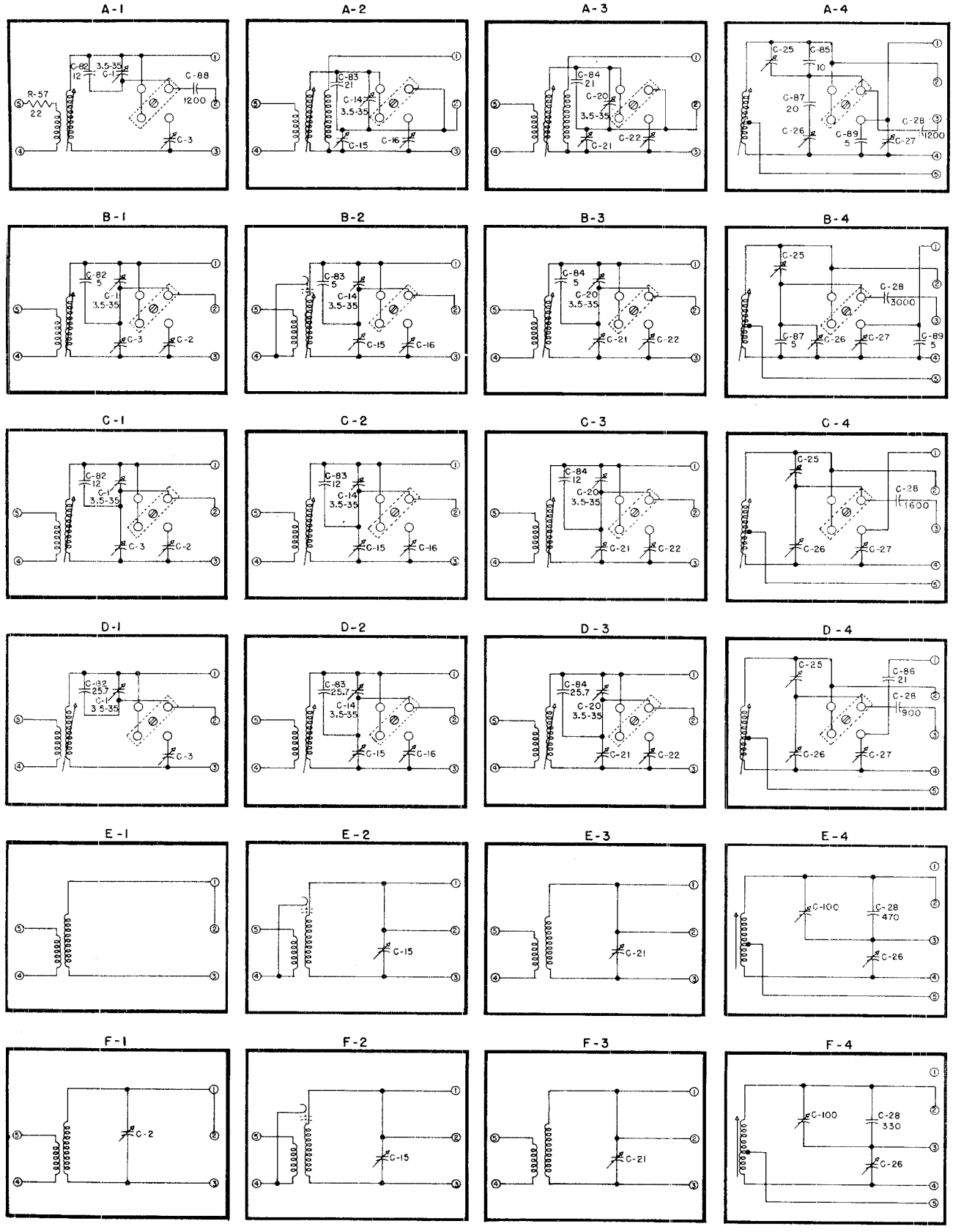
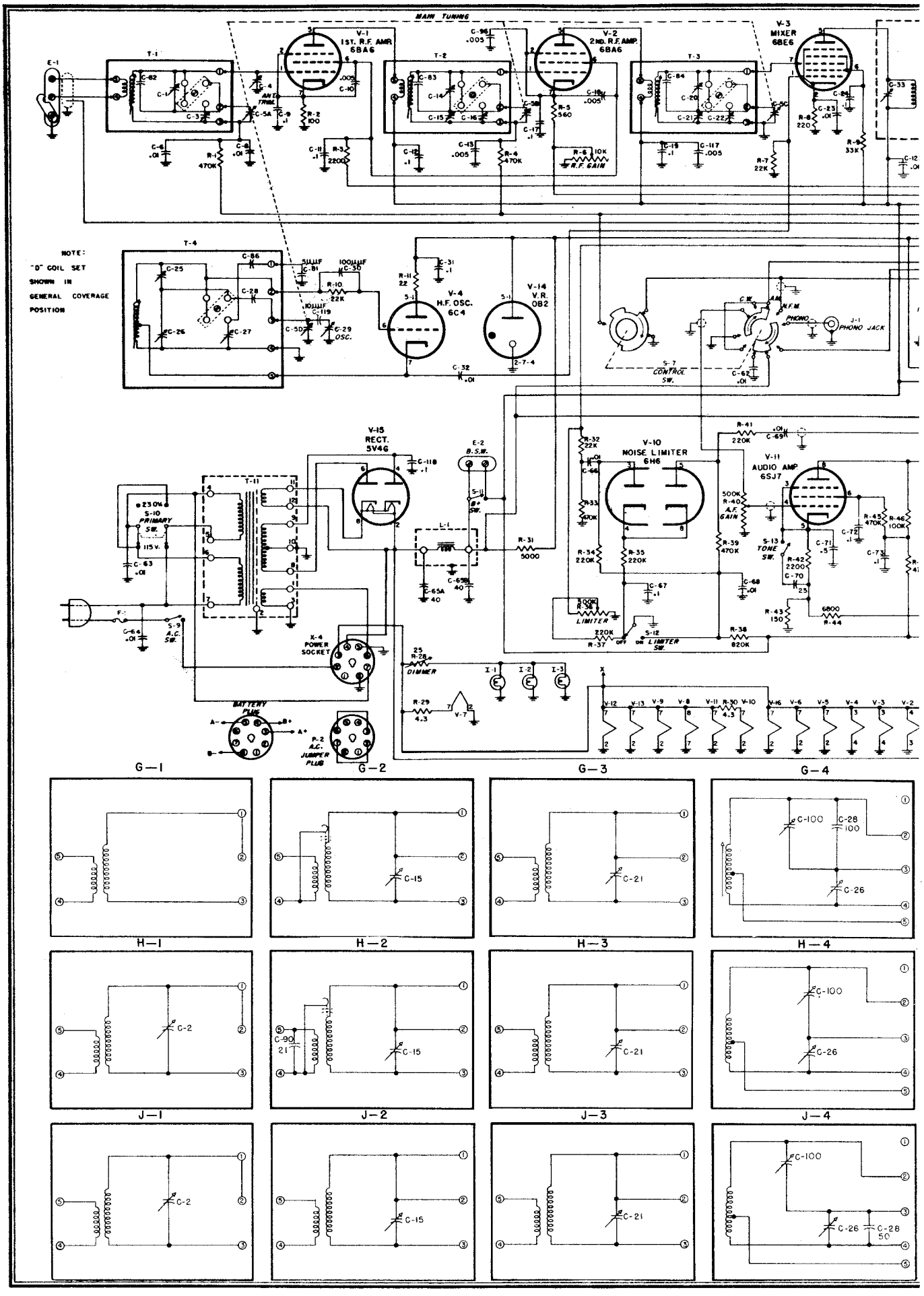


Figure No. 11. Schematic Diagrams, Coil Sets A, B, C, D, E and F


MAIN TUNING
V-1 1ST. R.F. AMP. 6BA6
V-2 2ND. R.F. AMP. 6BA6
V-3 MIXER 6BE6
T-1
T-2
T-3
T-4
R-6 10K R.F. GAIN
NOTE: "D" COIL SET SHOWN IN GENERAL COVERAGE POSITION
V-4 H.F. OSC. 6C4
V-14 V.R. OB2
S-7 CONTROL SW.
J-1 PHONO JACK
V-15 RECT. 5V4G
E-2 B.S.W.
V-10 NOISE LIMITER 6H6
V-11 AUDIO AMP 6SJ7
S-10 PRIMARY SW.
115 V.
S-9 A.C. SW.
X-4 POWER SOCKET
R-28 DIMMER
S-12 LIMITER SW.
BATTERY PLUG
P-2 A.C. JUMPER PLUG
G—1
G—2
G—3
G—4
H—1
H—2
H—3
H—4
J—1
J—2
J—3
J—4

MODEL HRO-50-1

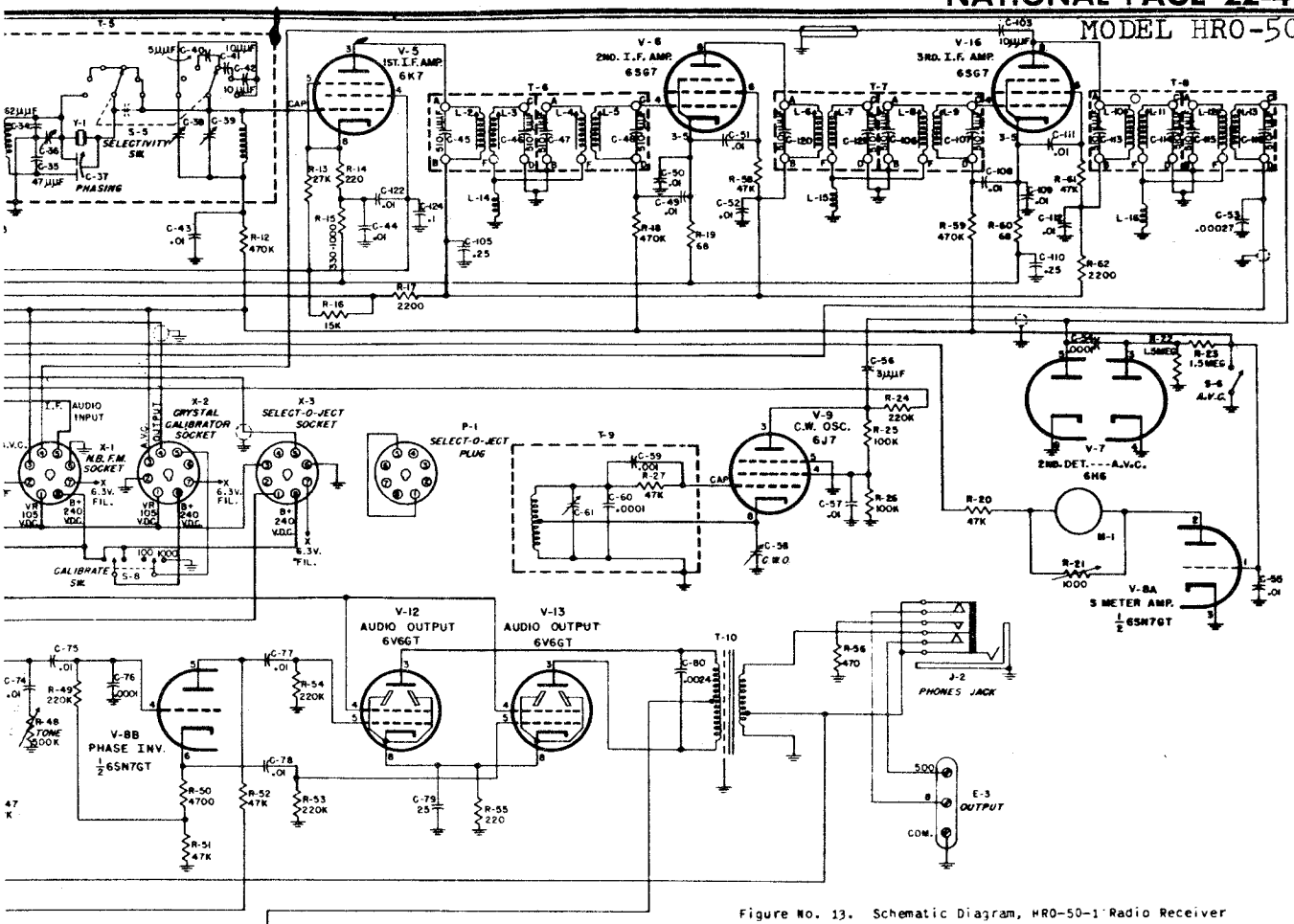
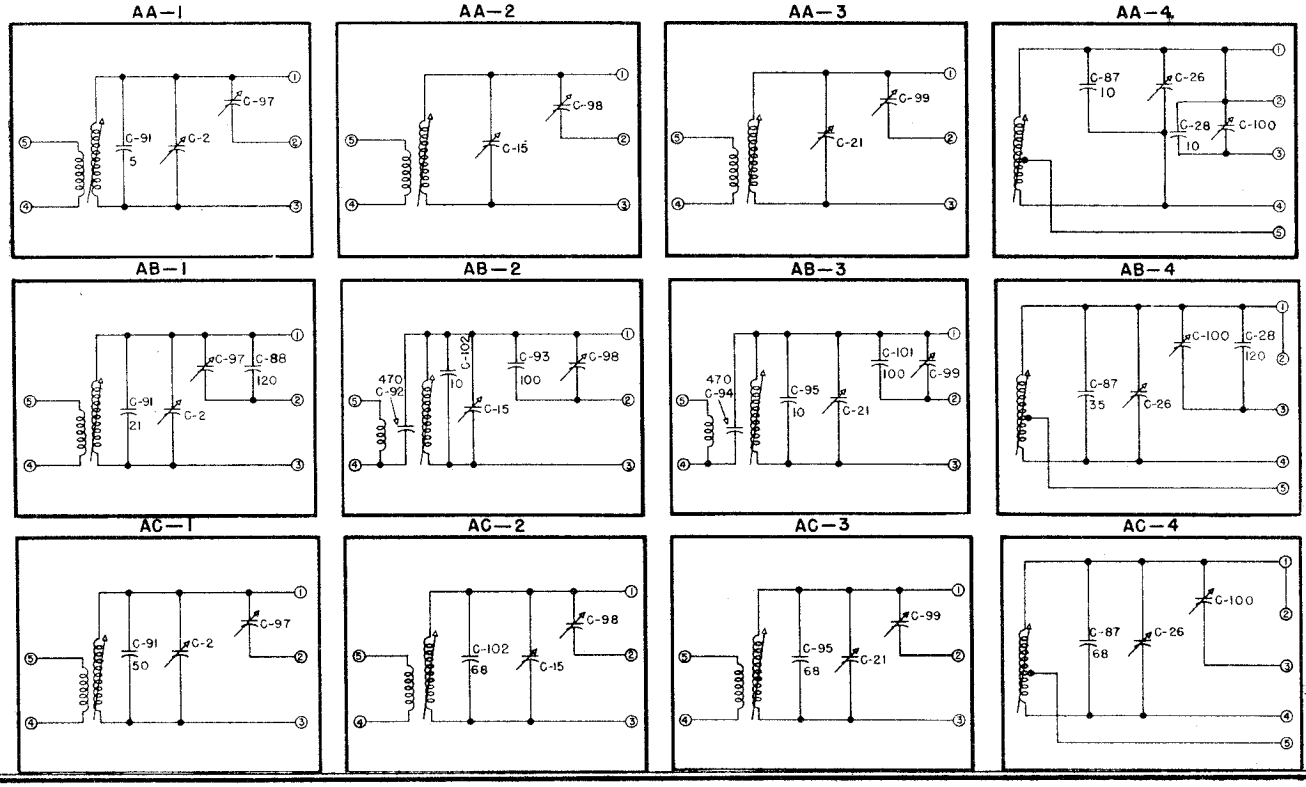


Figure No. 13. Schematic Diagram, HRO-50-1 Radio Receiver

NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS
K = 1000

Figure No. 12. Schematic Diagram, Coil Sets AA, AB, AC, G, H and J



MODEL HRO-50-1

INSTRUCTIONS FOR THE NATIONAL XCU-50-2 CRYSTAL CALIBRATOR UNIT

GENERAL

The type XCU-50-2 Crystal Calibrator Unit is designed expressly for use within the HRO-50 receiver. It utilizes an electron-coupled oscillator circuit controlled by a dual crystal (Valpey type DFS). This type of crystal provides two crystal-controlled marker frequencies of 100 kilocycles and 1 megacycle. When plugged into the Crystal Calibrator Socket, X-2, the XCU output is loosely coupled to the first R.F. amplifier input circuit. Selection of either the 100 kilocycle or 1000 kilocycle crystal-controlled signal is made possible by the front-panel mounted Calibrate switch on the receiver.

INSTALLATION

The XCU-50-2 calibrator is installed in the HRO-50-1 receiver by plugging the unit into the Crystal Calibrator Socket, X-2, on top of the chassis. A slotted-head screw mounted through the top of the unit is provided to bolt the unit to the chassis.

A trimmer capacitor, C-1, is connected across the crystal to permit adjustment of the frequency of the 100 kilocycle output marker when the unit is operated at locations where the temperature is vastly removed from that of normal room temperature. This capacitor should never require adjustment unless such abnormal temperatures are experienced. To make the adjustment proceed as follows:

(1) Plug in a coil set suitable for the reception of WWV on one of the various frequencies utilized by this standard frequency station.
(2) Adjust the receiver for normal A.M. operation as explained in Section 3-3.
(3) Set the front-panel mounted Calibrate switch at the 100 kilocycle position.
(4) Tune in the signal from WWV at a time when the signal is unmodulated.
(5) Adjust the trimmer capacitor, C-1, located at the top of the calibrator unit so that the 100 kilocycle marker signal harmonic is zero beat with the signal received from WWV.

OPERATION

The XCU-50-2 Crystal Calibrator provides a means of checking the accuracy of the frequency calibration of the receiver. The front-panel mounted Calibrate switch marked 100-Off-1000 connects B-plus to the Calibrator for instantaneous service. At the same time this switch selects either the 100 or 1000 kilocycle marker signal. To check calibration accuracy tune in the desired marker signal with the Control switch set at C.W. and zero beat the receiver with the harmonic marker. If the micrometer dial and the slide-rule dial do not read accurately correction should be made by adjusting the front-panel mounted Osc. trimmer control. Only a slight adjustment of the Osc. trimmer control should be necessary. If calibration is way off the plug-in coil set probably requires realignment and reference should be made to Section 4.

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	100 Kc. Tuning	Ceramic, variable, 6 -20 mmf.	E311-2
C-2	B+ Filter	Paper, .1 mfd. 400 vdcw	D827-12
C-3	Cathode by-pass	Paper, .1 mfd. 400 vdcw	D827-12
C-4	Output Coupling	Ceramic, 10 mmf. 500 vdcw	H872-1
C-5	Feedback	Ceramic, 3 mmf. 500 vdcw	J695-4
L-1	100 Kc. inductor	5 mh. type R-100	SA:2608
L-2	1000 Kc. inductor	.5 mh. type R-50	SA:2514
P-1	Plug	Octal	K783-1
R-1	Grid	Fixed, 4.7 megohms, 1/2 W.	J569-69
R-2	Not Used		
R-3	Screen dropping	Fixed, 22,000 ohms, 1 W.	J571-41
R-4	Plate	Fixed, 470,000 ohms, 1 W.	J571-57
V-1	Oscillator tube	6AK6	
Y-1	Crystal Resonator	Quartz, 100 - 1000 Kc.	Q560-1

MODEL HRO-50-1

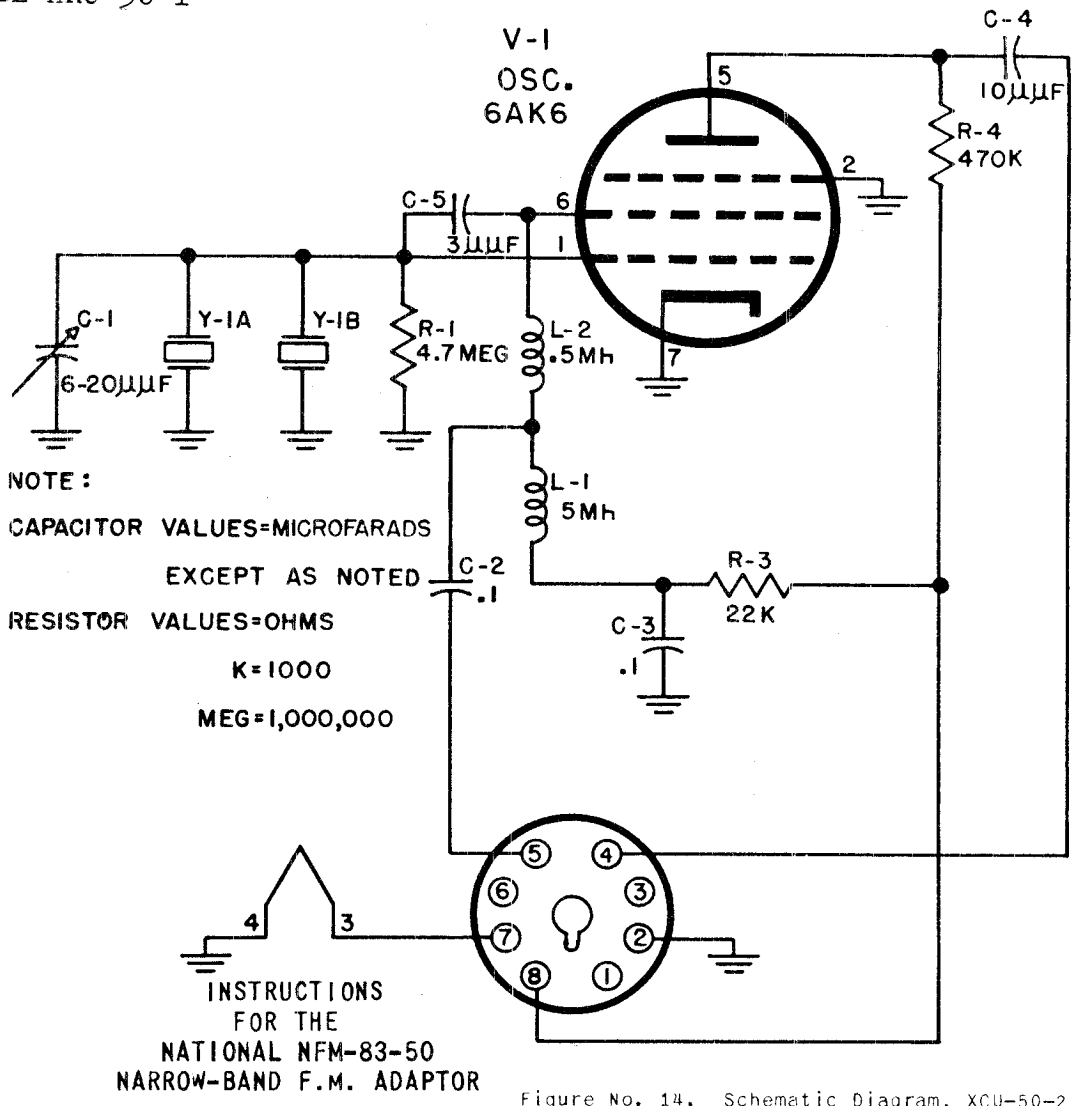


Figure No. 14. Schematic Diagram, XCU-50-2 Calibrator

INSTALLATION

The NFM-83-50 is installed in the HRO-50-1 receiver by plugging the adaptor unit into the N.B.F.M. Socket X-1 on the top of the chassis. A mounting bracket is furnished to hold the adaptor unit securely in position. The adaptor unit is aligned at National Company laboratories and realignment is not necessary.

ALIGNMENT

The NFM-83-50 is carefully aligned before shipment and no realignment is required unless the adaptor is accidently misaligned. The necessity of realignment can be determined by the A.M. rejection capabilities of the adaptor unit. Proper alignment will be indicated when the maximum A.M. rejection occurs at the center of the A.M. carrier. Maximum S-meter reading will indicate the center of the carrier.

The equipment required for alignment is a high-impedance vacuum tube voltmeter and an A.M. signal generator. The signal generator used should have an output reasonably free of any frequency modulation. The use of a broadcast station as a signal source, in place of a signal generator, would provide a test signal meeting the above requirement. In any case, the signal strength of the test signal should be of the order to provide an S-meter reading of from 2 to 5 S-units when the HRO-50-1 is correctly tuned to the test signal.

The preliminary alignment procedure is as follows:

1. Connect the high-impedance voltmeter between the test point jack, J-1, and chassis. The polarity of the voltage will depend on the alignment of the adaptor, connect the voltmeter to obtain an up-scale reading.

2. Connect a signal source to the antenna terminals, A and A, at the rear of the HRO-50-1. If a signal generator is used make the connection through a 300 ohm dummy load and select a frequency in the standard broadcast band.

3. Set the Control switch at N.F.M.

4. Set the Selectivity switch at Off.

5. Set the Limiter control at Off.

6. Plug in the E coil set, 900 to 2,050 Kc. If this coil set is not available use the D coil set, 1.7 to 4.0 Mc.

7. Set the B plus switch at On.

8. Set the A.V.C.-Off switch at A.V.C.

9. Turn the R.F. Gain control to 10.

10. Adjust the A.F. Gain control for the desired volume.

11. Tune the test signal by adjustment of the Main Tuning knob. The correct tuning point is the setting that produces maximum S-meter reading.

Alignment is effected as follows:

1. Detune both primary, L-1, and secondary L-2, I.F. trimmers by rotating the screw adjustments until they are withdrawn from the shield can as far as possible. The adjustment with the dot of red paint opposite it is the primary trimmer L-1.

2. Tune the primary trimmer, L-1, for maximum reading on the voltmeter. If two peaks in output are observed, the correct peak will be the first one encountered when rotating the screw adjustment into the shield can.

3. Tune the secondary trimmer, L-2, for a zero reading on the voltmeter. It will be noted that there is a crossover in the polarity of the test voltage at this point.

4. Adjust the capacitor, C-9, for a null in the audio output. This capacitor is accessible after removal of the button plug on the side of the adaptor unit.

5. Adjustment of capacitor, C-9, may affect the zero voltage reading obtained by adjustment of the secondary trimmer, L-2. Retrim L-2 and C-9, as necessary, until both a zero voltage reading on the voltmeter and a null in the audio output are obtained.

PARTS LIST

SYMBOL NO.	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	I.F. Amp. Coupling	Ceramic, 10 Mmf, 500 vdcw	D825D-402
C-2	Input Divider	Ceramic, 38.5 Mmf, 500 vdcw	D825D-414
C-3	I.F. Amp. Cathode Bypass	Mica, 0.01 Mfd, 300 vdcw	J666-56
C-4	I.F. Amp. Screen Bypass	Mica, 0.001 Mfd, 300 vdcw	J665-71
C-5	T-1 Primary Tuning	Mica, 100 Mmf, 500 vdcw	H500-7
C-6	T-1 Secondary Tuning	Mica, 180 Mmf, 500 vdcw	H500-3
C-7	T-1 Secondary Tuning	Mica, 180 Mmf, 500 vdcw	H500-3
C-8	T-1 Secondary Tuning	Ceramic, 38 Mmf, 500 vdcw	D825D-424
C-9	T-1 Sec. Balance Adjustment	Ceramic, Variable, 7-35 Mmf.	E311-4
C-10	Disc. Cathode Filter	Elect. 1 Mfd, 450 vdcw	E338-10
C-11	B Supply Bypass	Mica, 0.01 Mfd, 300 vdcw	J666-56
C-12	R.F. Filter	Mica, 470 Mmf, 500 vdcw	J665-56
C-13	Audio Coupling	Mica, 0.01 Mfd, 300 vdcw	J666-56
R-1	I.F. Amp. Grid Leak	Fixed, 1 Megohm, 1/2 W.	K379-61
R-2	I.F. Amp. Cathode Bias	Fixed, 1,000 Ohms, 1/2 W.	K379-25
R-3	I.F. Amp. Screen Dropping	Fixed, 47,000 Ohms, 1/2 W.	K379-45
R-4	R.F. Filter	Fixed, 47,000 Ohms, 1/2 W.	K379-45
R-5	Diode Load	Fixed, 15,000 Ohms, 1/2 W.	K379-39
R-6	Diode Load	Fixed, 15,000 Ohms, 1/2 W.	K379-39
R-7	Decoupling	Fixed, 4,700 Ohms, 1/2 W.	J569-33
J-1	Test Point	Tip Jack, Bakelite	K421-1
L-1	T-1 Primary Inductor	Adjustable Iron-Core	SA:4892
L-2	T-1 Secondary Inductor	Adjustable Iron-Core	SA:4891
P-1	Adaptor Unit Plug	8 Prong Octal	K783-1
T-1	Discriminator Transformer	Ratio Type 455 Kc.	SA:4890
V-1	I.F. Amplifier	6SK7	
V-2	Discriminator	6H6	

MODEL HRO-50-1

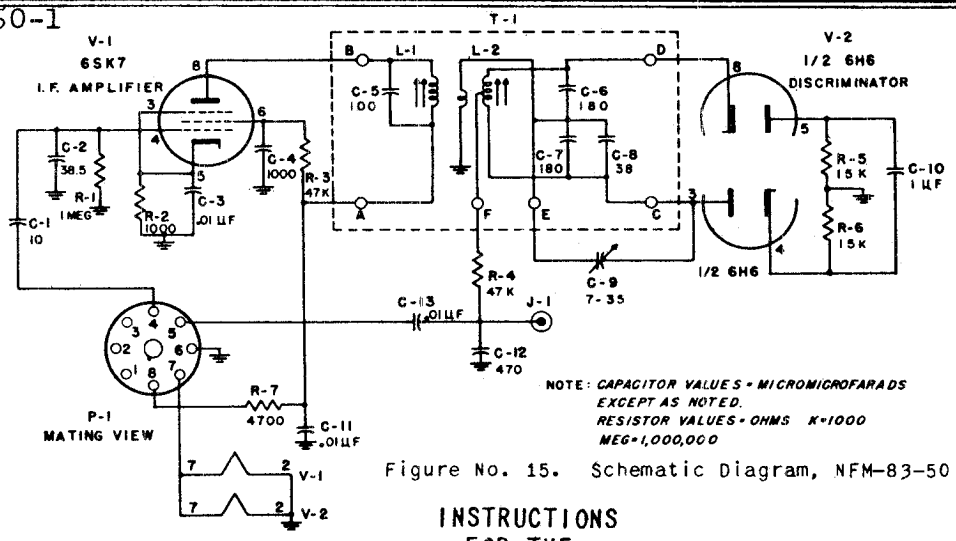


Figure No. 15. Schematic Diagram, NFM-83-50 Adaptor

INSTRUCTIONS FOR THE NATIONAL TYPE 650S VIBRATOR POWER SUPPLY

GENERAL

The National Type 650S Table Model Vibrator Power Unit has been designed to furnish complete operating voltages for the HRO-50-1 receiver. The unit operates from a 6-volt D.C. supply and provides approximately 150 volts D.C. at 70 milliamperes in normal operation. Output voltages for both A and B supply are available at a four prong socket for convenient connection to the Receiver.

The 650S consists of a vibrator unit utilizing an 0Z4A type rectifier tube and a vibrator in a circuit employing efficient R.F. filtering of vibrator hash. Further filtering of the low frequency or audio hum component in the output is accomplished by using the regular filter system in the receiver.

INSTALLATION

The 650S unit is supplied with a battery connecting cable as well as an interconnecting cable to facilitate connection to the receiver.

Battery clips are provided on the battery connecting cable W-1 for convenient connection to a 6-volt storage battery or similar source of power. The interconnecting cable W-2 is terminated at one end in a four-prong plug to mate with the socket X-1 of the 650S. The other end utilizes an octal plug to mate with the power socket X-1 at the rear of the HRO-50-1 receiver. The receiver A.C. jumper plug P-1 used for A.C. operation must be removed from the power socket. Figure Number 16 shows the Schematic Wiring Diagram.

The 650S Vibrapack Unit has been completely tested and adjusted at the factory to provide efficient and economical service when used with the HRO-50-1 receiver. An adjustment control switch has been furnished for increasing the B-plus output. This is a screw driver control available through an entry hole provided at the rear of the 650S. The control switch has four steps from approximately 150 volts of filtered D.C. at 70 milliamperes in the extreme counterclockwise position (step 1) to approximately 210 volts at 90 milliamperes in the fully clockwise position (step 4). It is recommended that the receiver be operated at the lower B voltage of step 1. The total battery drain is approximately 11 amperes when furnishing power to the receiver if the NFM-83-50, XCU-50-2 and SOJ-3 units are used. If the receiver is used without these accessories the total drain is approximately 9.5 amperes. The V.R. tube does not light under these conditions but the receiver will operate normally and operation from a storage battery becomes practical. In step 4 the V.R. tube will light and full receiver output will be obtained but the drain on the storage battery will be approximately 15.5 amperes when all accessories are utilized. Without these accessories the total receiver drain from the battery will be approximately 13.8 amperes.

The two intermediate control switch steps 2 and 3 should not be used as the voltage obtained is approximately the value required to fire the V.R. tube in the receiver. Under this condition the V.R. tube may fire on and off sporadically resulting in erratic operation of the receiver.

PARTS LIST

SYMBOL	FUNCTION	DESCRIPTION	NAT. CO. TYPE
C-1	Filter Capacitor	Elec. 500 mfd. 15 vdcw	E338-7
E-1	Vibrapack Unit	6 V.D.C. Mallory Type VP554	Q371-1
F-1	Fuse	20 Amperes 25 volts type 3 AG	F135-18
L-1	6-volt Line Filter	16 microhenries, iron core	SA:869
S-1	6-volt Line Switch	Toggle S.P.S.T.	E230-2
V-1	Rectifier Tube	Type 0Z4A	
W-1	6-volt Line Connector	Two-Contact	SA:1999
W-2	Interconnecting Cable	One end terminated in four prong plug; other in an octal plug	
Y-1	Vibrator	6 V.D.C. Mallory Type 825C	
X-1	Output Socket	Four Prong Female	E319-9

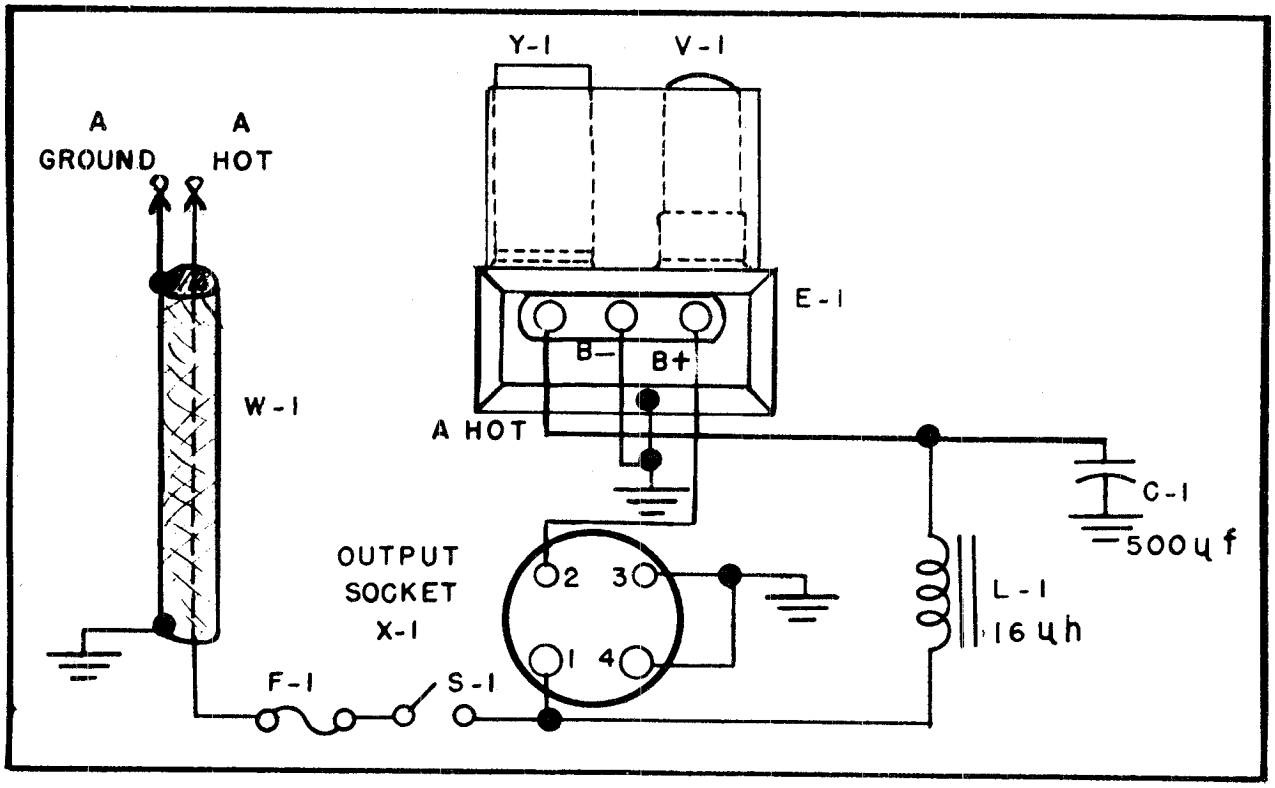


Figure No. 16. Schematic Diagram, 650S Vibrator Power Supply

MODEL SW-54

SECTION 1. INSTALLATION

1-1. INSTALLATION PROCEDURE

The SW-54 Receiver is designed to operate from a 105/130 volt, 50/60 cycle, A.C. source of supply or a 105/130 volt, D.C. source of supply. Normal power consumption is approximately 25 watts at 115 volts.

Installation of the SW-54 is accomplished as follows:

1. Connect the antenna as recommended in Section 1-2.
2. Connect a good external ground (radiator or water pipe) to the cabinet. A screw-type terminal is provided at the top center of the cabinet back to facilitate this connection. This connection, if used, serves two purposes:
   a. Achieves a considerable reduction in noise interference in certain localities.
   b. Eliminates the possibility of shock occurring if the operator makes bodily contact between the Receiver and ground.
3. Connect the power cable and plug to the proper source of supply i.e., 105/130 volts, 50/60 cycles, A.C. or 105/130 volts D.C. Proper polarity of the plug should be observed when connection is made to a power source although no damage to the Receiver will occur if the polarity is reversed. Reversed polarity will be evidenced as follows and is corrected by simply reversing the plug prongs in the power outlet.
   a. D.C. Power Source — The Receiver will be inoperative, although the tubes and pilot lamp will light.
   b. A.C. Power Source — A hum may be heard in the output of the Receiver.

   Proper polarization of the plug will eliminate the possibility of shock occurring in installations where one side of the power line is grounded, if the operator should make bodily contact between the Receiver and ground.
4. Adjust controls as recommended in Section 2 for the reception of signals.

1-2. ANTENNA RECOMMENDATIONS

The antenna input circuit of the SW-54 is arranged for operation from either a single-wire type, doublet type or other types of antennas having impedances of 70 ohms or more. The input impedance of the antenna circuit is approximately 300 ohms.

The most practical antenna for use in installations where the Receiver is to be used over a wide range of frequencies is the single-wire type. An antenna length of from 50 to 75 feet is recommended although the length is not critical and any length from 25 to 75 feet may be used. If the Receiver is to be operated on one frequency or a narrow band of frequencies, best results will be obtained by the use of a tuned antenna, such as the folded doublet or half-wave dipole type, designed for the operating frequency.

The methods of connecting the various types of antennas to the antenna terminal strip at the rear of the Receiver are as follows:

1. Single-wire type — Connect the antenna to terminal A at the left of the strip and connect the metal link to the unused A terminal.
2. Doublet-type — Connect the antenna feeders to the two terminals marked A; the metal link is not used.
3. Concentric transmission line type — Connect the inner conductor to terminal A at the left of the strip and the outer conductor to the other A terminal. Connect the metal link to the center A terminal.

2-1. GENERAL DESCRIPTION

The SW-54 is an A.C./D.C. superheterodyne Receiver having a complement of four tubes plus a rectifier with a continuous frequency range of from 540 kilocycles to 30 megacycles. The Receiver is designed to provide reception of amplitude modulated voice or music and code telegraphy signals throughout its entire frequency range.

A stage outline of the circuit employed in the Receiver is given below together with the tube type associated with each stage.

Converter	12BE6
C.W. Osc. -- I.F. Amplifier (455 Kc.)	12BA6
Second Det. - A.V.C. - First Audio	12AV6
Audio Output	50C5
Rectifier	35Z5

Two audio output circuits are provided in the SW-54:

1. The built-in loudspeaker is a permanent magnet type.
2. Phone tip jacks are mounted at the rear of the receiver to accommodate headphones. The headphones load impedance is not critical, permitting the use of various types of headphones including crystal types.

2-2. TUNING SYSTEM

The two-gang main tuning capacitor and four set of coils are used to cover the frequency range of the SW-54 in four tuning bands as shown on the following table. A bandspread tuning dial scale calibrated from 0 to 100 is provided to permit bandspread tuning of any portion of the frequency range of the receiver.

BAND	FREQUENCY COVERAGE
A	.54 to 1.6 mc.
B	1.6 to 4.7 mc.
C	4.6 to 14.5 mc.
D	12 to 30 mc.

The main dial has four scales accurately calibrated directly in megacycles. The respective scales are marked with heavy black scorings to clearly locate for the operator such short-wave features as the Amateur, Police, Foreign Broadcast and Ship bands. These locating markers are identified by letters AM, P, F and S respectively.

2-3. OPERATING INSTRUCTIONS

After the SW-54 has been installed as outlined in Section 1, it is placed in operation for voice

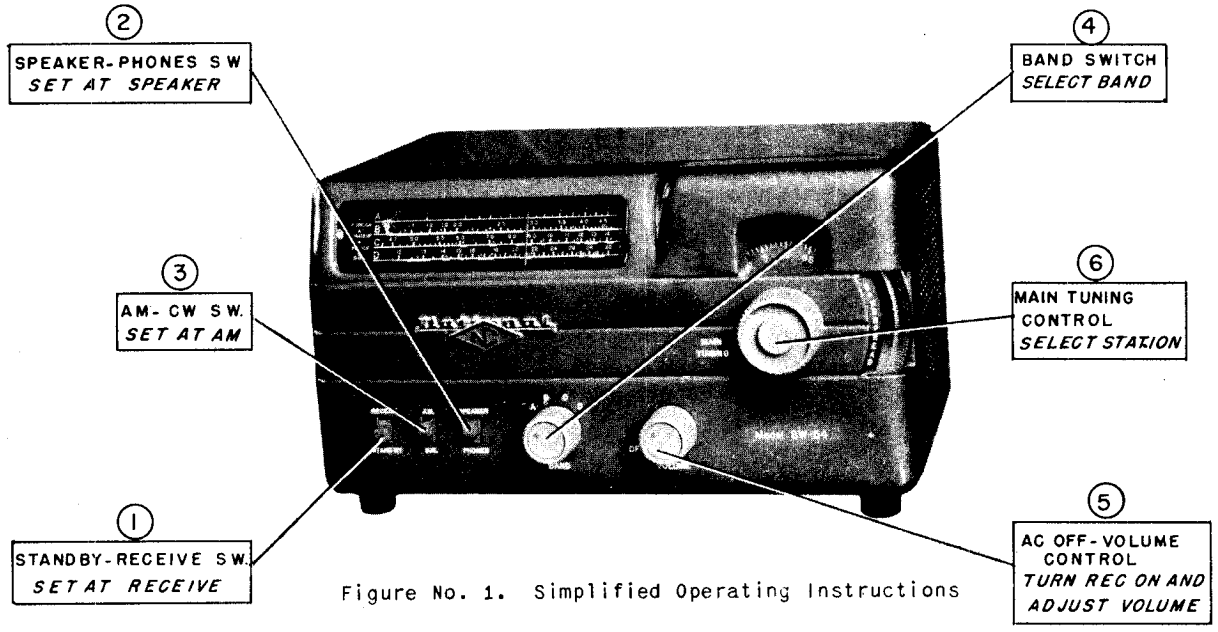


Figure No. 1. Simplified Operating Instructions

or music reception by adjustment of the receiver controls. Figure No. 1 gives the step-by-step procedure to follow for the reception of signals. The same procedure is outlined below with a brief description of the function of each control.

1. Set the Standby-Receive switch at Receive. This switch, in the Standby position is used to quiet the Receiver for a period of time such as during a transmitting period, when it is desirable to resume reception immediately without waiting for the tubes to warm up.

2. Set the Speaker-Phones switch at Speaker. Should headphone operation be desired set the switch at Phones and connect headphones to the Phones jack located at the rear of the receiver.

3. Set the AM-CW switch at AM.

4. Set the Band switch at the band of frequencies to be tuned. The four positions of the Band switch select the proper set of coils to cover the frequency range of the four tuning bands of the SW-54. Each position is marked with a band letter designation which corresponds to the markings appearing on the main dial.

5. Turn the Volume control from the A.C. off position to the point providing the desired audio volume. In the A.C. Off position the SW-54 is turned off: advancing the control knob in a clockwise direction turns on the Receiver and increases the audio output volume to a maximum at the extreme clockwise position.

6. Set the main tuning dial pointer at the desired frequency. The main tuning control knob and dial scale are used to tune the entire frequency range of the Receiver and tunes at any one time the band of frequencies selected by the Band switch.

7. To utilize the advantages of bandspread (fine) tuning and logging provided by the SW-54 proceed as follows:

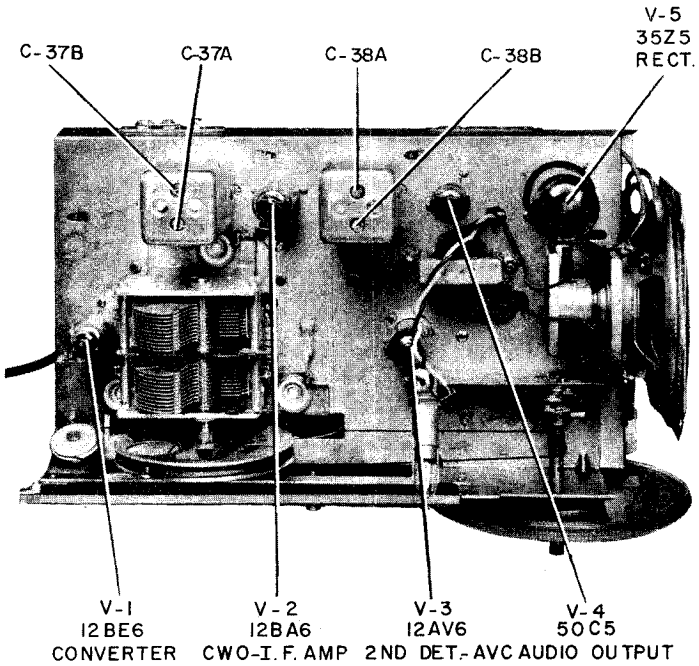
(a) Set the main tuning dial pointer at the Low frequency limit of the band of frequencies to be tuned.

(b) Hold the main tuning control knob (or the outer edge of the Bandspread dial) firmly enough to prevent the main tuning dial pointer from moving and set the bandspread dial at Zero by rotating the inner segment of the Bandspread dial.

(c) Bandspread tuning can now be accomplished by rotation of the entire Bandspread dial in a clockwise direction. Logging of stations is accomplished by noting the frequency setting of the main dial pointer and the numerical setting of the bandspread dial.

2-4. CODE TELEGRAPHY RECEPTION

The adjustment of the receiver controls for code reception is the same as that for voice and music except that the AM-CW switch must be set at CW.



NOTE: *ALTERNATE IF TRANS. HAVE L-9 & L-11 AT BOTTOM OF CAN, L-10 & L-12 AT THE TOP.*

Figure No. 2. Tube and Alignment Adjustment Locations

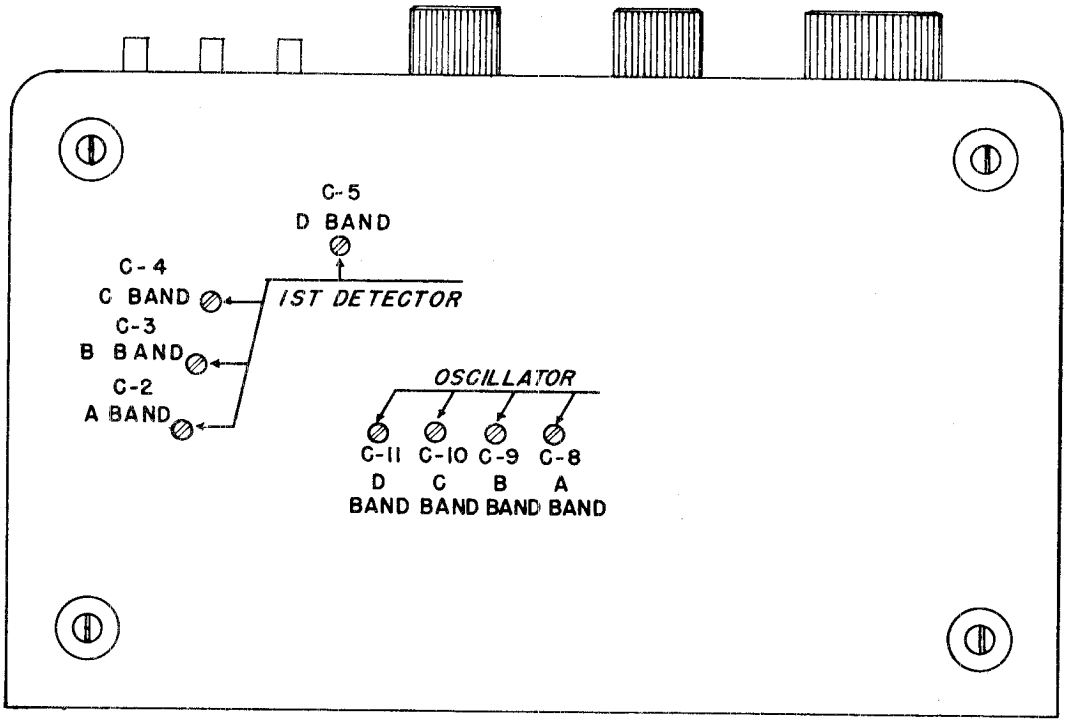
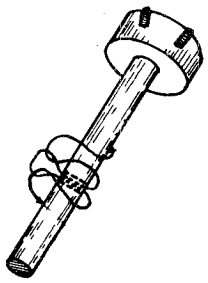


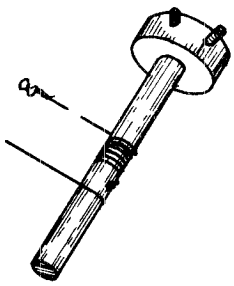
Figure No. 3. R.F. Alignment Trimmer Locations

1 LENGTH OF CORD = 38" INCLUDING CLIP AT ONE END AND LOOP IN OTHER.
MEASURE 16 3/4" FROM CLIP END AND MARK THIS POINT. LOOP CORD AT MARK AND PUSH THRU HOLE IN SHAFT. BRING ENDS OF CORD THRU LOOP AS SHOWN AND PULL TAUT KEEPING MARKED POINT OVER HOLE.



2 a WIND CLIP END OF CORD 6 1/2 TURNS AROUND SHAFT AND WITH TUNING CAPACITOR AT MAXIMUM HOOK CLIP TO LARGE PULLEY.

b TURN CAPACITOR TO MINIMUM ALLOWING OTHER END OF CORD TO WIND ITSELF AROUND SHAFT.



3 SET PULLEY AT POSITION SHOWN AND PASS CORD AROUND SMALL PULLEY. FASTEN SPRING TO END OF CORD AND CLIP TO HOLE IN PULLEY PROVIDING CORRECT TENSION.

4. ATTACH POINTER TO CORD AND BY ELECTRICAL CALIBRATION TEST SET POINTER AT CORRECT POSITION

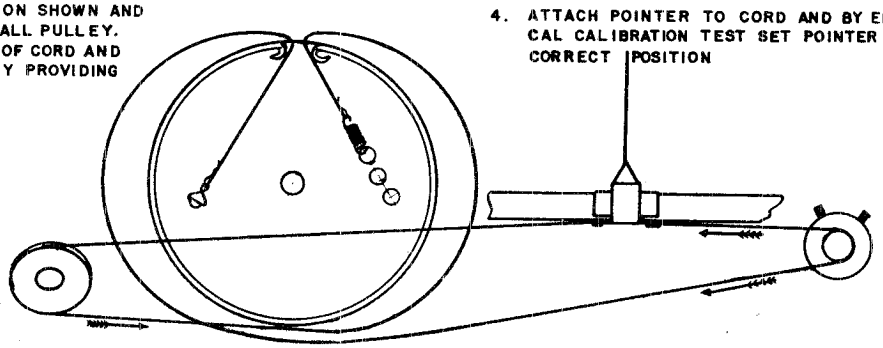


Figure No. 4. Dial Stringing Instructions

MODEL SW-54

SW-54

ALIGNMENT AND TEST INSTRUCTIONS

Note: 1. An isolation transformer should be used wherever possible: If the transformer is not available, the set may be handled with safety if the following precautions are observed:

a. Find out with an AC volt meter which side of power socket is at ground potential.

b. With receiver plug out of power socket, turn on power switch and with an ohmmeter find which tab of power cord is connected directly to the chassis through the volume control switch.
Insert the cord into the power socket so that both grounds come together. When these precautions have been taken one may connect other grounds to receiver chassis without danger.
If the power source is DC, the set will not operate unless proper polarity of the plug is observed.

2. A dummy antenna of 300 ohms is also needed.
Alignment should not be made without this resistor.

3. A blocking condenser .01 to .1 mfd. should be used. This condenser should be used in series with the hot lead of the signal source at all times. Having observed polarity of plug as under Note #1, the ground lead of the signal source may be connected directly to the chassis.

I Check tuning condenser and dial pointer setting--

a. Rotate tuning dial fully counter-clockwise against stop.

b. Look at tuning condenser. The rotor should be fully meshed. This is very, very important. This is your reference, and will avoid tracking and calibration troubles. When we say fully meshed, we do not mean 1/2 of a degree or one degree, but that the plates be flush.

c. To set the condenser rotate dial fully counter-clockwise. Loosen the two set screws on dial shaft. Hold the collar, which has the two set screws, against the stop. Turn dial until tuning condenser hits its stop. Tighten set screws.

d. Set the pointer over the first calibration mark on band "B".

II Connect the power to the receiver.

III Connect headphones and output meter to output jack.

IV Connect the 300 ohm dummy to hot antenna terminal.

V Put band change switch in the "A" position.

VI Set dial to 1000 kc.

VII Set signal to 455 kc ±1 kc.
Caution: Do not depend on the accuracy of your signal generator, unless you know it is good.

VIII Connect the signal source to the top contact on the front switch wafer (flue lead). This is the mixer grid connection with the band change switch at "A".

IX Adjust L9, 10, 11 and 12 or C-37A C37B, C38A and C38B for maximum output. The maximum input required for 50 mw output should not be over 75 micro-volts. The minimum may run as low as 10 micro-volts. If the set is stable-10 micro-volts will be all right. A normal set will require 25 micro-volts. Use approximately 100 micro-volts input when making IF adjustments. The IF alignment is now complete.

X Set the frequency at the high end of band "A" with condenser C-8 (osc.) Adjust det. trimmer C-2 for maximum gain. Check calibration at the low end of band. 600 kc should fall within ±10 kc.
Note: A chart is being supplied which will show calibration and alignment points for each band. This chart will also show tolerances on calibration.

XI Set the band change switch at "B". Set the frequency at the high end of the band. Peak mixer trimmer while rocking the dial for maximum output. Check the calibration at the low end of the band.

XII Repeat Operation XI for band "C" (Band switch at "C".)

XIII Set band switch at "D". Set the frequency at the high end of the band. Peak the mixer trimmer on signal for maximum output while rocking the dial. Check the frequency at the low end of band. On Band "D", adjust loop in det. coil at 14 mc for maximum gain.

Check chart below for calibration and alignment points.

Band	Set	Peak Det. Trimmer at	Check Cal. at Tol.	Check Tracking at
"A"	1.5 mc.	1.5 mc.	.6 mc±10kc.	.6 mc.
"B"	4.0 mc.	3.8 mc.	2.0 mc 20kc.	1.8 mc.
"C"	14.0 mc.	13.5 mc.	5.0 mc±60kc.	5.5 mc.
"D"	28.0 mc.	29.0 mc.	14.0 mc±150kc.	13.5 mc.

The above tolerances apply to the whole band.

SELECTIVITY Input: 100 micro-volts
Output: level 10 milliwatts

6 db 3.4 kc.
20 db 14.0 kc.
40 db 28.2 kc.
60 db 49.5 kc. AVC at 2 MC 300 ohm dummy-

Measurement taken here to avoid noise pick-up.
10 micro-volts = 0 db = 1 mw.
100 - " - + 15
1000 - " - + 20
10000 - " - + 24
100000 - " - + 28.0

Overall distortion at 1 MC

30% mod. 1000 CPS

100 mw.	2 %
200	2.2
300	2.6
500	2.8
.7	3.5
.8	4.2
1.0	6.5
1.5 watts	10+

Maximum power 1.8 watts

Overall fidelity at 2 mc.

100	-11.0
200	- 5.0
400 cp.s	0 db
1000	+ 2.0
2000	- 2.0
3000	- 6.5
4000	-12.5
5000	-18.0

GAIN Dial set at 1000 kc.

Location	Frequency	Input	Output
Mixer Grid	455 kc.	26 uv	50 mw
IF Grid	455 kc.	3000 uv	50 mw
First Audio	400 cps	.5 volts	50 mw
Last Audio	400 cps	1.8 volts	50 mw

Audio response from first audio grid.
Input constant at .4 volts.

100	-12.0
200	- 5.5
400	0
1000	+ 1.8
2000	+ 1.0
3000	- .75
4000	- 3.5
5000	- 6.5
10000	-19.0

MODEL SW-54

HUM

As measured on 4 ohms with Ballantine volt meter

IF grid grounded
Audio gain off 1.8 micro-watts
Audio gain full 1.8 micro-watts
Line cord reversed 1.8 micro-watts

OVERALL GAIN, S/N RATIO, AND IMAGE RATIO

FREQ. MC.	GAIN FOR 50 MW	10 DB SIG/NOISE 300 OHMS	10 DB SIG/NOISE NO. DUMMY	IMAGE DB	50 MW DIRECT	OSC. VOLTS
BAND "A"						
.6	21.5 uv	18 uv	18 uv	43	22	6.6
1.0	11	10	10	42	16.5	9.0
1.5	15	10	10	35	19	9.6
BAND "B"						
1.7	11	11	3.1	30	5.5	4.2
2.5	6	6	2.8	32	2.8	6.2
4.0	7.2	7.7	4.5	20	4.0	7.2
BAND "C"						
5.0	14.0	13	4.5	22	5.5	2.6
8.0	9.4	7.0	2.4	16.0	4.5	3.6
14.0	4.0	4.0	3.8	18.0	3.0	2.2
BAND "D"						
15	28.0	28.0	8.5	8.0	13.5	2.4
20	10	10	8.5	12.0	6.5	2.6
29	4.5	4.5	4.0	6.0	6.0	1.6

SOCKET VOLTAGES

Meter - High impedance D.C. 100 ohms per volt A.C.

All measurements to ground
Bandswitch at "A"
No signal
Dial at 1000 kc.
Audio gain turned down.

Tube	Pin #1	Pin #2	Pin #3	Pin #4	Pin #5	Pin #6	Pin #7
12BE6	9 DC	.6AC	11AC	22 AC	98 DC	98 DC	.3 DC
12BA6	.3DC	0 AC	22AC	35 AC	35 AC	105 DC	1.1 DC
12AV6	.9DC	0	11AC	0	.45DC	.45DC	72 DC
50C5	7.0DC	0	80AC	35 AC	0	100 DC	120 DC
35Z5	100 DC	115 AC	110AC	0	110 AC	125 DC	80 AC

RESISTANCE MEASUREMENTS TAKEN TO CHASSIS (POWER REMOVED).

Bandswitch at "A"

Tube	Pin #1	Pin #2	Pin #3	Pin #4	Pin #5	Pin #6	Pin #7	Pin #8
12BE6	22K	.2	11	22	20K	20K	3 meg	
12BA6	2.5 meg.	0	20	30	20K	20K	100	
12VA6	10 meg.	0	11	0	.5 meg	.5 meg	260K	
50C5	150	.5 meg	100	40	.5 meg	.5 meg	20K	
35Z5	22K	120	120	Open Cir.	120	120	85	20K

Primary-output trans. 100 ohms
Secondary .2 ohms

RESISTANCE OF RF COILS

A Det. Coil Sec.	3.5 ohms	A Det. Coil Prim	29.5 ohms
B Det. Coil Sec.	.83 "	B Det. Coil Prim.	.93 "
C Det. Coil Sec.	.05 "	C Det. Coil Prim	.93 "

A Osc. Coil Total	2.34 ohms
cold end to trap	.35 ohms
B Osc. Coil Total	1.01 ohms
C Osc. Coil Total	.06 ohms
D Osc. Coil Total	.04 ohms

Caution: Be sure that no part of the metal frame of the speaker touches the chassis.

Never substitute 10% condensers for the 5% as called for on the parts list. These 5% condensers are used as padders and are C-12, C-13 and 4...470 mmfd ...1000 mmfd and 3000 mmfd.

Length of wires on tuning condenser should not be changed.

SOME TROUBLES AND FAULTY PARTS WHICH COULD BE THE CAUSE

Mushy audio and loud hum.
Defective condenser C-29C or C-29D.

Off signal, audio not mushy on signal.
Be sure the shield on the 12AV6 tube V-3 is properly seated.

Hum modulation in broadcast band.
Try replacing C-33.

Hum modulation in the higher frequency bands-check C-32.
C-39 may be defective.

Oscillation in the IF stage.
C-36 defective
C-35 defective
CW switch does not ground the feed back wire with the CW off.
Plate and grid leads should be down near the chassis.
Pin #2 and center shield on the socket not grounded.
Shorted cathode resistor.

Poor sensitivity at low end of band "B" with almost normal gain at the high end of the band.
C-1 may be open.

Poor sensitivity on all bands and trimmers C-2, 3 and 4 do not peak properly.
C-6 open.

High frequency oscillator does not work at some spot in one of the bands.
Poor contact on shorting rotor on band change switch.

PARTS LIST

Symbol No.	Description	Nat. Co. Type
	CAPACITORS	
C-1	Paper .01 mfd 400 vdcw	D827-5
C-2	Variable mica 2.2-40 mmf 500 vdcw	D832-5
C-3	Variable mica 2.2-40 mmf	D832-5
C-4	Variable mica 2.2-40 mmf	D832-5
C-5	Variable mica 2.2-40 mmf	D832-5
C-6	Paper .02 mfd 200 vdcw	D827-51
C-7	Ceramic 10 mmf 500 vdcw	D827D-426
C-8	Variable mica 2.2-40 mmf	D832-5
C-9	Variable mica 2.2-40 mmf	D832-5
C-10	Variable mica 2.2-40 mmf	D832-5
C-11	Variable mica 2.2-40 mmf	D832-5
C-12	Mica 470 mmf 500 vdcw	J665-55
C-13	Mica 1000 mmf 300 vdcw	J665-70
C-14	Mica 3000 mmf 500 vdcw	J666-30
C-15	Ceramic 21 mmf 500 vdcw	D825D-410
C-16	2 section variable	K577-2
C-16A	12 to 441.7 mmf	Part of C-16

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C-16B	12 to 441.7 mmf	Part of C-16
C-17	Ceramic 3 mmf	J695-4
C-18	Ceramic 100 mmf	J695-6
C-19	87 mmf	Part of T-1
C-20	87 mmf	Part of T-1
C-21	Paper .01 mfd 400 vdcw	D827-5
C-22	110 mmf	Part of T-2
C-23	110 mmf	Part of T-2
C-24	110 mmf	Part of T-2
C-25	110 mmf	Part of T-2
C-26	Paper .005 mmf 200 vdcw	D827-50
C-27	Paper .005 mmf 200 vdcw	D827-50
C-28	Mica 4700 mmf 500 vdcw	J665-56
C-29	4 section dry electrolytic	Q252-1
C-29A	5 mfd	Part of C-29
C-29B	40 mfd	Part of C-29
C-29C	40 mfd	Part of C-29
C-29D	60 mfd	Part of C-29
C-30	Paper .02 mfd 600 vdcw	D827-44
C-31	Paper .02 mfd 200 vdcw	D827-51
C-32	Mica 470 mmf 500 vdcw	J665-56
C-33	Paper .1 mfd 400 vdcw	D827-12
C-34	Paper .02 mfd 600 vdcw	D827-44
C-35	Paper .02 mfd 200 vdcw	D827-51
C-36	Paper .25 mfd 200 vdcw	D827-15
C-37	Variable ceramic 2 section	Part of T-1*
C-37A	35-150 mmf	Part of C-37
C-37B	35-150 mmf	Part of C-37
C-38	Variable ceramic 2 section	Part of T-2*
C-38A	35-150 mmf	Part of C-38
C-38B	35-150 mmf	Part of C-38

RESISTORS

R-1	Fixed 470,000 ohms 1/2 watt	J569-57
R-2	Fixed 47 ohms 1/2 watt	J569-9
R-3	Fixed 47 ohms 1/2 watt	J569-9
R-4	Fixed 100 ohms 1/2 watt	J569-13
R-5	Fixed 47,000 ohms 1/2 watt	J569-45
R-6	Variable 500,000 ohms w/switch	K347-6
R-7	Fixed 2,200,000 ohms 1/2 watt	J569-65
R-8	Fixed 10,000,000 ohms 1/2 watt	J569-73
R-9	Fixed 220,000 ohms 1/2 watt	J569-53
R-10	Fixed 470,000 ohms 1/2 watt	J569-57
R-11	Fixed 150 ohms 1/2 watt	J569-15
R-12	Fixed 15,000 ohms 1 watt	J571-39
R-13	Fixed 220 ohms 1/2 watt	J569-5
R-14	Fixed 22 ohms 1/2 watt	J569-22
R-15	Fixed 1000 ohms 1 watt	J571-25
R-16	Fixed 330 ohms 1/2 watt	J569-19
R-17	Fixed 22,000 ohms 1/2 watt	J569-41

*Alternate IF Trans.

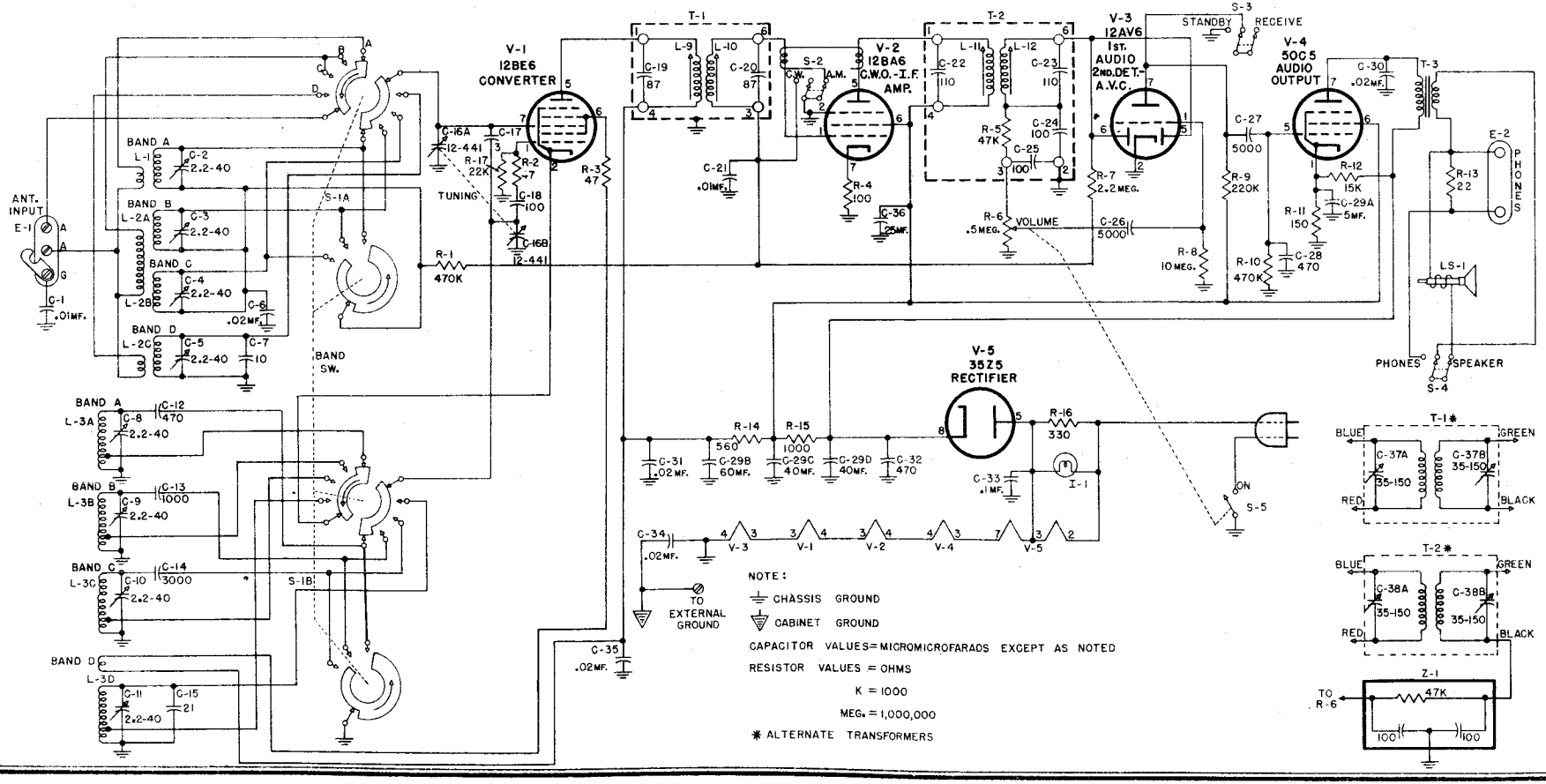
MISCELLANEOUS

E-1	Antenna terminal board 3 terminal	E261-3
E-2	Terminal board, speaker output, 2 terminal	E264-1
I-1	Lamp, #47 bayonet type 6-8 v 15 amps	F136-11
L-1	Inductor, detector "A" coil air core	SA:7971
L-2	Inductor, detector "B", "C" and "D" coils air core	SA:7973
L-2A		Part of L-2
L-2B		Part of L-2
L-2C		Part of L-2
L-3	Inductor, oscillator "A", "B", "C" and "D" coils air core	SA:7981
L-3A		Part of L-3
L-3B		Part of L-3
L-3C		Part of L-3
L-3D		Part of L-3
L-4	Inductor, variable, iron core tuning	Part of T-1
L-5	Inductor, variable, iron core tuning	Part of T-1
L-6	Inductor, variable iron core	Part of T-2
L-7	Inductor, variable iron core	Part of T-2
LS-1	Loudspeaker, 4" PM	Q374-1
S-1	Switch, band selector, 2 pole 4 pos	SA:7972
S-1A		Part of S-1
S-1B		Part of S-1
S-2	Switch, CW-AM, 2 pole 3 pos	SA:7977
S-3	Switch, standby, 2 pole 3 pos	SA:7978
S-4	Switch, phone, 2 pole 3 pos	SA:7976
S-5	Switch, on off, spst	Part of R-6
T-1	Transformer, IF, 455 Kc., shielded	Q242-1
T-1*	Transformer, IF, 455 Kc., shielded	Q243-1
T-2	Transformer, IF, 455 Kc., shielded	Q242-2
T-2*	Transformer, IF, 455 Kc., shielded	Q243-2
T-3	Transformer: speaker matching, primary 2500 ohms secondary 3.2 ohms, iron core	K588-2
V-1	Tube, converter, 12BE6	
V-2	Tube, pentode, 12BA6	
V-3	Tube, duo diode triode, 12AV6	
V-4	Tube, beam power amplifier, 50C5	
V-5	Tube, full wave rectifier, 35Z5	
Z-1	Filter, one 47,000 ohm resistor and two 100 mmf. capacitors	Q262-1

*Alternate IF Trans.

MECHANICAL PARTS

Bracket, main support	Q228-1
Bracket, to mount coil (2)	Q249-1
Bracket, pulley support	SA:7969
Bumper, rubber: chassis insulator	Q258-1
Cabinet	SA:7979
Channel, rubber	Q255-1
Chassis, metal wraparound less all components	Q227-1
Clip for miniature tube	K925-1
Collar for dial shaft	D637-4
Cord, AC Line	Q241-1
Cord, dial	SA:7975
Cover, bottom of cabinet	Q224-1
Cover, rear of cabinet	Q223-1
Foot (4)	Q237-1
Knob, large	SA:5692-2
Knob, small (2)	SA:7984
Pad, rubber	Q254-1
Plate, for switch	Q235-1
Pointer, dial scale	Q240-1
Rail, for pointer	Q234-1
Ring, retaining (dial shaft)	P491-3
Scale, slide rule type	Q233-1
Shaft, dial	SA:7974
Shield, for miniature tube	K924-1
Socket, for dial light	J721-2
Socket, miniature 7 pin (4)	K926-2
Socket, octal type	Q236-1
Strap, for speaker mounting	Q235-1
Washer, stop, for dial shaft	P149-2
Washer, stop, for dial shaft (6)	P149-1
Window for the slide rule scale	Q225-1



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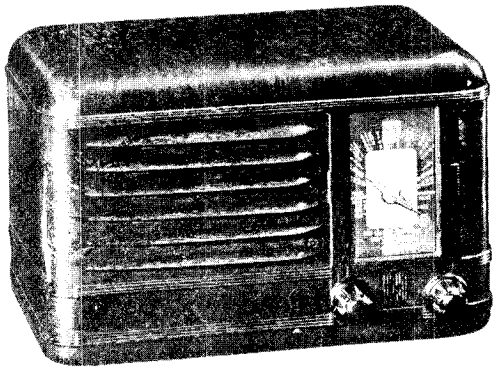


SPECIFICATIONS

OVERALL DIMENSIONS:

Height	6"
Width	10-⅛"
Depth	5-⅝"
Shipping Weight	6 Lbs.

ELECTRICAL RATING:

Line Voltage	110-120 volts AC-DC
Power Consumption	28 watts @ 115 volts

TUNING FREQUENCY RANGE:
540 to 1620 KC

INTERMEDIATE FREQUENCY:
455 KC

ELECTRICAL POWER OUTPUT:
1.75 watts (maximum)

LOUDSPEAKER:

Type	Permanent Magnet
Outside Cone Diameter	4"
Voice Coil Impedance	3.2 ohms @ 400 C.P.S.
Magnet Rating	.68 Oz. Alnico V

TUBES:

NO.	TUBE	FUNCTION
V-1	12SA7	Frequency Converter
V-2	12SK7	I-F Amplifier
V-3	12SQ7	2nd Detector—1st Audio
* V-4	50L6-GT	Power Amplifier
V-5	35Z5-GT	Rectifier

** V-4 in a few late sets is a 50C5.*

GENERAL INFORMATION

Model 100-A is a superheterodyne receiver employing four tubes plus one rectifier. It is for operation on AC or DC current and is housed in a plastic table model cabinet of walnut, ivory, or maroon design.

SPECIAL SERVICE INFORMATION

STAGE GAIN MEASUREMENTS:

Measurements taken with Volume Control maximum and A.V.C. shorted out.

Standard Output—50 milliwatts . . . Dummy Antenna—200 Mmf.

Converter Grid to 1st I-F Grid . . . 71X at 1000 KC
Converter Grid to 1st I-F Grid . . . 78X at 455 KC
1st I-F Grid to 2nd Detector . . . 77X at 455 KC
Overall Audio Gain 20 milliwatts in for 50 milliwatts out.

D.C. RESISTANCE MEASUREMENTS:

1st I-F Coil:

Primary	17.5 ohms
Secondary	17.5 ohms

2nd I-F Coil:

Primary	14.5 ohms
Secondary	14.5 ohms

Oscillator Coil:

Primary	1.2 ohms
Secondary	4.5 ohms

Due to the variation of winding methods, the D.C. resistance measurements shown are subject to a 20% tolerance.

OSCILLATOR CATHODE VOLTAGES:

The following voltages were measured at 117 volts AC line with an A.C. vacuum tube voltmeter input loading above 10 megohms.

1500 KC	2.3 VAC
1000 KC	2.0 VAC
600 KC	2.6 VAC

ALIGNMENT PROCEDURE

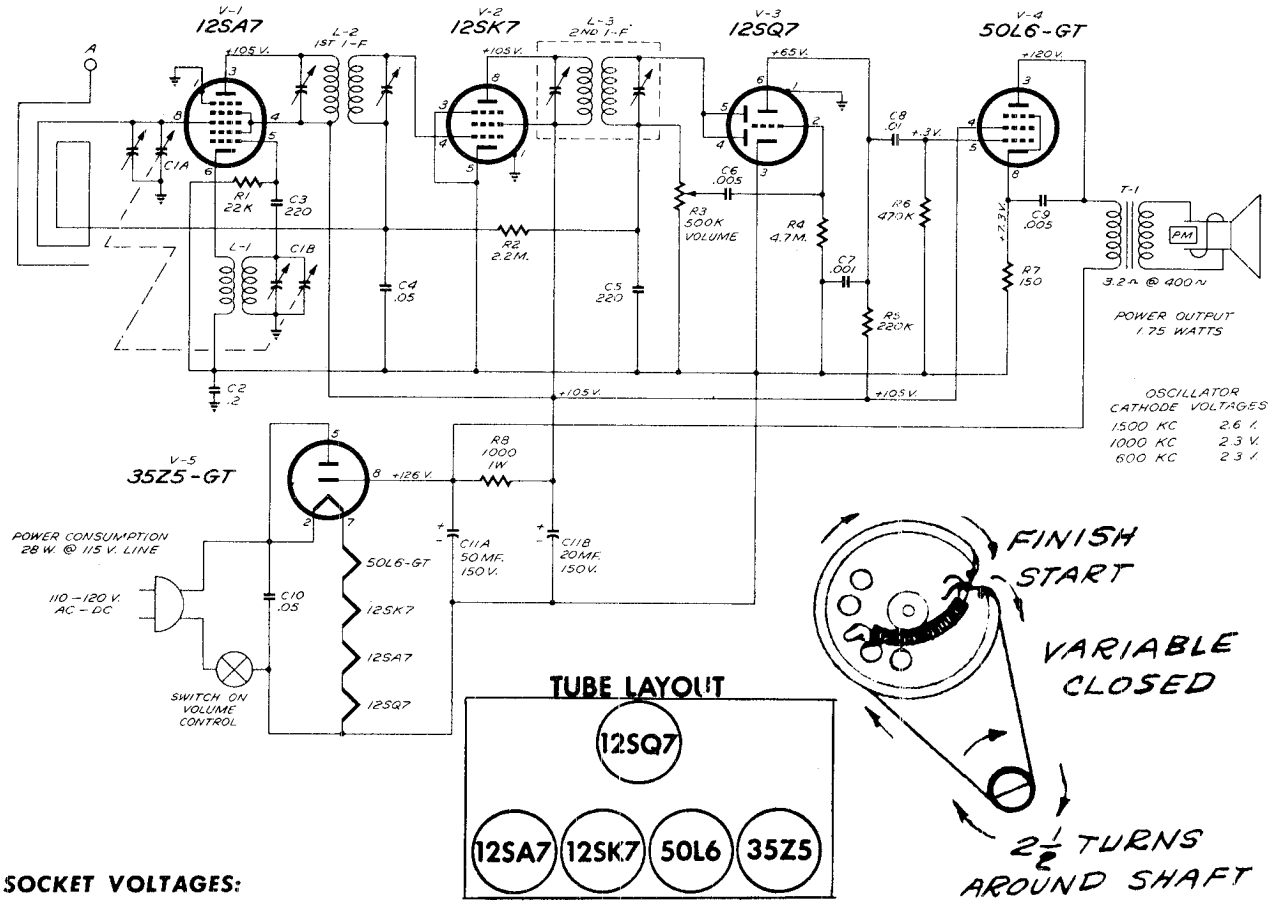
Alignment Procedure consists of the steps outlined in the Alignment Chart. Make certain each step is done with a minimum input signal.

Connect output meter to speaker voice coil.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	Trimmers A, B, C, & D
2	R-F Grid & Ground	1500 KC	1500 KC	Trimmer E
3	R-F Grid & Ground	1500 KC	1500 KC	Trimmer F
4	REPEAT STEPS 2 & 3			
5	Check Stationizing. Adjust pointer so that all stations tune correctly.			

MODEL 100-A



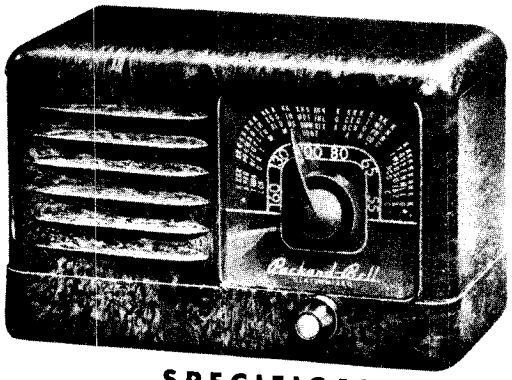
SOCKET VOLTAGES:

The socket voltages shown in the schematic diagram were measured as follows:
D.C. voltages measured with a vacuum tube voltmeter . . . A.C. voltages measured with a 1,000 ohms per volt A.C. meter . . . all voltages shown are positive D.C. and were measured from socket contacts to negative buss unless otherwise specified.

TABLE OF REPLACEABLE PARTS

REF. SYMBOL	DESCRIPTION	PB PART NO.
	CAPACITOR, TUBULAR,	
C-7	.001 Mfd. 600 volt	23001
C-6, 9	.005 Mfd. 600 volt	23004
C-4, 10	.05 Mfd. 200 volt	23017
C-2	.2 Mfd. 200 volt	23018
C-8	.01 Mfd. 600 volt	23022
	CAPACITOR, VARIABLE,	
C-1A & B	Two Gang	23523E
	CAPACITOR, CERAMIC,	
C-3, 5	220 Mmf. 20% GP	23915
	CAPACITOR, ELECTROLYTIC,	
C-11A & B	50-20 Mfd. 150 volt	24041
	CONTROL,	
R-3	Volume, 500K w/AC Switch	25014
	COILS,	
L-2	1st I-F, 455 KC	29045
L-3	2nd I-F, 455 KC	29046
L-1	Oscillator	29220
	Loop	29331
	RESISTOR, ½ WATT, 10%,	
R-7	150 ohms	73015
R-1	22,000 ohms	73041

REF. SYMBOL	DESCRIPTION	PB PART NO.
	RESISTORS, ½ WATT, 20%,	
R-5	220,000 ohms	73153
R-6	470,000 ohms	73157
R-2	2.2 megohms	73165
R-4	4.7 megohms	73169
	RESISTORS, 1 WATT, 10%,	
R-8	1,000 ohms	73225
	TRANSFORMER,	
T-1	Output, 2500 to 3.2 ohms	89417
	MISC. PARTS,	
	Cabinet (specify color)	21004
	A.C. Cord	32011
	Dial, Stationized	38124
	Handle (specify color)	49009
	Knobs (specify color)	52027
	Dial Crystal	55003
	Back Panel (loop Mtg.)	62000
	Dial Pointer	67005
	Tube Socket, Std. Octal	79002
	Tube Socket, 7 Pin miniature (50C5)	79081
	Speaker, 4" PM	83007



SPECIFICATIONS

OVERALL DIMENSIONS:

Height	6-7/16"
Width	10-⅛"
Depth	5-⅝"
Shipping Weight	8 Lbs.

ELECTRICAL RATING:

Line Voltage	110-120 volts AC-DC
Power Consumption	.28 watts @ 115 volts

TUNING FREQUENCY RANGE:

540 to 1620 KC

INTERMEDIATE FREQUENCY:

455 KC

ELECTRICAL POWER OUTPUT:

1.75 watts (Maximum)

LOUDSPEAKER:

Type	Permanent Magnet
Outside Cone Diameter	4"
Voice Coil Impedance	3.2 ohms @ 400 C.P.S.
Magnet Rating	.68 Oz. Alnico V

TUBES:

NO.	TUBE	FUNCTION
V-1	12SA7	Frequency Converter
V-2	12SK7	I-F Amplifier
V-3	12SQ7	2nd Detector—1st Audio
V-4	50L6-GT	Power Amplifier
V-5	35Z5-GT	Rectifier

GENERAL INFORMATION

Model 501 is a superheterodyne receiver employing four tubes plus one rectifier. It is for operation on AC or DC current and is housed in a plastic table model cabinet of walnut, ivory or maroon design.

SPECIAL SERVICE INFORMATION

STAGE GAIN MEASUREMENTS:

Measurements taken with Volume and Tone Controls maximum and A.V.C. shorted out.

Standard Output—50 milliwatts . . . Dummy Antenna—200 Mmf.

Converter Grid to 1st I-F Grid	71X at 1000 KC
Converter Grid to 1st I-F Grid	78X at 455 KC
1st I-F Grid to 2nd Detector	77X at 455 KC
Overall Audio Gain	20 millivolts in for 50 milliwatts out.

D.C. RESISTANCE MEASUREMENTS:

1st I-F Coil:

Primary	17.5 ohms
Secondary	17.5 ohms

2nd I-F Coil:

Primary	14.5 ohms
Secondary	14.5 ohms

Oscillator Coil:

Primary	1.2 ohms
Secondary	4.5 ohms

Due to the variation of winding methods, the D.C. resistance measurements shown are subject to a 20% variation.

OSCILLATOR CATHODE VOLTAGES:

The following voltages were measured at 117 volt AC line with an A.C. vacuum tube voltmeter input loading above 10 megohms.

1500 KC	2.6 VAC
1000 KC	2.3 VAC
600 KC	2.0 VAC

ALIGNMENT PROCEDURE

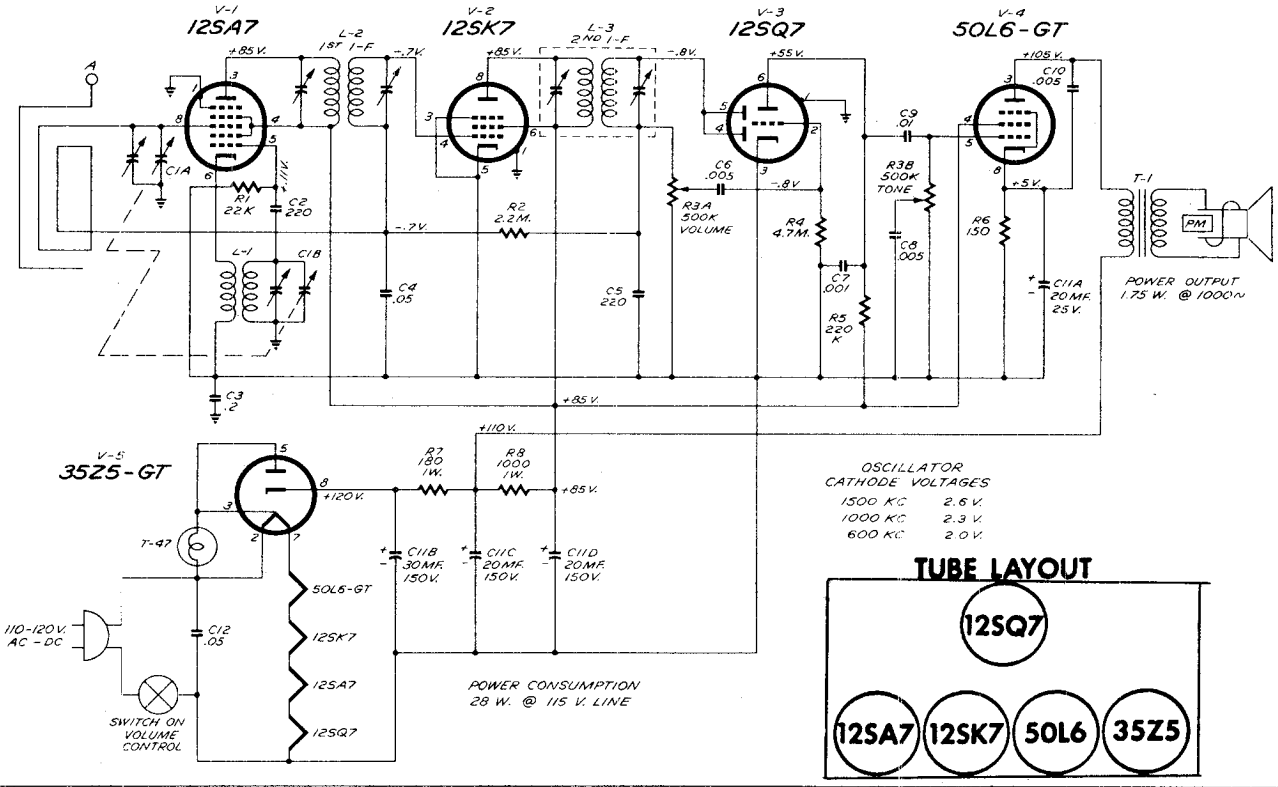
Alignment procedure consists of the steps outlined in the Alignment Chart. Make certain each step is done with a minimum input signal.

Connect output meter to speaker voice coil.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	A, B, C & D (I-F Trimmers)
2	R-F Grid & Ground	1500 KC	1500 KC	E (Osc. Trimmer)
3	R-F Grid & Ground	1500 KC	1500 KC	F (Ant. Trimmer)
4	REPEAT STEPS 2 & 3			
5	Check Stationizing. Adjust pointer so that all stations tune correctly.			

MODEL 501



OSCILLATOR CATHODE VOLTAGES

1500 KC	2.6 V.
1000 KC	2.3 V.
600 KC	2.0 V.

TUBE LAYOUT

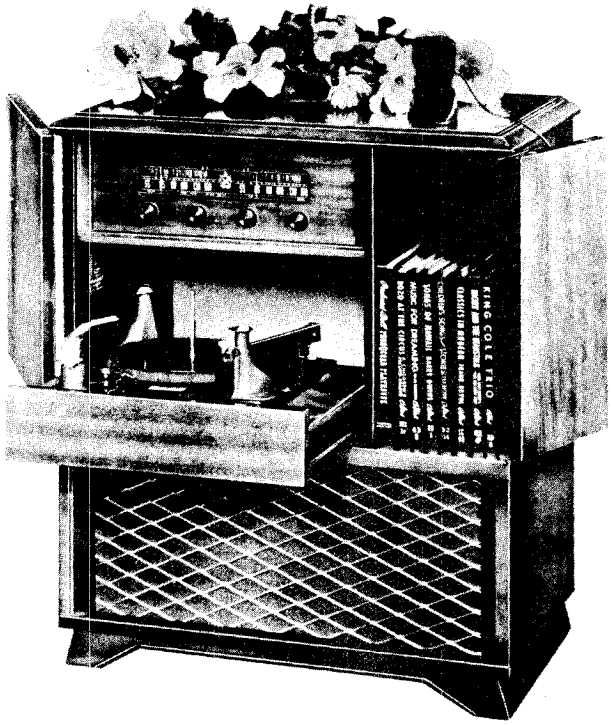
SOCKET VOLTAGES:

The socket voltages shown on the schematic diagram were measured as follows:
D.C. voltages measured with a vacuum tube voltmeter . . . A.C. voltages measured with a 1,000 ohms per volt A.C. meter . . . all voltages shown are positive D.C. and were measured from socket contacts to negative buss unless otherwise specified.

TABLE OF REPLACEABLE PARTS

REF. SYMBOL	DESCRIPTION	PB PART NO.
	CAPACITORS, TUBULAR,	
C-7	.001 Mfd. 600 volt	23001
C-6, 10	.005 Mfd. 600 volt	23004
C-4, 12	.05 Mfd. 200 volt	23017
C-3	.2 Mfd. 200 volt	23018
C-9	.01 Mfd. 600 volt	23023
	CAPACITORS, VARIABLE,	
C-1A & B	2 gang	23528
	CAPACITORS, ELECTROLYTIC,	
C-2, 5	220 Mmf. 20% GP	23915
C-8	.005 Mfd. Hy-Kap	23931
	CAPACITOR, ELECTROLYTIC,	
C-11A, B, C, D,	30/20/20-150; 20/25	24034B
	CONTROLS,	
R-3A & B	Dual w/AC Switch—Volume-500K Tone-500K	25024
	COILS,	
L-2	1st I-F, 455 KC	29045
L-3	2nd I-F, 455 KC	29046
L-1	Oscillator	29220
	Loop	29331
	RESISTORS, ½ WATT, 10%,	
R-6	150 ohms	73015
R-1	22,000 ohms	73041

REF. SYMBOL	DESCRIPTION	PB PART NO.
	RESISTORS, ½ WATT, 20%,	
R-5	220,000 ohms	73153
R-2	2.2 megohms	73165
R-4	4.7 megohms	73169
	RESISTORS, 1 WATT, 10%,	
R-7	180 ohms	73216
R-8	1,000 ohms	73225
	TRANSFORMERS,	
T-1	Output, 2500 to 3.2 ohms	89417
	MISC. PARTS,	
	Cabinet (specify color)	21111
	A.C. Cord, 6'	32011
	Dial, Stationized	38125
	Handle (specify color)	49009
	Dial Lamp—T-47	54002
	Back Panel (Loop Mtg.)	62101
	Speaker, 4" PM	83007
	KNOBS,	
	Tuning (specify color)	52072
	Tone (specify color)	52073
	Volume (specify color)	52074
	SOCKETS,	
	Tube, Standard Octal	79002
	Dial Lamp, Bayonet Base	79082



GENERAL DESCRIPTION

Model 801 is a PhonOcord console employing seven tubes plus one rectifier. The following are the outstanding features incorporated in this model.

1. Superheterodyne receiver.
2. Automatic Home Recording with Public Address System.
3. Phonograph with Automatic Record Changer.

Cabinet finishes are Walnut, Mahogany, Maple and Modern Blonde Oak.

Service Information concerning the automatic record changer-recorder will be found in "*Service Instructions—Automatic Record Changer-Recorder Combination (Packard-Bell Part No. 58004B)*". Published in 1946.

SPECIFICATIONS

OVERALL DIMENSIONS:

Height	35"
Width	29"
Depth	18"
Shipping Weight	110 Lbs.

ELECTRICAL RATING:

Line Voltage	110-120 volts, 50-60 C.P.S.
Power Consumption	92 watts

TUNING FREQUENCY RANGE:
540 to 1620 KC

INTERMEDIATE FREQUENCY:
455 KC

ELECTRICAL POWER OUTPUT:

Maximum	5.0 watts
Undistorted	3.0 watts

LOUDSPEAKER:

Type	Permanent Magnet
Outside Cone Diameter	10"
Voice Coil Impedance	3.2 ohms @ 400 C.P.S.
Magnet Rating	3.16 Oz. Alnico V

TUBE COMPLEMENT:

No.	Tube	Function
V-1	6SK7	R-F Amplifier
V-2	6SA7	Frequency Converter
V-3	6SK7	I-F Amplifier
V-4	6H6	Compressor Rectifier
V-5	6SF7	1st Audio Amplifier
V-6	6SQ7	2nd Detector & Mike Amplifier
V-7	6V6-GT	Power Amplifier
V-8	5Y3-GT	Rectifier

SPECIAL SERVICING INFORMATION

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT:

Model 801 automatic home recording circuit employs volume compression. Referring to the schematic diagram, it will be noted that V-4 (6H6) rectifies a portion of the output voltage and varies the grid bias of V-5 (6SF7). The compression system is automatic and is in the circuit on both record positions.

The compression voltage is approximately a minus 2.25 volts. This voltage may be checked by turning the switch to Radio Record position and feeding a 1 volt (RMS) 1,000 cycle signal into the diode return of the 2nd I-F (brown lead). Connect a vacuum tube voltmeter to the point indicated on the schematic diagram.

RECORDING HEAD PRESSURE:

The proper recording head pressure is 1¼ ounces. It is important, for best recording results, that this pressure be maintained at all times.

The cutting head pressure may be adjusted by turning the small screw on the top of the Recording Arm—*CLOCKWISE TO INCREASE THE CUTTING DEPTH* and *COUNTER CLOCKWISE TO DECREASE THE CUTTING DEPTH*. This adjustment is very critical and should be made in quarter turns employing a small postal scale or its equivalent as a means of accurate measurement.

STAGE GAIN MEASUREMENTS:

Measurements taken with Volume and Tone Controls maximum; Selector Switch in Radio position. A.V.C. shorted to ground.

Standard Output	50 milliwatts
Dummy Antenna	200 Mmf.
Antenna to R-F Grid	7X at 1000 KC
R-F Grid to Converter Grid	9X at 1000 KC
Converter Grid to 1st I-F Grid	48X at 455 KC
1st I-F Grid to 2nd Detector	50X at 455 KC
Overall Audio Gain	65 millivolts in (1st Audio Grid) — 50 milliwatts out (Voice Coil)

D. C. RESISTANCE MEASUREMENTS:

Due to a variation in winding methods, the D. C. resistance on all coils is subject to a 20% tolerance.

1st I-F Coil:

Primary	17 ohms
Secondary	14.5 ohms

2nd I-F Coil:

Primary	17 ohms
Secondary	14.5 ohms*

Oscillator Coil:

Primary	1 ohm
Secondary	6 ohms

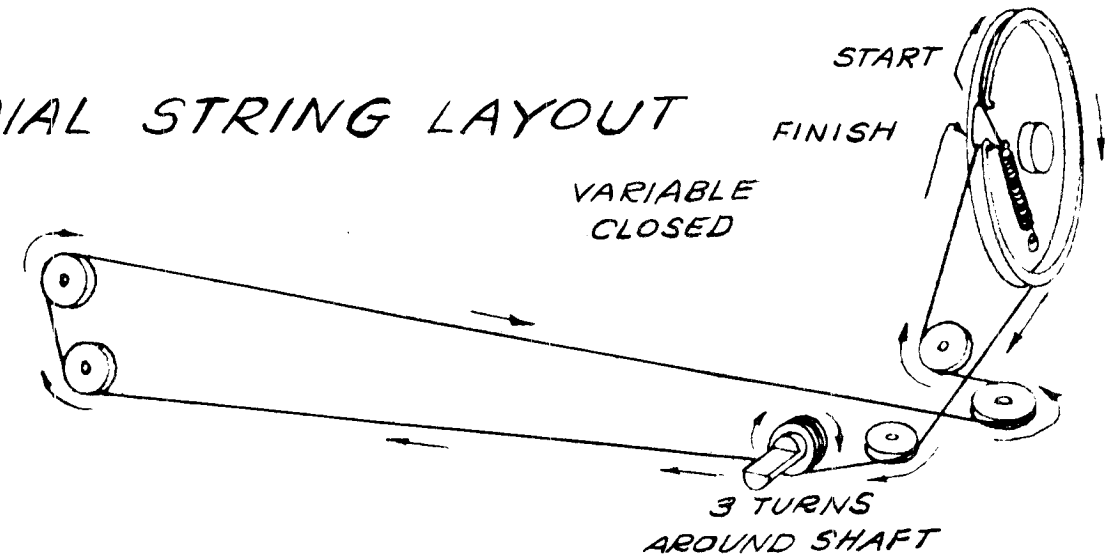
R-F Coil:

Primary	58 ohms
Secondary	4.2 ohms

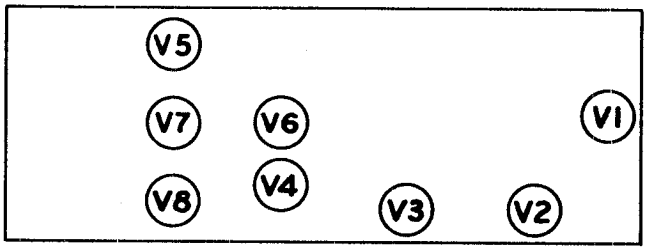
*Because of the 47K resistor in series with the secondary of the 2nd I-F, the reading shown can only be obtained by removing the coil from the can.

MODEL 801

DIAL STRING LAYOUT



SOCKET VOLTAGES



The socket voltages shown were measured under the following conditions:

1. D. C. voltages measured from socket contacts to chassis with a D. C. vacuum tube voltmeter.
2. A. C. voltages measured with a 1,000 ohms per volt A. C. meter.
3. Volume and Tone Controls maximum.
4. Selector Switch in Radio Receive position; no signal.
5. All voltages are positive D. C. unless otherwise noted.
6. Voltage readings subject to a 10% variation.

V-1—6SK7, R-F Amplifier:

Pin	Element	Voltage
1	Shield	0
2	Heater	0
3	Grid 3	0
4	Grid 1	-.5
5	Cathode	.5
6	Grid 2	80
7	Heater	6.0 VAC
8	Plate	187

V-2—6SA7, Frequency Converter:

Pin	Element	Voltage
1	Grid 3	0
2	Heater	0
3	Plate	187
4	Grids 2 & 4	80
5	Grid 1	-8.5
6	Cathode	0
7	Heater	6.0 VAC
8	Grid #3	-.6

V-3—6SK7, I-F Amplifier:

Pin	Element	Voltage
1	Shield	0
2	Heater	0
3	Grid 3	0
4	Grid 1	-.5
5	Cathode	2.6
6	Grid 2	80
7	Heater	6.0 VAC
8	Plate	187

V-4—6H6, Compressor Rectifier:

Pin	Element	Voltage
1	Shield	0
2	Heater	0
3	Plate-Diode 2	0
4	Cathode-Diode 2	0
5	Plate-Diode 1	-.15
6	No Connection	0
7	Heater	6.0 VAC
8	Cathode-Diode 1	.5

V-5—6SF7, 1st Audio Amplifier:

Pin	Element	Voltage
1	Shield	0
2	Grid 1	-.5
3	Cathode	0
4	Grid 2	11
5	Plate (Diode)	0
6	Plate	54
7	Heater	6.0 VAC
8	Heater	0

V-6—6SQ7, Detector & Microphone Amplifier

Pin	Element	Voltage
1	Shield	0
2	Grid (Triode)	-.55
3	Cathode	0
4	Plate (Diode)	0
5	Plate (Diode)	0
6	Plate (Triode)	91
7	Heater	6.0 VAC
8	Heater	0

V-7—6V6-GT, Power Amplifier:

Pin	Element	Voltage
1	No Connection	0
2	Heater	0
3	Plate	225
4	Grid 2	187
5	Grid 1	-10
6	No Connection	0
7	Heater	6.0 VAC
8	Cathode	0

V-8—5Y3-GT, Rectifier:

Pin	Element	Voltage
1	No Connection	0
2	Heater	245 (5.0 VAC to pin 8)
3	No Connection	0
4	Plate	260 VAC (to Pow. Trans. C.T.)
5	No Connection	0
6	Plate	260 VAC (to Pow. Trans. C.T.)
7	No Connection	0
8	Heater	245 (5.0 VAC to pin 2)

ALIGNMENT PROCEDURE

MODEL 801

Alignment procedure consists of the steps outlined in the alignment procedure chart. Make certain each step is done with a minimum input signal.

Connect output meter to speaker voice coil.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	Trimmers A, B, C, D
2	R-F Grid & Ground	1500 KC	1500 KC	Trimmer E
3	R-F Grid & Ground	600 KC	600 KC	Trimmer H
4	R-F Grid & Ground	1500 KC	1500 KC	Trimmers F & G
5	Repeat Steps 2, 3, & 4			
6	Check Stationizing. Slide pointer on string if stations are uniformly off in one direction.			

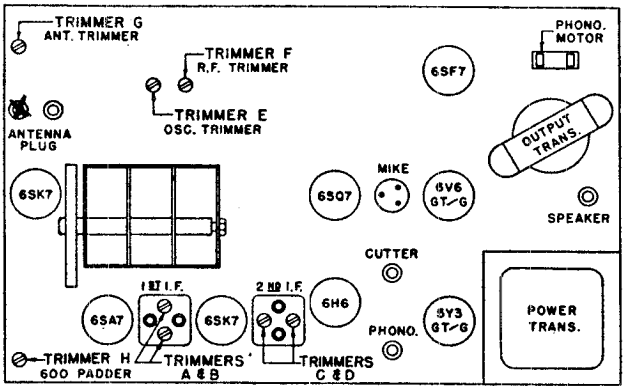


Figure 3 Trimmer Location

TABLE OF REPLACEABLE PARTS

REF. SYMBOL	DESCRIPTION	PB PART NO.
	CAPACITORS, TUBULAR	
C-13	.001 Mfd. 600 volt	23001
C-15, 22	.005 Mfd. 600 volt	23004
C-14,17	.02 Mfd. 600 volt	23007
C-4, 5	.05 Mfd. 600 volt	23010
C-16	.1 Mfd. 400 volt	23011
C-9, 18	.05 Mfd. 200 volt	23017
C-21	.1 Mfd. 200 volt	23019
C-20, 23	.01 Mfd. 600 volt	23023
	CAPACITORS, TRIMMER	
C-2, 10	3-30 Mmf. Dual	23400
C-12	300-800 Mmf. (Padder)	23402
	CAPACITORS, VARIABLE	
C-1A, B, C	3 gang	23521
	CAPACITORS, CERAMIC	
C-6, 11	47 Mmf. 20%	23912
C-3, 8	220 Mmf 20%	23915
	CAPACITORS, ELECTROLYTIC	
C-25	20 Mfd. 350 volt	24003
C-24	40 Mfd. 350 volt	24063
	CONTROLS	
R-9	Volume, 1 megohm—tapped	25010C
R-10	Tone, 5 megohms	25506C
	COILS	
L-3	1st I-F —455 KC	29004E
L-4	2nd I-F—455 KC	29007
L-1	R-F	29102F
L-2	Oscillator	29205C
	Loop	29335
	RESISTORS, ½ WATT, 10%	
R-2, 22	39 ohms	73008
R-7	390 ohms	73020
R-23	560 ohms	73022
R-11	15,000 ohms	73039
R-4	22,000 ohms	73041
R-24, 28	47,000 ohms	73045
	RESISTORS, ½ WATT, 20%	
R-12, 15, 20, 27	220,000 ohms	73153
R-14, 19, 25	470,000 ohms	73157
R-21	680,000 ohms	73159
R-8	1 megohm	73161
R-26	1.5 megohms	73163
R-1, 3, 18	2.2 megohms	73165
R-13, 16, 17	4.7 megohms	73169
	RESISTORS, 1 WATT 10%	
R-31	150 ohms	73215
	RESISTORS, 2 WATT, 10%	
R-5	10,000 ohms	73437
	RESISTORS, WIRE WOUND	
R-6	½ ohm, 1 watt, 10%	73601
R-29	15 ohms, 1 watt, 10%	73605
R-30	2,000 ohms, 5 watt, 10%	73631
	TRANSFORMERS	
T-2	Power (Plate Winding 520 volts center tapped; @ 70 MA)—89016C	
T-1	Output—5,000 to 3.2 ohms—89409D	
	PLUGS	
	Antenna, Phono, Cutter & Speaker	66004
	Microphone	66013
	SOCKETS	
	Tube, Std. octal	79002
	Microphone	79004
	Phono Pick-up	79005
	A.C. Motor	79007
	Dial Lamp	79010
	MISC. PARTS	
	Cabinet (specify finish)	21105
	A.C. Cord, 8'	32003
	Cutter Cartridge	36024
	Dial, Stationized	38121
	Knobs	52037-1
	Lamp, Dial	54001
	Microphone with cable	57010
	Record Changer-Recorder	58004E
	Speaker, 10" PM	83705
	Switch, wafer type	86009B

MODEL 301

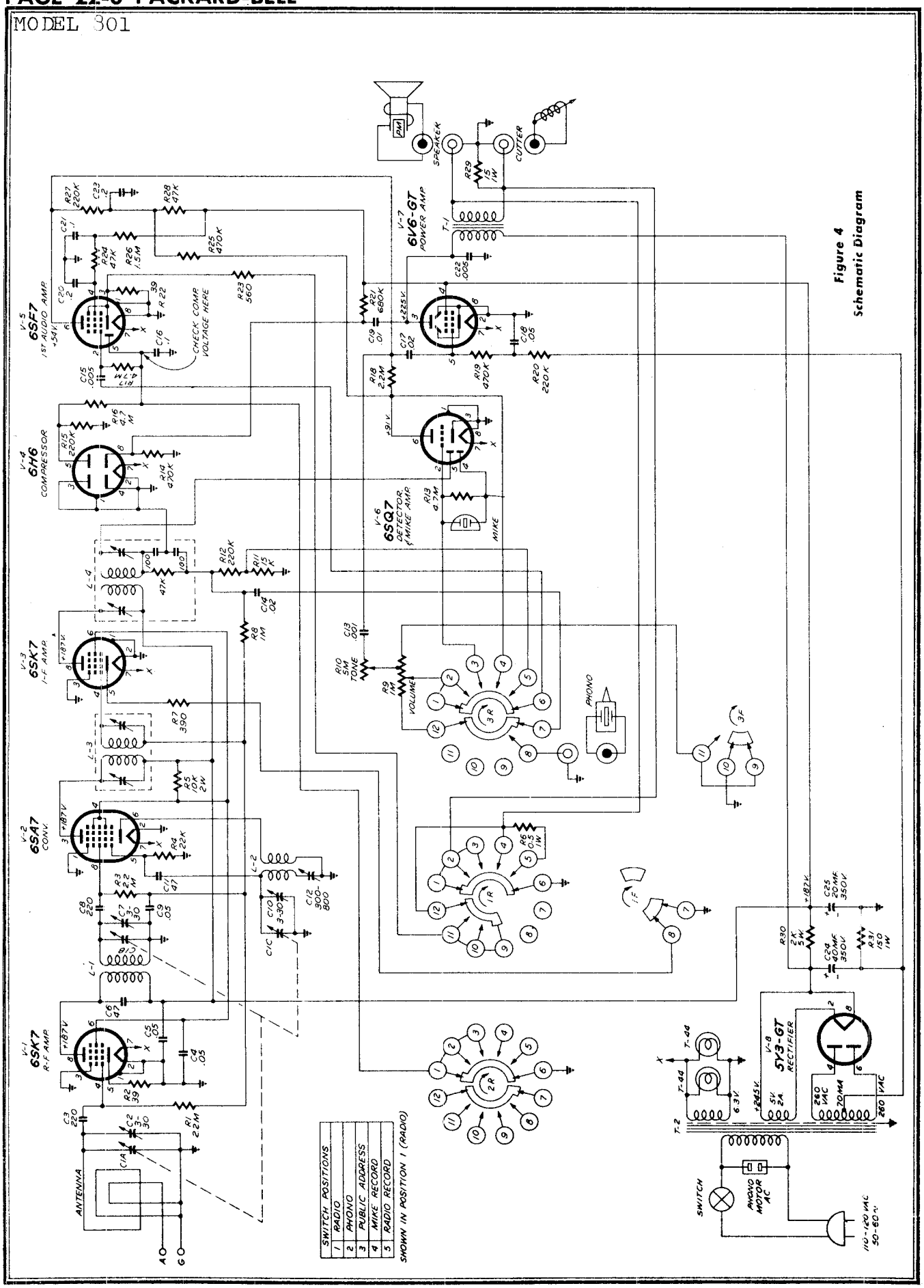
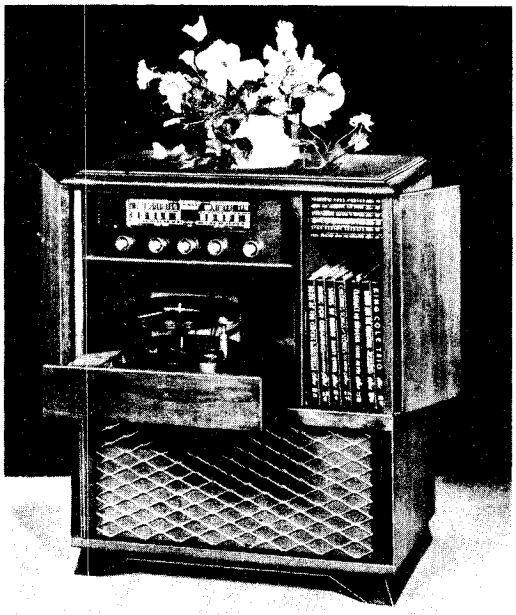


Figure 4
Schematic Diagram



Model 901

GENERAL DESCRIPTION

Model 901 is a console AM-FM radio-phonograph combination employing eight tubes plus one rectifier. Cabinet finishes are walnut, mahogany, maple and modern blonde oak.

SPECIFICATIONS

OVERALL DIMENSIONS:

Height	35"
Width	29"
Depth	18"
Shipping Weight	100 Lbs.

ELECTRICAL RATING:

Line Voltage	110-120, 50-60 C.P.S.
Power Consumption	90 watts @ 115 V.A.C.

TUNING FREQUENCY RANGE:

AM	540 to 1620 KC
FM	88 to 108 MC

INTERMEDIATE FREQUENCY:

AM	455 KC
FM	10.7 MC

ELECTRICAL POWER OUTPUT:

Maximum	6.0 watts
Undistorted	4.0 watts

LOUDSPEAKER:

Type	permanent magnet
Outside Cone Diameter	10"
Voice Coil Impedance	3.2 ohms @ 400 C.P.S.
Magnet Rating	3.16 Oz. Alnico V

TUBES:

Tube	No.	Function
6BA6	V-1	R-F Amplifier
6BA6	V-2	Mixer
6BA6	V-3	I-F Amplifier
6AU6	V-4	I-F Driver
6AL5	V-5	Ratio Detector
6AU6	V-6	Oscillator
5Y3-GT	V-7	Rectifier
6SF7	V-8	AM Detector-1st Audio Amplifier
6V6-GT	V-9	Power Amplifier

SPECIAL SERVICING INFORMATION

D. C. RESISTANCE MEASUREMENTS:

1st AM I-F Coil:

Primary	7.5 ohms
Secondary	7.5 ohms

2nd AM I-F Coil:

Primary	8.0 ohms
Secondary	8.0 ohms

1st FM I-F Coil:

Primary	0.75 ohms
Secondary	0.75 ohms

2nd FM I-F Coil:

Primary	1.5 ohms
Secondary	0.5 ohms

Ratio Detector:

Primary	1.5 ohms
Secondary	0.1 ohms
Each side to Tertiary	0.25 ohms

AM R-F Coil:

Primary	5.8 ohms
Secondary	4.2 ohms

AM Oscillator Coil:

Primary	1 ohm
Secondary	6 ohms

All D.C. Resistance measurements are subject to a 20% tolerance.

STAGE GAIN MEASUREMENTS AM:

Measurements taken with Volume and Tone Controls maximum; Band Switch in AM position; A.V.C. shorted to ground.

Standard Output—50 milliwatts . . . Dummy Antenna—200 Mmf.

Antenna to R-F Grid	12X at 1000 KC
R-F Grid to Converter Grid	9X at 1000 KC
Converter Grid to 1st I-F Grid	20X at 455 KC
1st I-F Grid to 2nd Detector	40X at 455 KC
Overall Audio Gain	30 millivolts to produce 50 milliwatts at 400 C.P.S.

STAGE GAIN MEASUREMENTS FM:

Measurements taken with Volume and Tone Controls maximum; Band Switch in FM position; A.V.C. shorted to ground.

Dummy Antenna—270 ohms.

Dipole Terminal to R-F Grid	0.9X at 98 MC
Converter Grid to 1st I-F Grid	12X at 10.7 MC
1st I-F Grid to Driver Grid	45X at 10.7 MC

SOCKET VOLTAGES

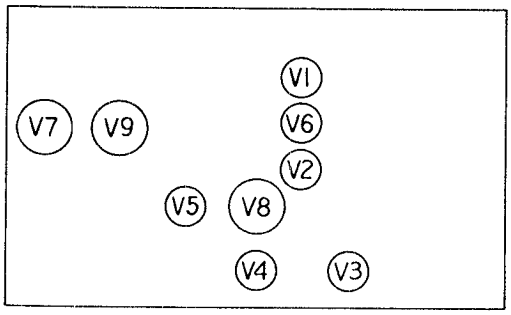


Figure 2 Tube Location Chart

The socket voltages shown were measured with the following conditions existant:

1. D.C. voltages measured from socket contacts to chassis with a D.C. vacuum tube voltmeter.
2. A.C. voltages measured with a 1,000 ohms per volt A.C. meter.
3. Volume and Tone Controls maximum.
4. Selector Switch in AM Radio position.
5. No signal.
6. All voltages are positive D.C. unless otherwise noted.
7. Voltage readings subject to a 10% variation.

VOLTAGES SHOWN IN PARENTHESIS WERE MEASURED WITH THE SELECTOR SWITCH IN FM POSITION.

V-1—6BA6, R-F Amplifier:

Pin	Element	Voltage
1	Grid 1	-.2 (-.5)
2	Grid 3	0
3	Heater	6.0 VAC
4	Heater	0
5	Plate	175 (160)
6	Grid 2	115 (90)
7	Cathode	2.35 (.4)

V-2—6BA6, Mixer:

Pin	Element	Voltage
1	Grid 1	-.4 (0)
2	Grid 3	0
3	Heater	0
4	Heater	6.0 VAC
5	Plate	180 (190)
6	Grid 2	140 (95)
7	Cathode	7.2 (2.1)

V-3—6BA6, I-F Amplifier:

Pin	Element	Voltage
1	Grid 1	-.3 (-.2)
2	Grid 3	0
3	Heater	6.0 VAC
4	Heater	0
5	Plate	135 (125)
6	Grid 2	135 (125)
7	Cathode	1.2 (1.1)

V-4—6AU6, F-M Driver (Used on F-M only):

Pin	Element	Voltage
1	Grid 1	0
2	Grid 3	0
3	Heater	6.0 VAC
4	Heater	0
5	Plate	165
6	Grid 2	165
7	Cathode	1.5

V-5—6AL5, FM Ratio Detector (Used on FM only):

Pin	Element	Voltage
1	Cathode 1	0
2	Plate 2	0
3	Heater	0
4	Heater	6.0 VAC
5	Cathode 2	.25
6	Shield	0
7	Plate 1	-.25

V-6—6AU6, Oscillator:

Pin	Element	Voltage
1	Grid 1	-6 (-1)
2	Grid 3	0
3	Heater	0
4	Heater	6.0 VAC
5	Plate	185 (170)
6	Grid 2	185 (170)
7	Cathode	0

V-7—5Y3-GT, Rectifier:

Pin	Element	Voltage
1	No Connection	0
2	Heater	320 (5.0 VAC to pin 8)
3	No Connection	0
4	Plate	340 VAC
5	No Connection	0
6	Plate	340 VAC
7	No Connection	0
8	Heater	320 (5.0 VAC to pin 2)

V-8—6SF7, 1st Audio—AM Detector:

Pin	Element	Voltage
1	Shield	0
2	Grid 1	-.5
3	Cathode & Grid 3	0
4	Grid 2	10
5	Diode Plate	-.7
6	Plate	80
7	Heater	6.0 VAC
8	Heater	0

V-9—6V6-GT, Power Amplifier:

Pin	Element	Voltage
1	No Connection	0
2	Heater	6.0 VAC
3	Plate	310
4	Grid 2	240
5	Grid 1	0
6	No Connection	0
7	Heater	0
8	Cathode	12.5

ALIGNMENT PROCEDURE

AM ALIGNMENT:

AM Alignment consists of the steps outlined in the AM Alignment Chart. Make certain each step is done with a minimum signal input.

Connect output meter to speaker voice coil.

AM ALIGNMENT CHART:

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	S-7, 8, 9, 10
2	R-F Grid & Ground	1500 KC	1500 KC	Trimmers F & G
3	R-F Grid & Ground	600 KC	600 KC	Padder B
4	R-F Grid & Ground	1500 KC	1500 KC	Trimmer A
5	Repeat Steps 2, 3, & 4 in sequence.			
6	Check Stationizing. Slide pointer on string if stations are uniformly off in one direction.			

FM ALIGNMENT:

It is important that the FM trimmers be adjusted in the sequence shown in the FM Alignment Chart. Rock variable for Steps 4 & 5.

FM ALIGNMENT CHART:

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	CONNECT VOLTMETER TO	ADJUST FOR MAX. OUTPUT
1	R-F Grid & Ground	10.7 MC	88 MC	Point I	S-11, 6, 4, 3
2	R-F Grid & Ground	10.7 MC	88 MC	Point H	S-12 for zero center
3	RECHECK STEPS 1 & 2				
4	Doublet terminals thru 270 ohms	108 MC	108 MC	Point I	Trimmers D, C & E
5	Doublet terminals thru 270 ohms	88 MC	88 MC	Point I	S-1 & 2
6	RECHECK STEPS 4 & 5				

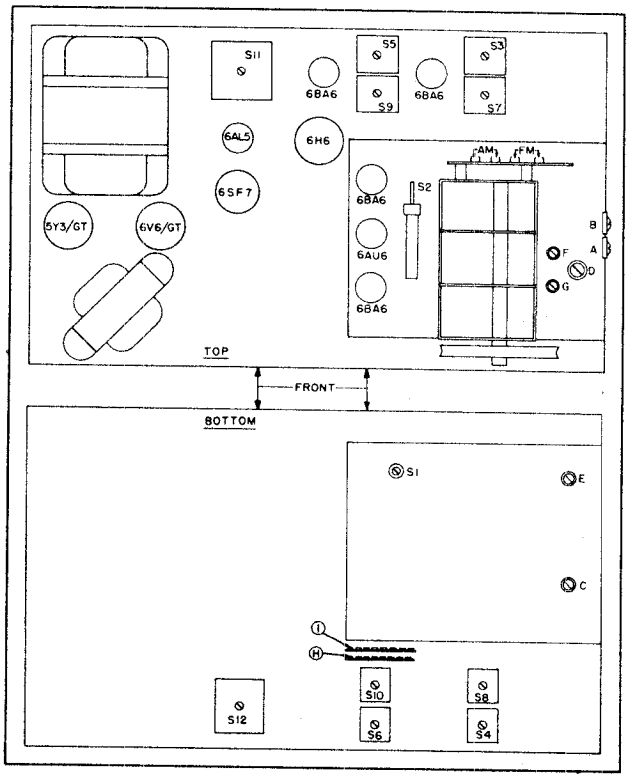


Figure 3 Trimmer Location

ALIGNMENT TRIMMERS:

A	AM Antenna Trimmer
B	600 KC Padder
C	FM R-F Trimmer (108 MC)
D	FM Oscillator Trimmer
E	FM Antenna Trimmer (108 MC)
F	AM Oscillator Trimmer
G	AM R-F Trimmer
S-1	FM Antenna (88 MC)
S-2	FM R-F (88 MC)
S-3	1st FM I-F Secondary (Top)
S-4	1st FM I-F Primary (Bottom)
S-5	2nd FM I-F Secondary (Top)
S-6	2nd FM I-F Primary (Bottom)
S-7	1st AM I-F Secondary (Top)
S-8	1st AM I-F Primary (Bottom)
S-9	2nd AM I-F Secondary (Top)
S-10	2nd AM I-F Primary (Bottom)
S-11	Ratio Detector Primary (Top)
S-12	Ratio Detector Secondary (Bottom)

MODEL 901

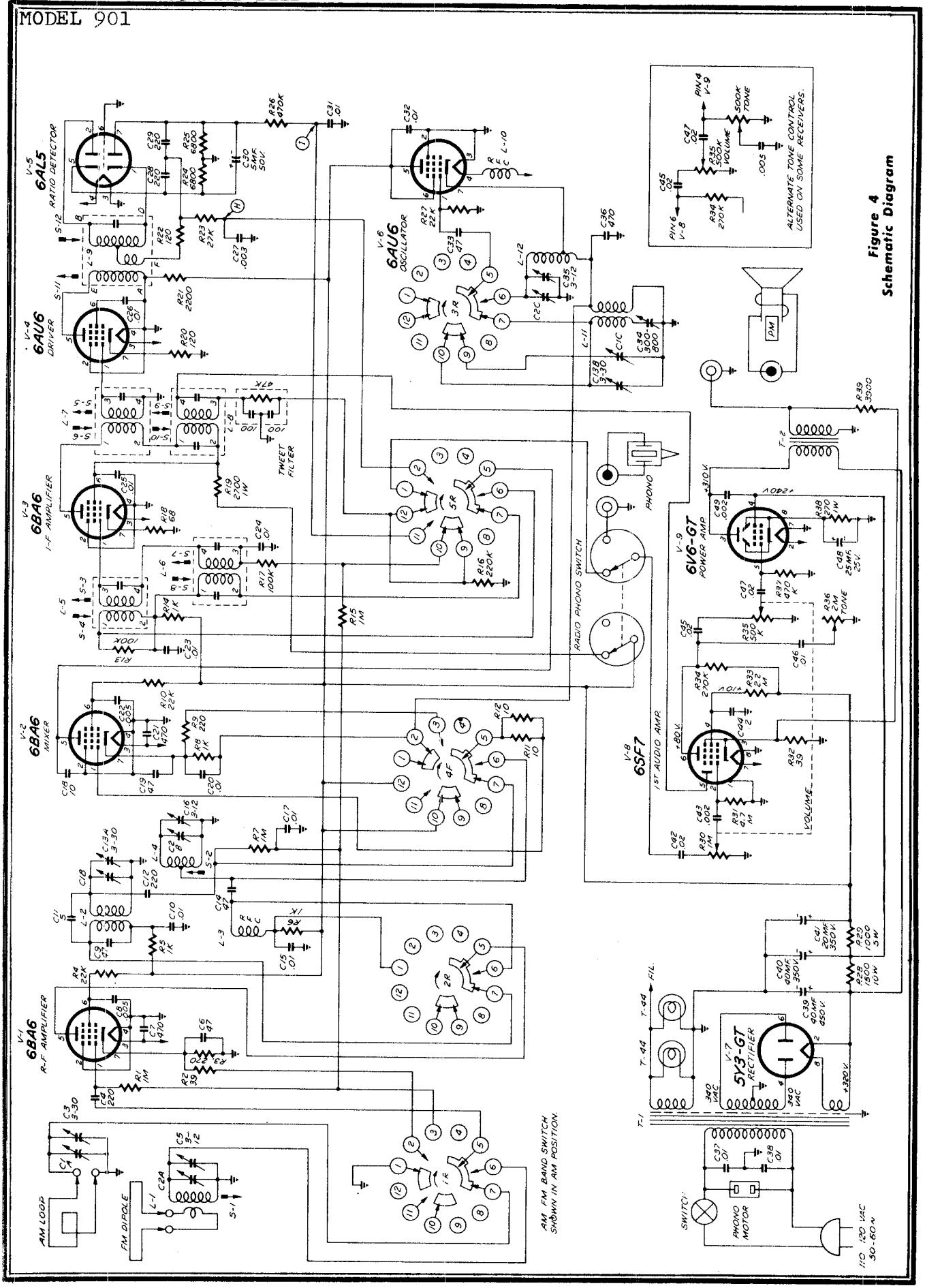


Figure 4
Schematic Diagram

TABLE OF REPLACEABLE PARTS

REF. SYMBOL	DESCRIPTION	PB PART NO.
	CAPACITOR, TUBULAR,	
C-43, 49	.002 Mfd. 600 volt	23002
C-42, 45, 47	.02 Mfd. 600 volt	23007
C-27	.003 Mfd. 600 volt	23016
C-44	.2 Mfd.400 volt	23020
C-10, 15, 17, 20, 23, 24, 25, 26, 31, 32, 46	.01 Mfd. 600 volt	23023
	CAPACITOR, TRIMMER,	
C-13A & B	Dual 3-30 Mmf.	23400
C-34	Padder, 300-800 Mmf.	23402
C-3	Single 3-30 Mmf.	23406
C-5, 16	Tubular 3-12 Mmf.	23408
C-35	Single 3-12 Mmf.	23412
	CAPACITOR, VARIABLE,	
C-1A, B, C, C-2A, B, C	3 gang AM-FM	23525
	CAPACITOR, CERAMIC,	
C-11	5 Mmf. 20%	23908
C-6, 9, 14	47 Mmf. 20% GP	23912
C-4, 12, 28, 29	220 Mmf. 20% GP	23915
C-2, 21, 36	470 Mmf. 20% GP	23916
C-18	10 Mmf. 10%	23923
	Tweet Filter	23930
C-8, 22	.005 Mfd. Hy-Kap	23931
C-37, 38	.01 Mfd.125 VAC	23932
	CAPACITOR, ELECTROLYTIC;	
C-48	25 Mfd. 25 volts	24006
C-39	40 Mfd. 450 volts	24030
C-30	5 Mfd.50 volts	24038
C-40	40 Mfd. 350 volts	24063
C-41	20 Mfd. 350 volts	24064
	CONTROLS,	
R-36	Tone, 2 megohms w/AC switch	25014
R-30, 35	Volume, 2 deck, 1 megohm & 500 K	25021

REF. SYMBOL	DESCRIPTION	PB PART NO.
	COILS,	
L-9	Ratio Detector	29018
L-6	1st I-F—AM	29041
L-5	1st I-F—FM	29042
L-8	2nd I-F—AM	29051
L-7	2nd I-F—FM	29044
L-2	AM—R-F	29102F
L-3, 10	R-F Choke	29104
L-4, 12	FM R-F Osc. (same form)	29109
L-11	AM Osc.	29205C
	Loop	29335A
L-1	FM Antenna	29409

TABLE OF REPLACEABLE PARTS

REF. SYMBOL	DESCRIPTION	PB PART NO.
	RESISTORS, ½ WATT, 10%,	
R-11, 12	10 ohms	73001
R-2, 32	39 ohms	73008
R-18	68 ohms	73011
R-20, 22	120 ohms	73014
R-9	220 ohms	73017
R-3	270 ohms	73018
R-5, 6, 8, 14	1,000 ohms	73025
R-21	2,200 ohms	73029
R-39	3,900 ohms	73032
R-24, 25	6,800 ohms	73035
R-4, 10, 27	22,000 ohms	73041
R-23	27,000 ohms	73042
R-34	270,000 ohms	73054
	RESISTORS, ½ WATT, 20%,	
R-13, 17	100,000 ohms	73149
R-16	220,000 ohms	73153
R-26, 37	470,000 ohms	73157
R-1, 7, 15	1 megohm	73161
R-33	2.2 megohms	73165
R-31	4.7 megohms	73169
	RESISTORS, 1 WATT, 10%,	
R-38	270 ohms	73218
R-19	2,700 ohms	73230
	RESISTORS, WIRE WOUND,	
R-29	1,000 ohms, 10 watt, 10%	73623
R-28	1,500 ohms, 10 watt, 10%	73629
	TRANSFORMERS,	
T-1	Power, plate winding 105 MA @ 340 volts to center tap	89024
T-2	Output, 5,000 to 3.2 ohms	89409
	SOCKETS,	
	Tube, Std. octal	79002
	AC Motor	79007
	Lamp—Comp. light	79010
	Dual—Phono and speaker	79018
	Antenna	79045
	Tube, 7 pin miniature	79051
	PLUGS,	
	Antenna, (pin type)	66001
	Speaker & Phono	66004
	MISC. PARTS,	
	Cabinet (specify finish)	21117
	AC Cord 8'	32003
	Dial, Stationized	38122
	Lamp, T-47	54001
	3-Speed Record Changer V-M 950	58037
	3-Speed Record Changer Webster 100-11	58036
	Dial Pointer	67030
	Loudspeaker, 10" PM	83705
	Radio-Phono Switch	86008
	Band Switch	86017C

MODEL 602

GENERAL DESCRIPTION

Model 602 is a six tube superheterodyne receiver contained in a table model cabinet of natural or bleached mahogany finish.

Production of this model is divided into two sections: these sections are referred to as "Early" and "Late". There are two major differences between early and late production:

1. Dual 4" PM speakers were used in early production, while late production used a single 4 x 6" PM speaker.
2. Miniature tubes are used throughout in later production.

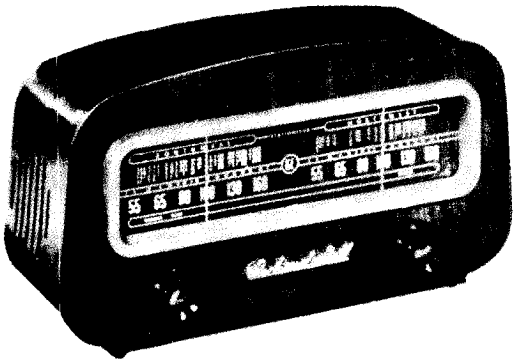


Figure 1

Model 602 "Early"

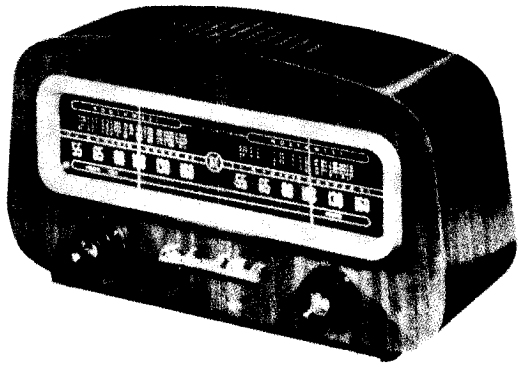


Figure 2

Model 602 "Late"

SPECIFICATIONS

OVERALL DIMENSIONS:

Height — 8½" Width — 13⅜"
Depth — 6" Weight — 7 Lbs.

ELECTRICAL RATING:

Line Voltage — 110-120 volts A.C. or D.C.
Power Consumption — 28 watts

TUNING FREQUENCY RANGE:

540 to 1620 KC

INTERMEDIATE FREQUENCY:

455 KC

ELECTRICAL POWER OUTPUT (MAXIMUM):

1.7 watts

LOUDSPEAKER:

Type — permanent magnet
Outside Cone Diameter — 4" (4 x 6" "Late")
Voice Coil Impedance — 3.2 ohms @ 400 C.P.S.
Magnet Rating — .68 Oz. Alnico V

TUBE COMPLEMENT:

Tubes shown in parenthesis indicate late production.

NO.	TUBE	FUNCTION
V-1	6BJ6	R-F Amplifier
V-2	12SA7 (12BE6)	Frequency Converter
V-3	6BJ6	I-F Amplifier
V-4	12SQ7 (12AT6)	2nd Detector — 1st Audio
V-5	50L6-GT (50C5)	Power Amplifier
V-6	35Z5-GT (35W4)	Rectifier

SPECIAL SERVICE INFORMATION

D.C. RESISTANCE MEASUREMENTS:

1st I-F Coil:
Primary — 11.8 ohms
Secondary — 11.5 ohms
2nd I-F Coil:
Primary — 12.2 ohms
Secondary — 11.5 ohms
Oscillator Coil:
Primary — 1 ohm
Secondary — 5.5 ohms

OSCILLATOR CATHODE VOLTAGES:

Measured with an A.C. vacuum tube voltmeter (input impedance above 10 megohms) at 117 volts A.C. line.

1500 KC — 1.0 VAC
1000 KC — 1.0 VAC
750 KC — 1.1 VAC
540 KC — 1.1 VAC

SOCKET VOLTAGES:

The voltages shown were measured under the following conditions:

1. D.C. Voltages with a vacuum tube voltmeter from socket contacts to B minus buss.
2. Filament voltages measured with a 1,000 ohms per volt meter across the filament of each tube.
3. Volume and Tone Controls maximum.
4. 117 volts A.C. line.
5. Voltages are positive D.C. unless otherwise noted.
6. Voltages are subject to a 10% variation.

V-1 — 6BJ6, R-F Amplifier

Pin	Element	Voltage
1	Grid 1	—3.5
2	Cathode	.25
3	Heater	6.0 VAC
4	Heater	6.0 VAC
5	Plate	60
6	Grid 2	85
7	Grid 3	0

V-2 — 12SA7, Frequency Converter

Pin	Element	Voltage
1	Grid 5	0
2	Heater	12.0 VAC
3	Plate	85
4	Grids 2 & 4	85
5	Grid 1	—11
6	Cathode	0
7	Heater	12.0 VAC
8	Grid 3	—3.5

V-2 — 12BE6, Frequency Converter

Pin	Element	Voltage
1	Grid 1	—11
2	Cathode	0
3	Heater	12.0 VAC
4	Heater	12.0 VAC
5	Plate	85
6	Grids 2 & 4	85
7	Grid 3	—3.5

V-4 — 12AT6, 2nd Detector — 1st Audio

Pin	Element	Voltage
1	Grid	—.6
2	Cathode	0
3	Heater	12.0 VAC
4	Heater	12.0 VAC
5	Plate Diode	—.4
6	Plate Diode	—.4
7	Plate	56

V-5 — 50L6-GT, Power Amplifier

Pin	Element	Voltage
1	No Conn.	0
2	Heater	50.0 VAC
3	Plate	105
4	Grid 2	105
5	Grid 1	—10
6	No Conn.	0
7	Heater	50.0 VAC
8	Cathode	5.6

V-5 — 50C5, Power Amplifier

Pin	Element	Voltage
1	Grid 3-Cathode	5.6
2	Grid 1	—10
3	Heater	50.0 VAC
4	Heater	50.0 VAC
5	Grid 1	—10
6	Grid 2	105
7	Plate	105

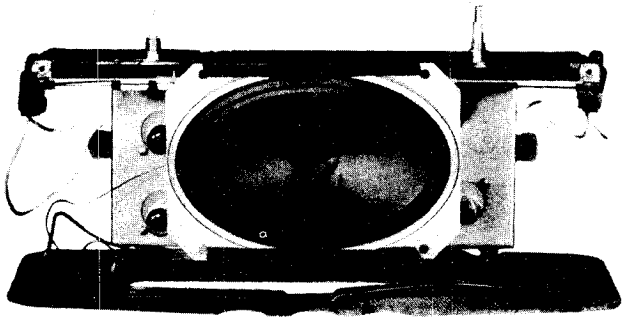


Figure 3

Top View of 602 "Late" Chassis

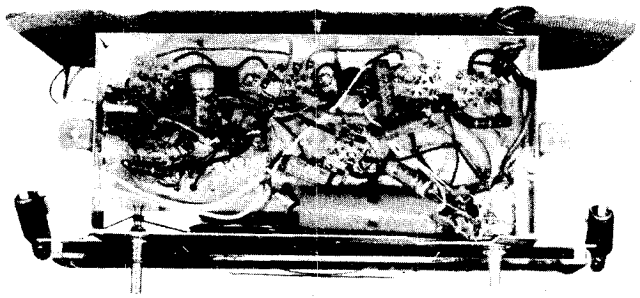


Figure 4

Bottom View of 602 "Late" Chassis

V-3 — 6BJ6, I-F Amplifier

Pin	Element	Voltage
1	Grid 1	—3.5
2	Cathode	1.15
3	Heater	6.0 VAC
4	Heater	6.0 VAC
5	Plate	85
6	Grid 2	85
7	Grid 3	0

V-4 — 12SQ7, 2nd Detector — 1st Audio

Pin	Element	Voltage
1	Shield	0
2	Grid	—.6
3	Cathode	0
4	Diode Plate	—.4
5	Diode Plate	—.4
6	Plate	56
7	Heater	12.0 VAC
8	Heater	12.0 VAC

V-6 — 35Z5-GT, Rectifier

Pin	Element	Voltage
1	No Conn.	0
2	Heater	35.0 VAC
3	Heater Tap (Dial Lite)	6.0 VAC to pins 2 or 7
4	No Conn.	0
5	Plate	109 VAC
6	No Conn.	0
7	Heater	35.0 VAC
8	Cathode	120

V-6 — 35W4, Rectifier

Pin	Element	Voltage
1	No Conn.	0
2	No Conn.	0
3	Heater	35.0 VAC
4	Heater	35.0 VAC
5	Plate	109 VAC
6	Heater Tap	6.0 VAC
7	Cathode	120

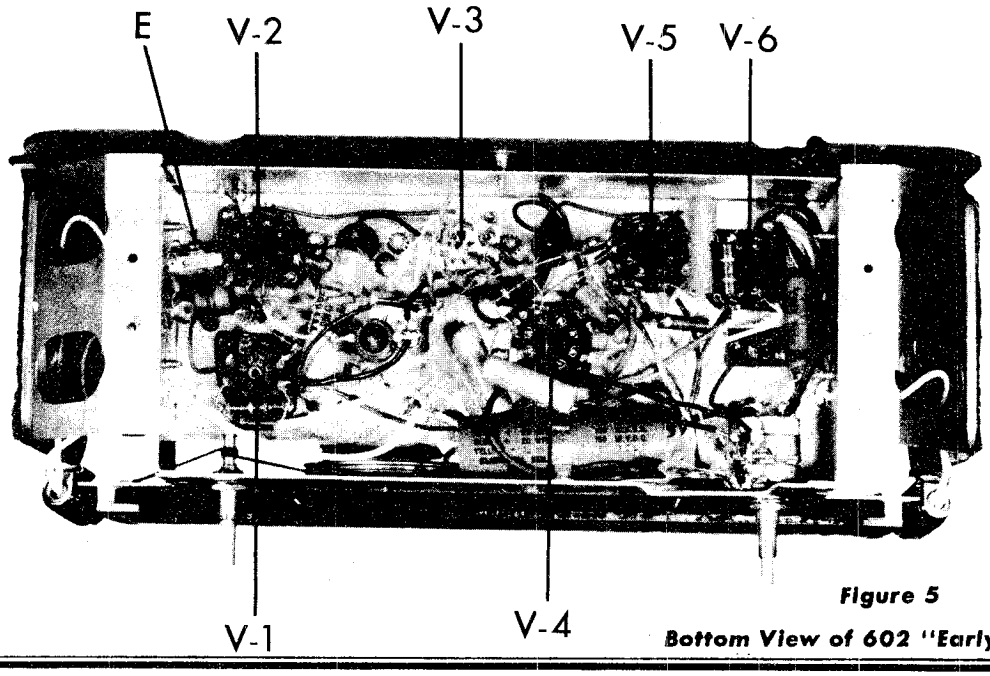


Figure 5

Bottom View of 602 "Early" Chassis

MODEL 602

ALIGNMENT PROCEDURE

Alignment procedure consists of the steps outlined in the Alignment Chart. See Figures 5 and 6 for location of trimmers. Make certain each step is done with a minimum input signal. Connect output meter to speaker voice coil.

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	Trimmers A, B, C & D
2	Mixer Grid & Ground	455 KC	540 KC	Trimmer E for minimum output
3	Mixer Grid & Ground	1620 KC	1620 KC	Trimmer F
4	Test Loop	1500 KC	1500 KC	Trimmer G
5	REPEAT STEPS 3 & 4			
6	CHECK STATIONIZING. SLIDE POINTER ON STRING IF STATIONS ARE UNIFORMLY OFF IN ONE DIRECTION.			

A, B, C, D — I-F Trimmers

E — I-F Trap

F — Osc. Trimmer

G — Ant. Trimmer

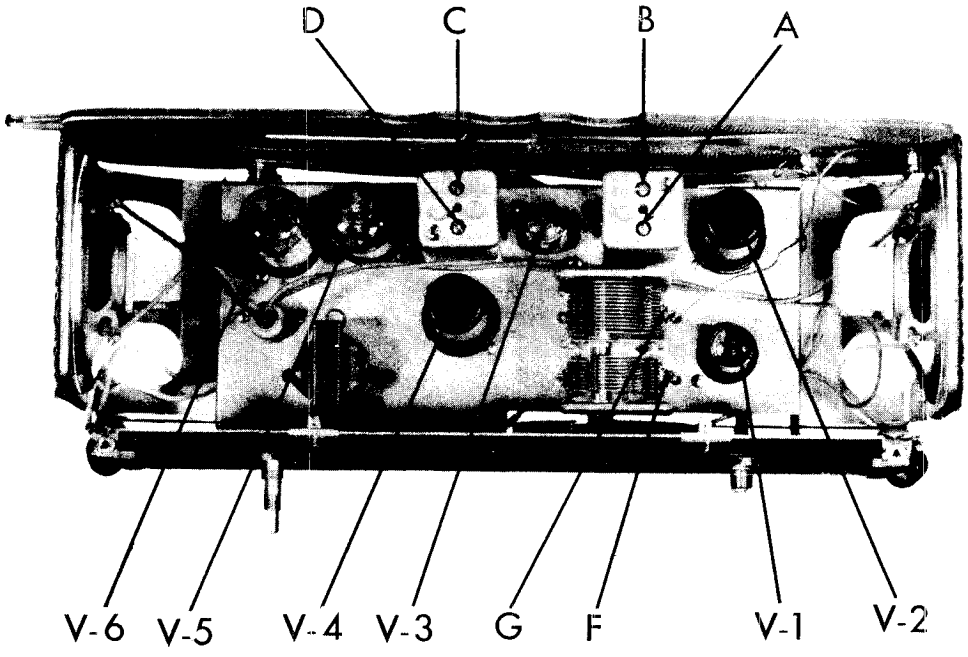


Figure 6

Top View of 602 "Early" Chassis

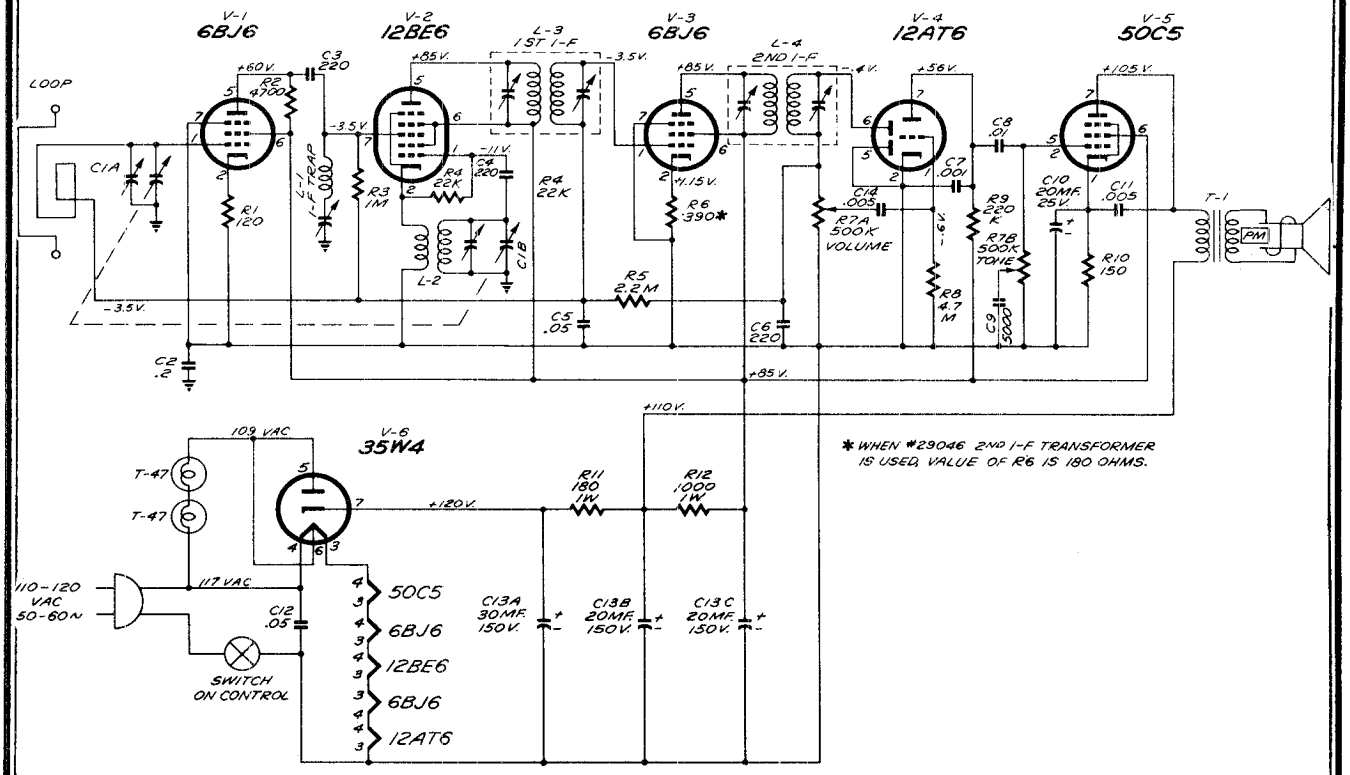


Figure 7

Schematic Diagram 602 "Late"

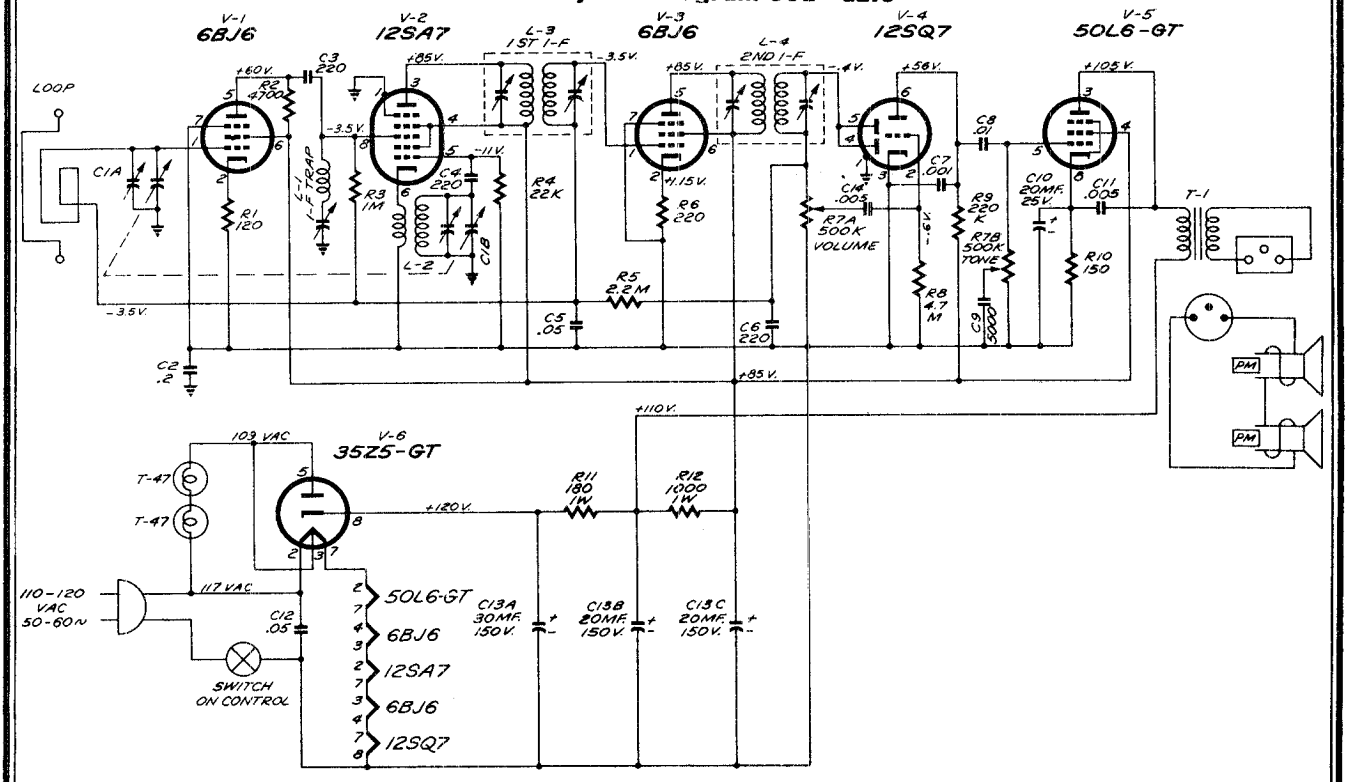


Figure 8

Schematic Diagram 602 "Early"

TABLE OF REPLACEABLE PARTS

COILS

REF. SYMBOL	DESCRIPTION	P. B. PART NO.
L-1	I-F Trap	29005
L-2	Oscillator	29220
L-3	1st I-F, 455 KC	29059
	(Alternate)	29004E
L-4	2nd I-F, 455 KC	29060
	(Alternate)	29046

CAPACITORS

REF. SYMBOL	DESCRIPTION	P. B. PART NO.
C1A & B	Variable, 2 gang	23529
C-2	Tubular, .2 Mfd. 200 volt	23018
C-3	Ceramic, 220 Mmf. 500 volt	23915
C-4	Ceramic, 220 Mmf. 500 volt	23915
C-5	Tubular, .05 Mfd. 200 Volt	23017
C-6	Ceramic, 220 Mmf. 500 volt	23915
C-7	Tubular, .001 Mfd. 600 volt	23001
C-8	Tubular, .01 Mfd. 600 volt	23006
C-9	Ceramic, 5000 Mmf. 500 volt	23931
C-10	Electrolytic, 20 Mfd. 25 volt (part of C-13 A, B, & C)	24034B
C-11	Tubular, .005 Mfd. 600 volt	23004
C-12	Tubular, .05 Mfd. 200 volt	23017
C-13 A, B, C	Electrolytic, 30-20-20 Mfd. 150 volt	24034B
C-14	Tubular, .005 Mfd. 600 volt	23004

CONTROLS

REF. SYMBOL	DESCRIPTION	P. B. PART NO.
R-7 A & B	Volume & Tone (Dual) 500,000 ohms	25024

TRANSFORMERS

REF. SYMBOL	DESCRIPTION	P. B. PART NO.
T-1	Output, 2,500 to 6 ohms (dual speakers)	89433
T-1	Output, 2,500 to 3.2 ohms (single speaker)	89417

RESISTORS

REF. SYMBOL	DESCRIPTION	P. B. PART NO.
R-1	Carbon, 120 ohms, ½ watt, 10%	73014
R-2	Carbon, 4,700 ohms ½ watt, 10%	73033
R-3	Carbon, 1 megohm, ½ watt, 20%	73161
R-4	Carbon, 22,000 ohms, ½ watt, 10%	73041
R-5	Carbon, 2.2 megohms, ½ watt, 20%	73165
R-6	Carbon, 220 ohms, ½ watt, 10%	73017
R-8	Carbon, 4.7 megohms, ½ watt, 20%	73169
R-9	Carbon, 220,000 ohms, ½ watt, 20%	73153
R-10	Carbon, 150 ohms, ½ watt, 10%	73015
R-11	Carbon, 180 ohms, 1 watt, 10%	73216
R-12	Carbon, 1,000 ohms, 1 watt, 10%	73225

MISC. PARTS

DESCRIPTION		P. B. PART NO.
Cabinet (2 speakers—"Early")	walnut	602 BG
	bleach	602 AL
Cabinet (1 speaker—"Late")	walnut	612 BG
	bleach	612 AL
Loop Antenna		29341
A. C. Cord, 6 ft.		32011
Dial, stationized		38126
Dial Escutcheon		41040
Tuning Knob		52055A
Volume Knob		52057A
Tone Knob		52056A
Dial Lamp, T-47		54002
Speaker Plug		66013
Dial Pointer		67036
Tube Socket, octal ("Early")		79002
Speaker Socket		79004
Tube Socket, 7 pin minature		79081
Tube Socket, 7 pin minature, W/shield		79088
Speaker, 4" P.M. ("Early")		83007
Speaker, 4 x 6 P.M. ("Late")		83105B

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts; 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION INCLUDING RECORD CHANGER: 115 Watts.

TUNING RANGE:

Broadcast Band:	540 to 1650 Kilocycles (182 to 555 Meters)
F-M Band:	87.5 to 108.5 Megacycles (2.7 to 3.4 Meters)

DIAL SCALE: The Dial Scale is calibrated in Kilocycles times 10 for the Broadcast Band, and in Megacycles for the F-M Band, corresponding to newspaper or periodical listings.

TUBES: The Tubes used, and their functions, are as follows:

12AT7	R-F Amplifier and Mixer (F-M)
6BE6	A-M Converter and F-M Oscillator
6BA6	1st I-F Amplifier (A-M & F-M)
6BA6	2nd I-F Amplifier (F-M)
6AL5	F-M Detector
6AV6	A-M Detector, A.V.C. and Audio Amp.
6V6GT	Beam Power Amplifier
5Y3GT	Rectifier

For the placement of these tubes, refer to the diagram on page 3 of this folder.

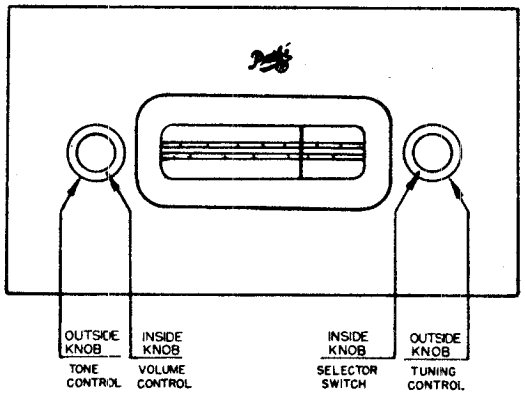


FIG. 1—FRONT PANEL CONTROLS

INSTALLATION: This receiver is complete in every detail for efficient and immediate operation. The following installation procedure should be followed in setting up the receiver for use:

(1) Remove all packing material.

(2) Examine the tubes on the receiver chassis and be sure that they are firmly in their sockets.

(3) Remove all shipping screws from the receiver and record changer compartments as noted on the attached instruction tags. Failure to remove the shipping screws from the rubber cushioned chassis brackets retaining the receiver chassis in place during shipment, may cause microphonic howl.

(4) Retain all screws and hardware removed from the receiver chassis and record changer for future re-use in shipping.

During the alignment procedure all adjustments should be made under the following conditions:

(A) Line voltage set at 117 Volts A.C.

(B) Volume control at maximum position.

(C) Tone control set at extreme left position (Treble).

(D) Minimum input from the signal generator. This procedure should be adhered to, otherwise adjustments will be broad, due to the action of the automatic volume control.

Refer to the trimmer and tube location diagram below for trimmer and core locations. Follow the sequence in the alignment chart for proper procedure.

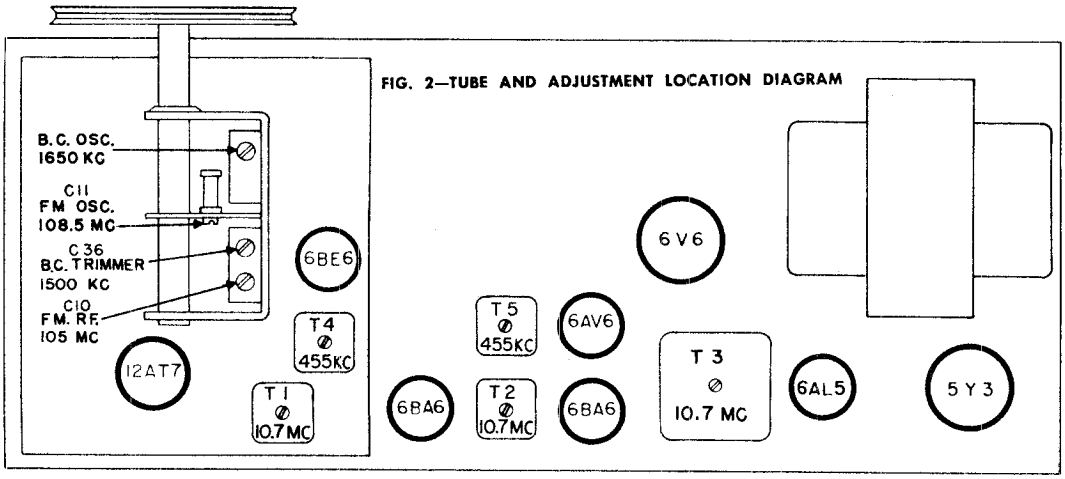


FIG. 2—TUBE AND ADJUSTMENT LOCATION DIAGRAM

29.463

ALIGNMENT CHART

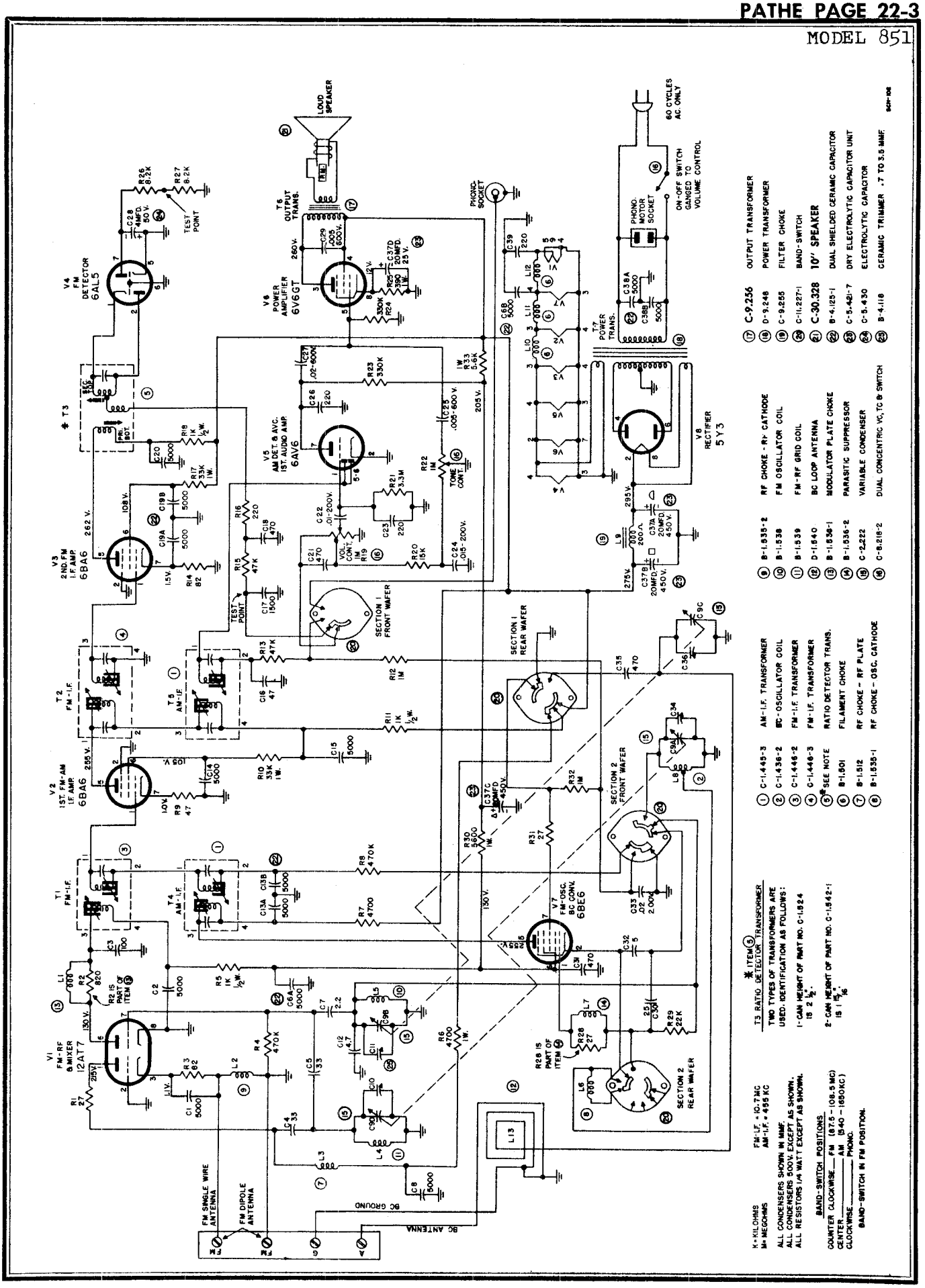
STEP	CIRCUIT ALIGNED	RECEIVER DIAL AT	SIGNAL GENERATOR			METER		ADJUST	METER INDICATION
			TYPE	FREQ.	CONNECTIONS	TYPE	CONNECTIONS		
1	B.C. I.F.	B.C. BAND MAX. FREQ.	A.M.	455 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T4 & T5	MAX. OUTPUT
PREFERRED METHOD 2	F.M. I.F.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.	HIGH SIDE THROUGH .005 MF. (APPROX.) CAP TO PIN 7 OF 12AT7	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T1 & T2; BOT. OF T3	MAX. OUTPUT
ALTERNATE METHOD 2			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 3	F.M. DET.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TOP OF T3	MAX. OUTPUT
ALTERNATE METHOD 3			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEG. TO JUNCTION OF 8.2K'S AT 6AL5; POS. TO JUNCTION OF R15 & C17.		ZERO BETWEEN TWO OPPOSITE POLARITY PEAKS
PREFERRED METHOD 4	F.M. OSC.	F.M. BAND MAX. FREQ.	F.M.	108.5 MC. 30% MOD.	EACH SIDE OF GEN. OUTPUT THROUGH 150 OHM RESISTOR TO F.M. ANT. TERMINALS	OUTPUT	ACROSS VOICE COIL	TRIMMER ON TOP CENTER OF VAR. COND. (C11)	MAX. OUTPUT
ALTERNATE METHOD 4			R.F. OR A.M.	108.5 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 5	F.M. R.F.	F.M. BAND 105 MC	F.M.	105 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TRIMMER AT REAR OF VAR. COND. (C10)	MAX. OUTPUT
ALTERNATE METHOD 5			R.F. OR A.M.	105 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
6	B.C OSC.	B.C. BAND MAX. FREQ.	A.M.	1650 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TRIMMER AT FRONT OF VAR. COND (C34).	MAX. OUTPUT
7	B.C. R.F.	B.C. BAND 1500 KC	A.M.	1500 KC 30% MOD.	EACH SIDE OF GEN. OUTPUT TO 2 OR 3-TURN LOOP (1 FOOT DIA.) SEVERAL FEET FROM ANT.	OUTPUT	ACROSS VOICE COIL	B.C. TRIM. AT REAR OF VAR. COND. (C36).	

29.498

NOTES:

1- TURN VOLUME CONTROL FULLY CLOCKWISE.
2- MAINTAIN SIGNAL INPUT LOW ENOUGH TO HAVE LESS THAN 2 VOLTS ACROSS METERS.
3- UNLESS OTHERWISE NOTED, CONNECT LOW SIDE OF SIGNAL GENERATOR TO CHASSIS.
4- UNLESS OTHERWISE NOTED, SET VARIABLE CONDENSER TO MINIMUM CAPACITY (MAX. FREQ.)
5- USE PROPER TOOL FOR SMALL I.F. TRANS. ADJUSTMENTS— I.E., .150 DIA. BAKELITE WITH BLADE .075 THICK.
6- MAINTAIN 60 CYCLE LINE VOLTAGE AT APPROX. 117 VOLTS.

MODEL 851



K = KILOHMS
M = MEGOHMS

ALL CONDENSERS SHOWN IN MMF.
ALL CONDENSERS 500V. EXCEPT AS SHOWN.
ALL RESISTORS 1/4 WATT EXCEPT AS SHOWN.

BAND-SWITCH POSITIONS
COUNTER CLOCKWISE — FM (87.5 - 108.5 MC)
CENTER — AM (540 - 1650 KC)
CLOCKWISE — PHONO.
BAND-SWITCH IN FM POSITION.

FM-I.F. = 10.7 MC
AM-I.F. = 455 KC

*ITEM (5) T3 RATIO DETECTOR TRANSFORMER
TWO TYPES OF TRANSFORMERS ARE USED. IDENTIFICATION AS FOLLOWS:
1-CAN HEIGHT OF PART NO. C-1.824 IS 2 1/2".
2-CAN HEIGHT OF PART NO. C-1.842-1 IS 1 15/16".

①	C-1.445-3	AM-I.F. TRANSFORMER	⑧	B-1.835-2	RF CHOKE - RF CATHODE	⑰	C-9.256	OUTPUT TRANSFORMER
②	C-1.436-2	BC-OSCILLATOR COIL	⑩	B-1.838	FM OSCILLATOR COIL	⑱	D-9.248	POWER TRANSFORMER
③	C-1.446-2	FM-I.F. TRANSFORMER	⑪	B-1.839	FM-RF GRID COIL	⑲	C-9.255	FILTER CHOKE
④	C-1.446-3	FM-I.F. TRANSFORMER	⑫	D-1.840	BC LOOP ANTENNA	⑳	C-11.227-1	BAND-SWITCH
⑤	*SEE NOTE	RATIO DETECTOR TRANS.	⑬	B-1.838-1	MODULATOR PLATE CHOKE	㉑	C-30.328	10" SPEAKER
⑥	B-1.801	FILAMENT CHOKE	⑭	B-1.836-2	PARASITIC SUPPRESSOR	㉒	B-4.125-1	DUAL SHIELDED CERAMIC CAPACITOR
⑦	B-1.512	RF CHOKE - RF PLATE	⑮	C-2.222	VARIABLE CONDENSER	㉓	C-5.421-7	DRY ELECTROLYTIC CAPACITOR UNIT
⑧	B-1.835-1	RF CHOKE - OSC. CATHODE	⑯	C-8.218-2	DUAL CONCENTRIC VC, TC & SWITCH	㉔	C-5.430	ELECTROLYTIC CAPACITOR
						㉕	B-4.118	CERAMIC TRIMMER .7 TO 3.6 MMF

SCP-98

SPECIFICATIONS

CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1605 kc.
AUDIO OUTPUT	1.2 watts
POWER INPUT	5.5 amperes at 6.6 volts, d.c.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	6BA6 (2), 6BE6, 6AV6, 6AS5, 6X4

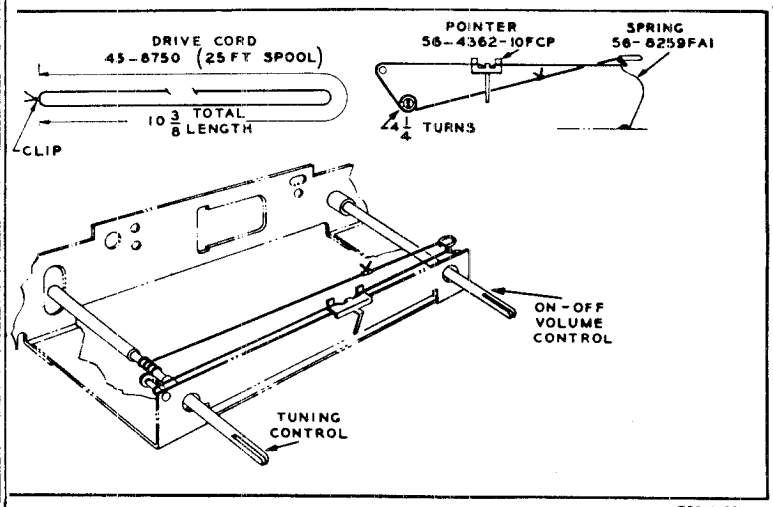


Figure 1. Drive-Cord Installation Details

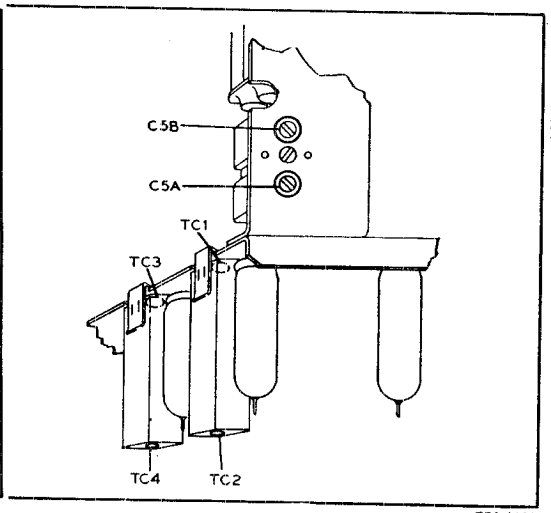


Figure 2. View Showing Trimmer Locations

ALIGNMENT PROCEDURE

OUTPUT METER — Connect across voice coil.

SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

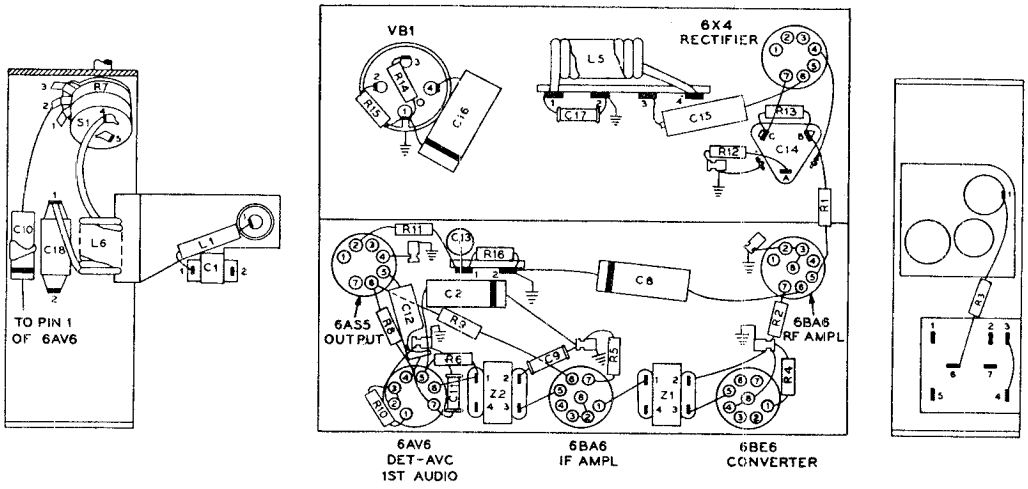
RADIO CONTROLS — Set volume control to maximum, and tuning control as indicated in chart.

OUTPUT LEVEL — During alignment, attenuate signal generator to maintain an output-meter indication below 1.5 volts.

DUMMY AERIAL — Connect signal-generator output lead through a 30-$\mu\mu f$. condenser to aerial socket; connect a 30-$\mu\mu f$. condenser from aerial socket to ground.

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .05-μf. condenser to converter grid (pin 7 of 6BE6).	455 kc.	Maximum counterclockwise	Adjust cores, in order given, for maximum output. TC1 and TC3 are reached through holes in bottom of i-f transformers.	TC4—2nd i-f sec. TC3—2nd i-f pri. TC2—1st i-f sec. TC1—1st i-f pri.
2	Through dummy aerial.	1605 kc.	1605 kc.	Adjust for maximum output.	C5B—osc. trimmer C5A—r-f trimmer C1—aerial trimmer
3			Tune to weak station near 1600 kc.	Readjust trimmer C1, with radio installed in car and aerial fully extended.	C1—aerial trimmer

MODEL . CR-501



TPO-1191

Figure 3. View Showing Locations of Components

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

Reference Symbol	Description	Service Part No.
C1	Condenser, aerial trimmer	31-6502
C2	Condenser, a-v-c filter, .047 μf.	45-3505-45*
C3	Condenser, d-c blocking, 10 $\mu\mu f$.	Part of C5
C4	Condenser, r-f fixed trimmer, 225 $\mu\mu f$.	Part of C5
C5	Condenser, 2-section trimmer	31-6522
C5A	Condenser, r-f trimmer	Part of C5
C5B	Condenser, oscillator trimmer	Part of C5
C6	Condenser, fixed osc. trimmer, 385 $\mu\mu f$.	Part of C5
C7	Condenser, d-c blocking, 56 $\mu\mu f$.	Part of C5
C8	Condenser, by-pass, .047 μf.	45-3505-45*
C9	Condenser, i-f filter, 220 $\mu\mu f$.	62-122001001
C10	Condenser, d-c blocking, .0047 μf.	45-3505-56*
C11	Condenser, plate by-pass, 220 $\mu\mu f$.	62-122001001
C12	Condenser, d-c blocking, .01 μf.	45-3505-41*
C13	Condenser, tone compensation, .01 μf.	45-3505-58*
C14	Condenser, 3-section electrolytic	61-0068A
C14A	Condenser, cathode by-pass, 20 μf.	Part of C14
C14B	Condenser, filter, 10 μf.	Part of C14
C14C	Condenser, filter, 10 μf.	Part of C14
C15	Condenser, buffer, .0082 μf., 1000v	30-4651-2*
C16	Condenser, line filter, .5 μf.	61-0137*
C17	Condenser, hash filter, 330 $\mu\mu f$.	62-133001001
C18	Condenser, hash filter, 330 $\mu\mu f$.	62-133001001
F1	Fuse, 14-amp.	45-2559
I1	Pilot lamp, brown bead, bayonet, .15 amp. at 6.3v	34-2068
L1	Choke, aerial	32-4422-24
L2	Coil, aerial	Part of Z3
L3	Coil, r-f	Part of Z3
L4	Transformer, oscillator	Part of Z3
L5	Choke, line filter	32-4170
L6	Choke, "A" lead hash filter	32-1374
LS1	Speaker	36-1636-1
R1	Resistor, plate load, 10,000 ohms	66-3108340*
R2	Resistor, cathode bias, 470 ohms	66-1478340*
R3	Resistor, grid return, 820,000 ohms	66-4828340*
R4	Resistor, grid return, 22,000 ohms	66-3228340*
R5	Resistor, cathode bias, 560 ohms	66-1568340*
R6	Resistor, diode load, 2.2 megohms	66-5228340*
R7	Volume control, 350,000 ohms (with off-on switch)	33-5556-7
R8	Resistor, plate load, 220,000 ohms	66-4228340*
R9	Resistor, dropping, 4300 ohms	66-2403340*
R10	Resistor, grid return, 10 megohms	66-6108340*
R11	Resistor, grid return, 470,000 ohms	66-4478340*
R12	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340*
R13	Resistor, filter, 1000 ohms, 1 watt	66-2104340*
R14	Resistor, damping, 82 ohms, 1 watt	66-0824340*
R15	Resistor, damping, 82 ohms, 1 watt	66-0824340*
R16	Resistor, feed back voltage divider, 10,000 ohms	66-3108340*
S1	Switch, off-on	Part of R7
T1	Transformer, output	32-8450
T2	Transformer, power	32-8451
VB1	Vibrator	45-6307
Z1	Transformer, 1st i-f	32-4160A
Z2	Transformer, 2nd i-f	32-4161A
Z3	Tuner, complete with coils and tuning cores	76-6011

MISCELLANEOUS

Description	Service Part No.
"A" lead	41-3910-11
Bezel	56-8247FA8
Clip, grounding spring, brass (2 required)	57-1335
Clip, pilot-lamp mounting	56-3545-5FA3
Cover, top (tube side)	56-8274FJ52
Dial backplate	56-8273FA3
Dial scale	54-5096
Drive cord, 25-foot spool	45-8750*
Fuse lead	41-3910-12
Housing	76-6135FJ52
Knob assembly (2 required)	27-4687-15
Master Kit	
Bolt, carriage, No. 10-24, 3/4" long (2 required)	1W18005FA3
Condenser, interference filter	30-4007
Lock washer, No. 10 (2 required)	1W24258FA1
Nut, No. 10-24 (2 required)	1W19990FA3
Resistor, distributor	33-1196
Screw, drive, No. 10, 5/8" long (2 required)	1W19765FA3
Screw, drive, slotted hex-head, No. 8 x 3/8" (2 required)	1W19751FA3
Screw, drive, slotted hex-head, No. 10 x 1-1/2"	1W19770FA3
Washer, No. 10, 1-1/4" diameter	1W52359FA3
Washer, flat (2 required)	1W52692FA3
Pilot-lamp assembly	27-6233-4*
Pointer	56-4362-10FCP
Socket, aerial	57-1243FA3
Socket, miniature, with center shield	27-6203
Socket, miniature, without center shield	27-6203-12
Socket, vibrator	27-6243
Spring, dial-cord	56-8259FA1
Strap, universal	56-4767FA3

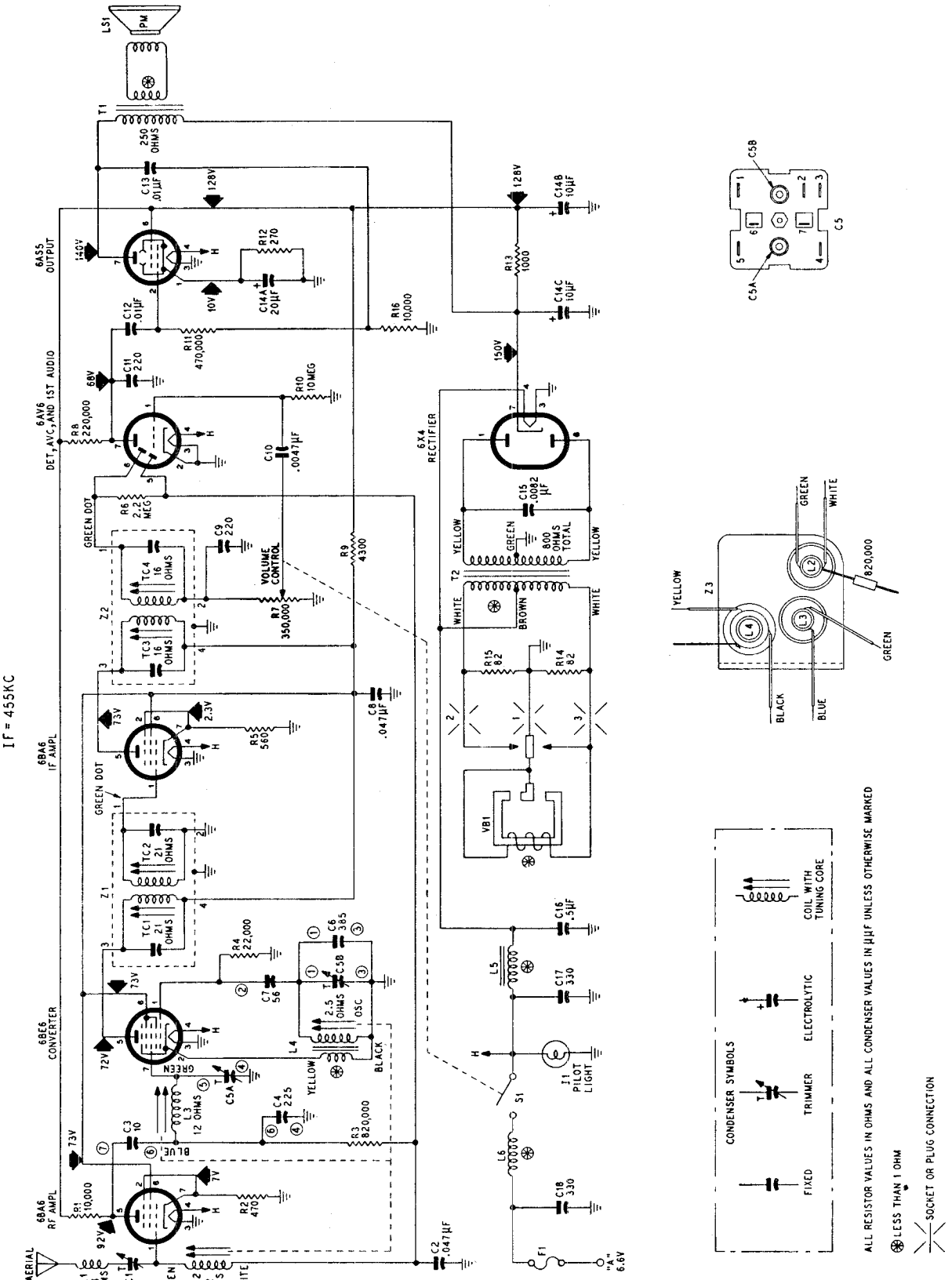


Figure 4. Philco Auto Radio Model CR-501, Schematic Diagram

MODEL CR-503

SPECIFICATIONS

CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1605 kc.
AUDIO OUTPUT	3.2 watts
POWER INPUT	6.0 amperes at 6.6 volts, d.c.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	6BA6 (2), 6BE6, 6AV6, 6AQ5, 6X4

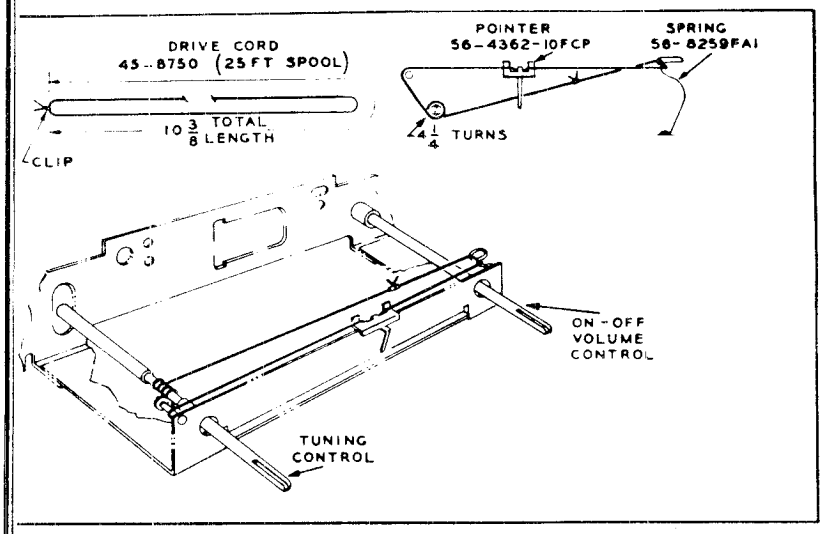


Figure 1. Drive-Cord Installation Details

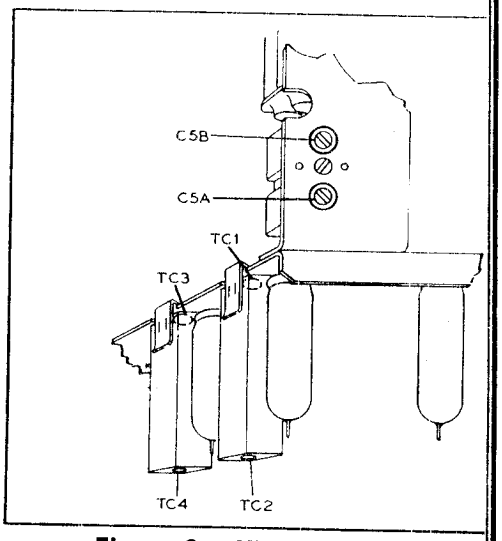


Figure 2. View Showing Trimmer Locations

ALIGNMENT PROCEDURE

OUTPUT METER — Connect across voice coil.

SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS — Set volume control to maximum, and tuning control as indicated in chart.

OUTPUT LEVEL — During alignment, attenuate signal generator to maintain an output-meter indication below 1.5 volts.

DUMMY ANTENNA — Connect signal-generator output lead through a 30-$\mu\mu f$. condenser to antenna socket; connect a 30-$\mu\mu f$. condenser from antenna socket to ground.

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .05-μf. condenser to converter grid (pin 7 of 6BE6).	455 kc.	Maximum counterclockwise	Adjust cores, in order given, for maximum output. TC1 and TC3 are reached through holes in bottom of i f transformers.	TC4—2nd i-f sec. TC3—2nd i-f pri. TC2—1st i-f sec. TC1—1st i-f pri.
2	Through dummy antenna.	1605 kc.	Maximum clockwise	Adjust for maximum output.	C5B—osc. trimmer C5A—r-f trimmer C1—ant. comp.
3			Tune to weak station near 1600 kc.	Readjust trimmer C1, with radio installed in car and antenna fully extended.	C1—ant. comp.

MODEL CR-503

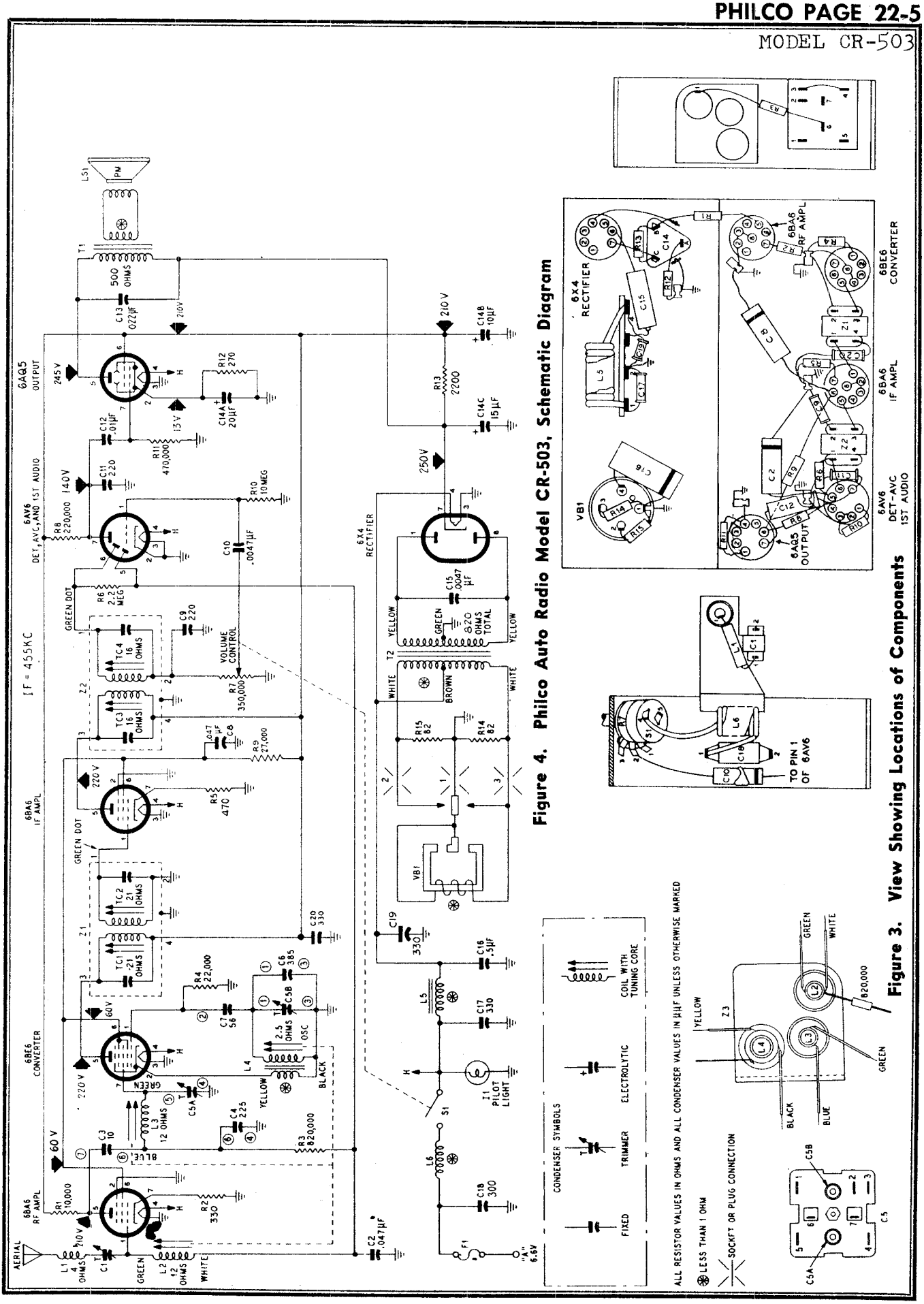


Figure 4. Philco Auto Radio Model CR-503, Schematic Diagram

Figure 3. View Showing Locations of Components

MODEL CR-503

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

Reference Symbol	Description	Service Part No.
C1	Condenser, antenna compensator	31-6502
C2	Condenser, a-v-c filter, .047 μf.	45-3505-45*
C3	Condenser, d-c blocking, 10 $\mu\mu f$.	Part of C5
C4	Condenser, r-f fixed trimmer, 225 $\mu\mu f$.	Part of C5
C5	Condenser, 2-section trimmer	31-6522
C5A	Condenser, r-f trimmer	Part of C5
C5B	Condenser, oscillator trimmer	Part of C5
C6	Condenser, fixed osc. trimmer, 385 $\mu\mu f$.	Part of C5
C7	Condenser, d-c blocking, 56 $\mu\mu f$.	Part of C5
C8	Condenser, by-pass, .047 μf.	45-3505-45*
C9	Condenser, i-f filter, 220 $\mu\mu f$.	62-122001001
C10	Condenser, d-c blocking, .0047 μf.	45-3505-55*
C11	Condenser, plate by-pass, 220 $\mu\mu f$.	62-122001001
C12	Condenser, d-c blocking, .01 μf.	45-3505-41*
C13	Condenser, tone compensation, .022 μf.	45-3505-60*
C14	Condenser, 3-section electrolytic	61-0089A
C14A	Condenser, cathode by-pass, 20 μf.	Part of C14
C14B	Condenser, filter, 10 μf.	Part of C14
C14C	Condenser, filter, 15 μf.	Part of C14
C15	Condenser, buffer, .0047 μf., 1000v	30-4661-1*
C16	Condenser, line filter, .5 μf.	61-0137*
C17	Condenser, hash filter, 330 $\mu\mu f$.	62-133001001
C18	Condenser, hash filter, 300 $\mu\mu f$.	30-1235
C19	Condenser, vibrator filter, 330 $\mu\mu f$.	62-133001001
C20	Condenser, 330 $\mu\mu f$.	62-133001001
F1	Fuse, 14-amp	45-2559
I1	Pilot lamp, brown bead, bayonet, .15 amp. at 6.3v	34-2068
L1	Choke, antenna	32-4422-24
L2	Coil, antenna	Part of Z3
L3	Coil, r-f	Part of Z3
L4	Transformer, oscillator	Part of Z3
L5	Choke, line filter	32-4170
L6	Choke, "A" lead hash filter	32-1374
LS1	Speaker	36-1638
R1	Resistor, plate load, 10,000 ohms	66-3108340*
R2	Resistor, cathode bias, 330 ohms	66-1338340*
R3	Resistor, grid return, 820,000 ohms	66-4828340*
R4	Resistor, grid return, 22,000 ohms	66-3228340*
R5	Resistor, cathode bias, 470 ohms	66-1478340*
R6	Resistor, diode load, 2.2 megohms	66-5228340*
R7	Volume control, 350,000 ohms (with off-on switch)	33-5556-7
R8	Resistor, plate load, 220,000 ohms	66-4228340*
R9	Resistor, dropping, 27,000 ohms	66-3278340*
R10	Resistor, grid return, 10 megohms	66-6108340*
R11	Resistor, grid return, 470,000 ohms	66-4478340*
R12	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340*
R13	Resistor, filter, 2200 ohms, 1 watt	66-2224340*
R14	Resistor, damping, 82 ohms, 1 watt	66-0824340*
R15	Resistor, damping, 82 ohms, 1 watt	66-0824340*
S1	Switch, off-on	Part of R7
T1	Transformer, output	32-8315-1
T2	Transformer, power	32-8457
VB1	Vibrator	83-0025*
Z1	Transformer, 1st i-f	32-4160-6A
Z2	Transformer, 2nd i-f	32-4161A
Z3	Tuner, complete with coils and tuning cores	76-6011

MISCELLANEOUS

Description	Service Part No.
"A" lead	41-3910-11
Clip, grounding spring, brass (2 required)	57-1335
Clip, pilot-lamp mounting	56-3545-5FA3
Cover, top (tube side)	56-8274FJ52
Dial backplate	56-8273FA3
Drive cord, 25-foot spool	45-8750
Fuse lead	41-3910-12
Housing	76-6135-1FA2
Knob assembly (2 required)	27-4687-15
Master Kit	
Braid	95-0073
Condenser, interference filter	30-4007
Lock washer, No. 10 (2 required)	1W24258FA1
Resistor, distributor	33-1196
Screw, drive, No. 8, ½" long (4 required)	1W19752FA3
Screw, drive, slotted hex-head, No. 8 x ⅜" (2 required)	1W19751FA3
Screw, drive, slotted hex-head, No. 10 x 1½"	1W19770FA3
Washer, No. 10, 1¼" diameter	1W52359FA3
Washer, flat (2 required)	1W52692FA3
Pilot-lamp assembly	27-6233-4*
Pointer	56-4362-10
Socket, aerial	57-1243FA3
Socket, miniature with center shield	27-6203
Socket, miniature, without center shield	27-6203-12
Socket, speaker	27-6149
Socket, vibrator	27-6245
Spring, dial-cord	56-8259FA1
Strap, universal	56-4767FA3

SPECIFICATIONS

CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1605 kc.
AUDIO OUTPUT	3.2 watts
POWER INPUT	6.0 amperes at 6.6 volts, d.c.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	6BA6 (2), 6BE6, 6AV6, 6AQ5, 6X4

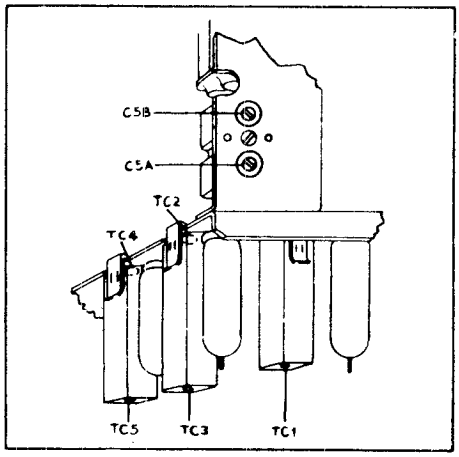


Figure 1. View Showing Trimmer Locations

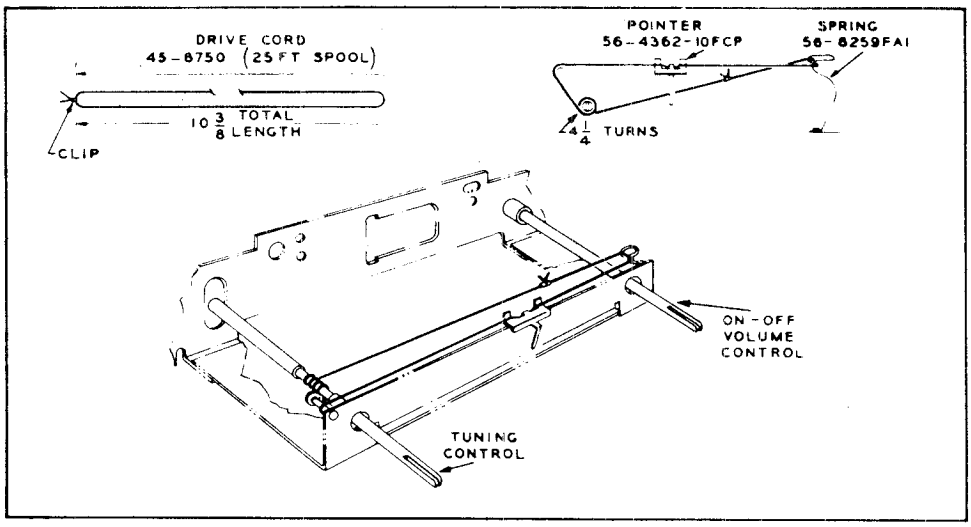


Figure 2. Drive-Cord Installation Details

ALIGNMENT PROCEDURE

OUTPUT METER — Connect across voice coil.

SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS — Set volume control to maximum, and tuning control as indicated in chart.

OUTPUT LEVEL — During alignment, attenuate signal generator to maintain an output-meter indication below 1.5 volts.

DUMMY ANTENNA — Connect signal-generator output lead through a 30-$\mu\mu f$. condenser to antenna socket; connect a 30-$\mu\mu f$. condenser from antenna socket to ground.

MODEL CR-505

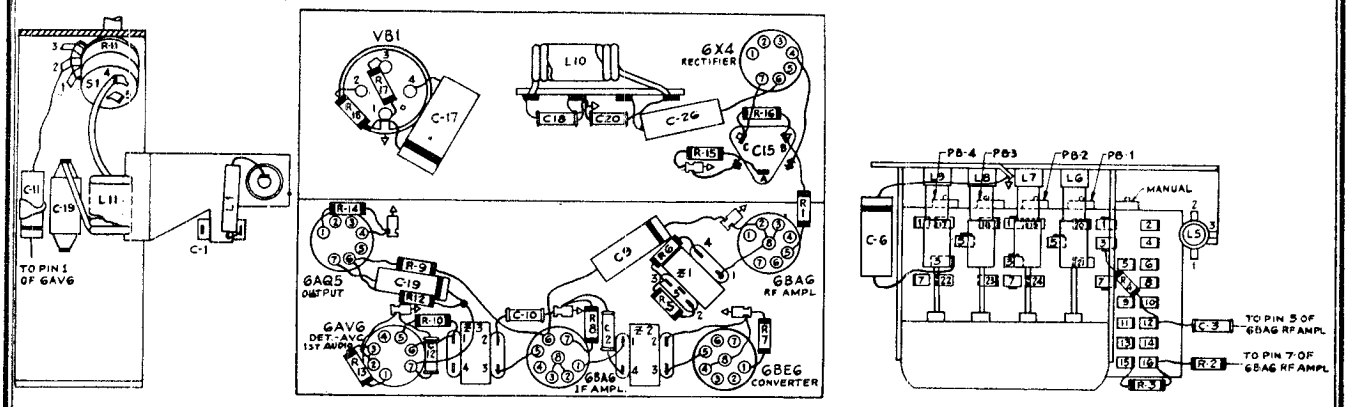


Figure 3. View Showing Locations of Components

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .05-μf. condenser to converter grid (pin 7 of 6BE6).	455 kc.	Maximum counterclockwise	Adjust cores, in order given, for maximum output. TC5 and TC3 are reached through holes in bottom of i-f transformers.	TC5—2nd i-f sec. TC4—2nd i-f pri. TC3—1st i-f sec. TC2—1st i-f pri.
2	Through dummy antenna.	1605 kc.	Maximum clockwise	Adjust for maximum output.	C5B—osc. trimmer C5A—r-f trimmer C1—ant. comp.
3			Tune to weak station near 1600 kc.	Readjust trimmer C1, with radio installed in car and antenna fully extended.	C1—ant. comp.

PUSH BUTTON ALIGNMENT

Make the Manual alignment first.

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	PUSH BUTTON	SPECIAL INSTRUCTIONS	
1	Through dummy antenna.	455 kc.	PB1	Adjust for minimum output.	TC1
2	Same as step 1.	730 kc.	PB1 and PB2	Tune for maximum output by turning core key. Then adjust for maximum with the hex-nut that holds core and osc. section to front frame. Re-cement.	
3	Same as step 2.	1000 kc.	PB3	Same as step 2.	
4	Same as step 2.	1200 kc.	PB4	Same as step 2.	
5	Same as step 2.	Frequency of desired station	PB1 PB2 PB3 PB4	Adjust by rotating core key. Adjust lowest frequency first.	
6	Repeat Step No. 5 with radio installed and antenna fully extended while listening to the station for which the adjustment is being made.				

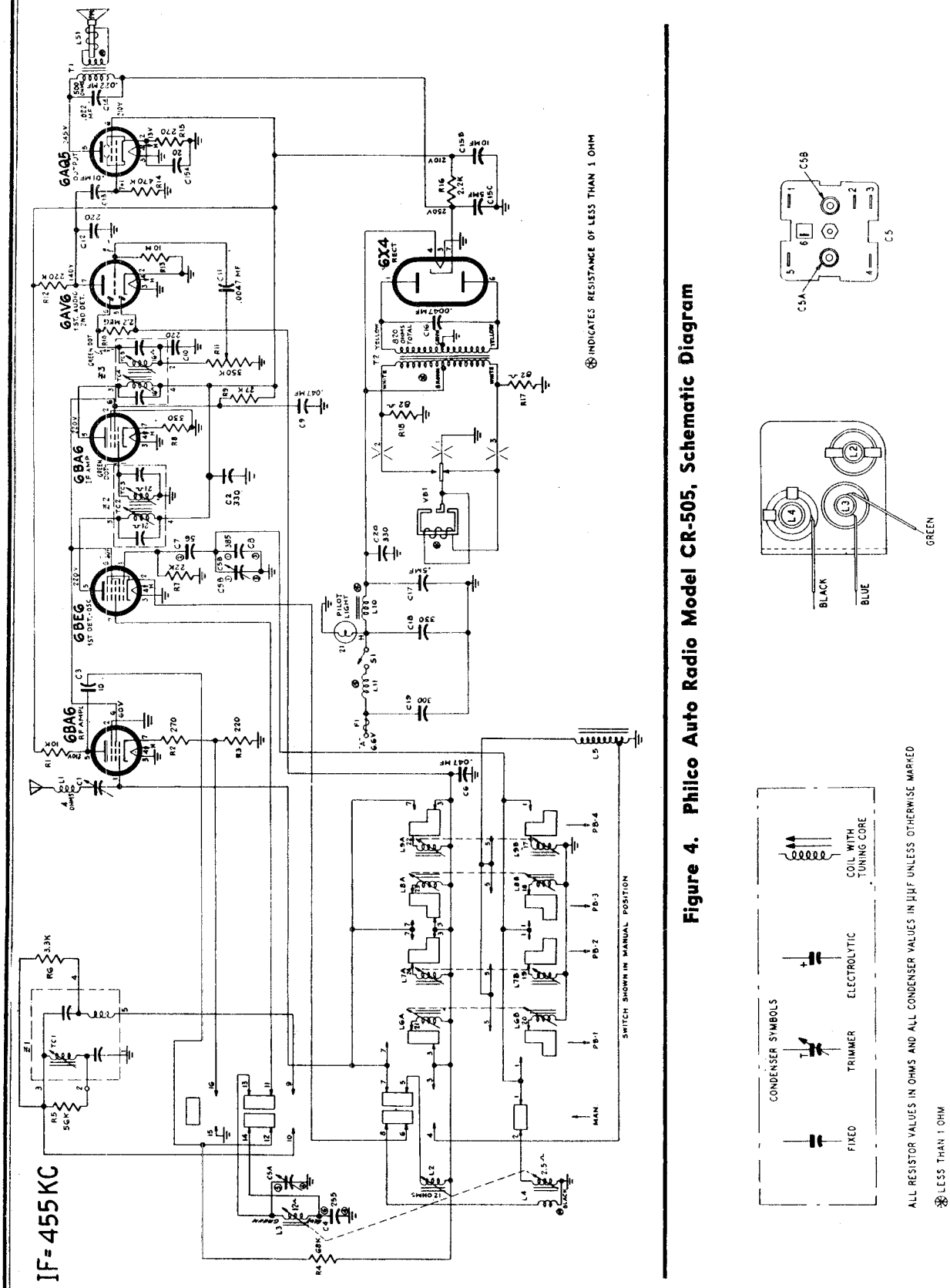


Figure 4. Philco Auto Radio Model CR-505, Schematic Diagram

MODEL CR-505

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

Reference Symbol	Description	Service Part No.
C1	Condenser, antenna compensator	31-6502
C2	Condenser, by-pass, 330 $\mu\mu f$.	62-133001001
C3	Condenser, d-c blocking, 10 $\mu\mu f$.	62-010009001*
C4	Condenser, fixed trimmer, 255 $\mu\mu f$.	Part of C5
C5	Condenser, 4 sections fixed and 2 section variable trimmer	31-6522-1
C5A	Condenser, r-f trimmer	Part of C5
C5B	Condenser, osc. trimmer	Part of C5
C6	Condenser, a-v-c by-pass, .047 μf.	45-3505-45*
C7	Condenser, d-c blocking, 56 $\mu\mu f$.	Part of C5
C8	Condenser, fixed osc. trimmer, 385 $\mu\mu f$.	Part of C5
C9	Condenser, screen by-pass, .047 μf.	45-3505-45*
C10	Condenser, i-f by-pass, 220 $\mu\mu f$.	62-122001001
C11	Condenser, d-c blocking, .0047 μf.	45-3505-56*
C12	Condenser, plate by-pass, 220 $\mu\mu f$.	62-122001001
C13	Condenser, d-c blocking, .01 μf.	45-3505-41*
C14	Condenser, tone compensation, .022 μf.	45-3505-60*
C15	Condenser, electrolytic, 3 section	61-0089A
C15A	Condenser, cathode by-pass, 20 μf.	Part of C15
C15B	Condenser, filter, 10 μf.	Part of C15
C15C	Condenser, filter, 15 μf.	Part of C15
C16	Condenser, buffer, .0047 μf., 1600v	30-4661-1
C17	Condenser, vibrator damping, .5 μf.	61-0137
C18	Condenser, hash filter, 330 $\mu\mu f$.	62-133001001
C19	Condenser, hash filter, 300 $\mu\mu f$.	30-1235
C20	Condenser, vibrator filter, 330 $\mu\mu f$.	62-133001001
F1	Fuse, 14 amp.	45-2559
I1	Pilot lamp, brown bead, bayonet, .15 amp. at 6.3v	34-2068
L1	Choke, antenna	32-4422-24
L2	Coil, antenna	Part of Z4
L3	Coil, r-f	Part of Z4
L4	Coil, oscillator	Part of Z4
L5	Coil, osc. shunt	Part of Z5
L6A, L7A, L8A, L9A	Coil, push button r-f	Part of Z5
L6B, L7B, L8B, L9B	Coil, push button oscillator	Part of Z5
L10	Choke, line filter	32-4170
L11	Choke, "A" lead hash filter	32-1374
LS1	Speaker	36-1638
R1	Resistor, plate load, 10,000 ohms	66-3108340*
R2	Resistor, cathode bias, 270 ohms	66-1278340*
R3	Resistor, cathode bias, 220 ohms	66-1228340*
R4	Resistor, grid return, 68,000 ohms	66-3688340*
R5	Resistor, r-f primary loading, 56,000 ohms	66-3568340*
R6	Resistor, band pass, 3,300 ohms	66-2338340*
R7	Resistor, grid return, 22,000 ohms	66-3228340*
R8	Resistor, cathode bias, 330 ohms	66-1338340*
R9	Resistor, screen dropping, 27,000 ohms	66-3278340*
R10	Resistor, diode load, 2,2 megohms	66-5228340*
R11	Volume control, 350,000 ohms	33-5556-8
R12	Resistor, plate load, 220,000 ohms	66-4228340*
R13	Resistor, grid return, 10 megohms	66-6108340*
R14	Resistor, grid return, 470,000 ohms	66-4478340*
R15	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340*
R16	Resistor, filter, 2,200 ohms, 1 watt	66-2224340*
R17	Resistor, vibrator damping, 82 ohms, 1 watt	66-0824340*
R18	Resistor, vibrator damping, 82 ohms 1 watt	66-0824340*
S1	Switch, off-on	Part of R11
T1	Transformer, output	32-8315-1
T2	Transformer, power	32-8457
VB1	Vibrator	83-0025*
Z1	Transformer, r-f	32-4349
Z2	Transformer, 1st i-f	32-4160-6A
Z3	Transformer, 2nd i-f	32-4161A

MISCELLANEOUS

Description	Service Part No.
"A" lead	41-3910-11
Clip, ground spring (2)	57-1335
Cover, top, tube side	56-8274FJ52
Dial Backplate	56-8273FA3
Dial cord, 25-foot spool	45-8750*
Spring, drive cord	58-8259FA1
Fuse lead	41-3910-12
Housing Assembly	76-6135-1FA2
Knob assembly (2)	27-4687-15
Master Kit	
Braid	95-0073
Condenser, interference filter	30-4007
Resistor, distributor	33-1196
Screw, No. 10 x 1-1/2" slotted hex-head drive, strap to fire wall	1W19770FA3
Screw, No. 8 x 1/2" slotted hex-head drive, speaker to plate (4)	1W19752FA3
Screw, No. 8 x 3/8" slotted hex-head drive, strap to set	1W19751FA3
Washer, No. 10 x 1-1/4" diam., .056" thick for No. 10 screw	1W52359FA3
Nut, bezel mounting (2)	56-8464FA7
Pilot lamp assembly	27-6233-4
Clip, pilot lamp mounting	56-3545-5FA3
Pointer	56-4362-10
Push button and key assembly (station buttons) (4)	76-6239
Push button and key assembly (manual)	76-6239-1
Socket, aerial	57-1243FA3
Socket, miniature, with center shield (3)	27-6203
Socket, miniature, without center shield (3)	27-6203-12
Socket, speaker	27-6149
Socket, vibrator	27-6245
Strap, universal, set mounting	56-4767FA3
Tuner, manual	76-6011-1
Tuner and switch assembly, push button, complete	76-5940
Tuner and switch assembly	76-6053

Production Changes

The following changes occurred early in production but were not identified by run number.

C10, the .022 *uf* tone compensation condenser, is now .0068 *uf* part number 45-3505-57*.

The wiring of C9 is reversed to use C9B, 220 *uuf* section, as plate by-pass for the 7C6, C9A, the .007 *uf* section is still used as the d-c blocking.

SPECIFICATIONS

CABINET	Molded plastic, mottled mahogany
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	One watt
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	30 watts
Phonograph	45 watts
INTERMEDIATE FREQUENCY	455 kc.
AERIAL	Built-in high-impedance loop; provision for external aerial
PHILCO TUBES (5)	7A8 converter, 7B7 i-f amplifier, 7C6 2nd det. 1st audio, 50L6GT output, 35Z5GT rectifier
PHONOGRAPH	Philco Model M-22 All-Speed Automatic Record Changer. (For service information, refer to Service Manual PR-1923.)

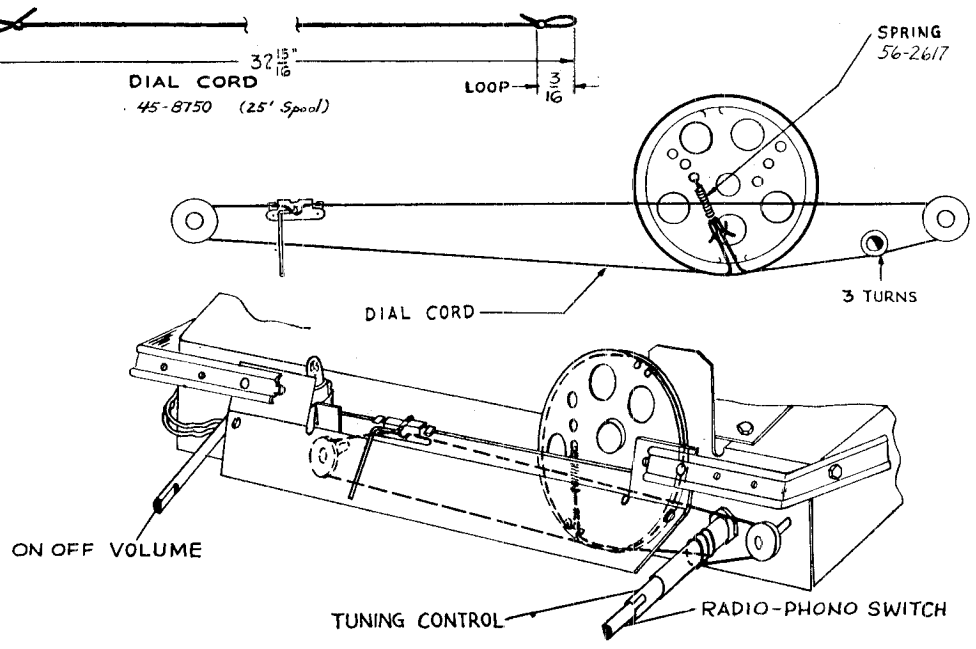


Figure 1. Drive-Cord Installation Details

MODEL 51-1330

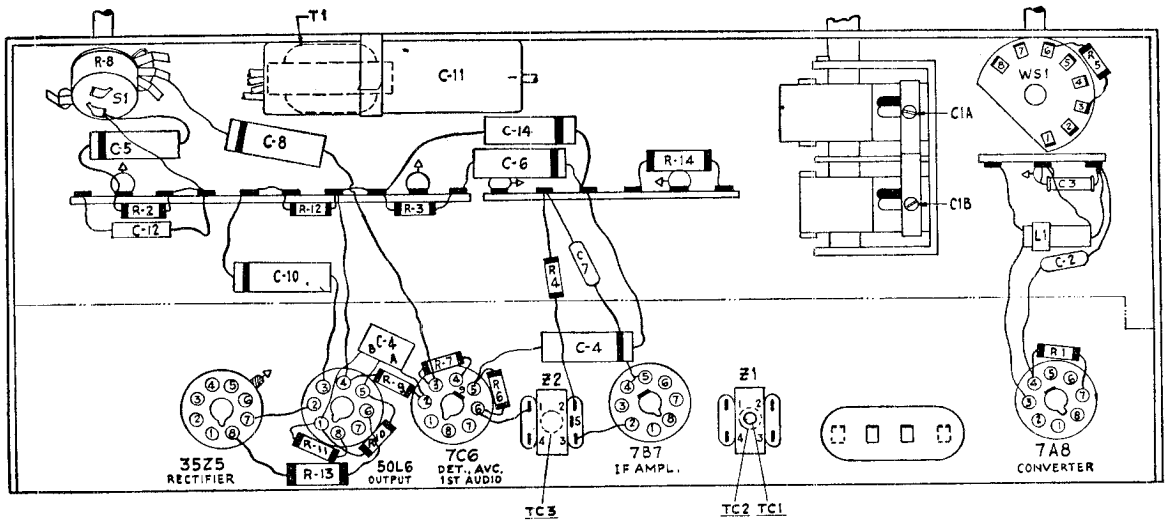


Figure 2. Base View, Showing Parts Placement and Alignment Points

ALIGNMENT PROCEDURE

DIAL POINTER—Turn tuning condenser to full-mesh position. Set dial pointer to the index mark, located to the left of "55".

CONTROLS—Set volume control to maximum, "Phono-Radio" switch to Radio position, and the tuning control as indicated in the chart.

OUTPUT METER—Connect across voice coil terminals.

SIGNAL GENERATOR—Ground lead to B–, output lead as indicated in chart.

OUTPUT LEVEL—During alignment, attenuate signal-generator output to hold output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through a .01 μf. condenser to pin #6 of the 7A8 converter tube.	455 kc.	Gang fully closed.	Adjust, in order given, for maximum output. TC2 and TC3 are located at the top of the transformers.	TC3—2nd i-f sec. TC2—1st i-f sec. TC1—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C1B—osc. trimmer
3	Same as Step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C1A—ant. trimmer

RADIATING LOOP: Make up a 6—8-turn, 8-inch-diameter loop from insulated wire, connect to signal generator output leads, and place near radio loop.

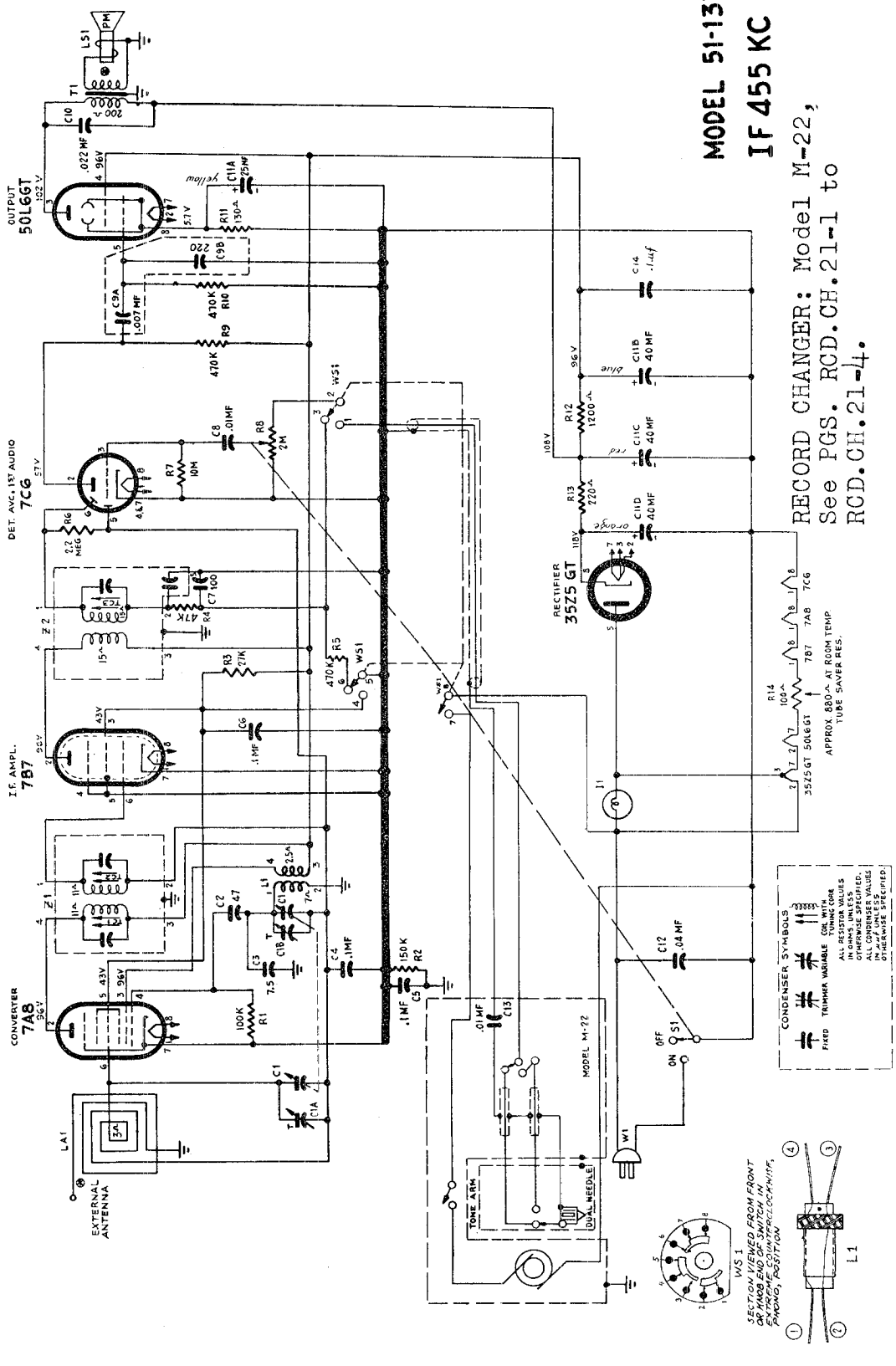


Figure 3. Philco Radio-Phonograph Model 51-1330, Schematic Diagram

MODEL 51-1330

CORRECTIONS TO MANUAL

Drive-Cord Installation Details

The spring, part number 56-2617 should be shown as terminating in the middle hole of the drive drum.

Run No. 2

The 2nd i-f transformer, Z2, is now part number 32-4240. This transformer is double tuned and has two 100 $\mu\mu f$. i-f filter condensers built-in. The transformer wiring is shown in figure 4.

When aligning, tune the primary following the secondary as given in the alignment instructions.

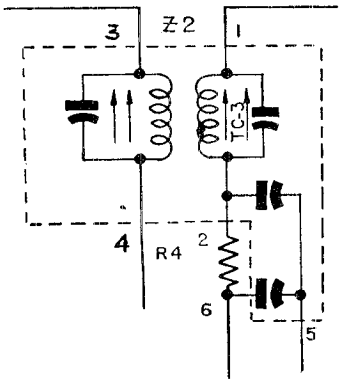


Figure 4. Run 2 I-F Transformer

Also, the 1st i-f transformer, Z1, is reversed. The transformer is rotated 180° on the chassis and the wiring is as follows: No. 1 is plate, No. 2 is B+, No. 3 is grid, No. 4 is a-v-c.

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the receiver will be either unchanged or improved. When ordering replacements, use only the "Service Part No.".

Reference Symbol	Description	Service Part No.
C1	Condenser, tuning gang	31-2751-9
C2	Condenser, osc. grid, d-c blocking, 47 $\mu\mu f$.	60-00515307*
C3	Condenser, temperature compensating, 7.5 $\mu\mu f$.	30-1224-65
C4	Condenser, a-v-c by-pass, .1 μf.	61-0113*
C5	Condenser, by-pass, .1 μf.	61-0113*
C6	Condenser, screen by-pass, .1 μf.	61-0113*
C7	Condenser, i-f filter, 100 $\mu\mu f$.	62-110009001*
C8	Condenser, d-c blocking, .01 μf.	61-0120*
C9	Condenser, dual ceramic	30-1239-4
C9A	Condenser, d-c blocking, .007 μf.	Part of C9
C9B	Condenser, grid by-pass, 220 $\mu\mu f$.	Part of C9
C10	Condenser, tone compensation, .022 μf.	45-3505-43*
C11	Condenser, electrolytic, 4 section	30-2575-32*
C11A	Condenser, cathode by-pass, 25 μf.	Part of C11
C11B	Condenser, filter, 40 μf.	Part of C11
C11C	Condenser, filter, 40 μf.	Part of C11
C11D	Condenser, filter, 40 μf.	Part of C11
C12	Condenser, line by-pass, .04 μf.	45-3505-62*
C13	Condenser, phono isolation, .01 μf.	61-0120*
C14	Condenser, r-f by-pass, .1 μf.	61-0113*
I1	Pilot lamp, type 47	34-2068
L1	Coil, oscillator	32-4263
LA1	Loop antenna	76-2127-11
LS1	Speaker, 5¼" round	36-1639
R1	Resistor, grid return, 100,000 ohms	66-4108340*
R2	Resistor, leakage, 150,000 ohms	66-4158340*
R3	Resistor, dropping, 27,000 ohms	66-3274340*
R4	Resistor, i-f filter, 47,000 ohms	66-3478340*
R5	Resistor, diode return, 470,000 ohms	66-4478340*
R6	Resistor, diode load, 2.2 megohms	66-5228340*
R7	Resistor, grid return, 10 megohms	66-6108340*
R8	Volume control, 2 megohms (with switch)	33-5564-11
R9	Resistor, plate load, 470,000 ohms	66-4478340*
R10	Resistor, grid return, 470,000 ohms	66-4478340*
R11	Resistor, cathode bias, 130 ohms	66-1128340*
R12	Resistor, filter, 1200 ohms	66-2128340*
R13	Resistor, filter, 220 ohms, 2 watts	66-1225340*
R14	Resistor, surge limiting, 880Ω cold, 100Ω hot	33-1343-3
S1	Switch, off-on	Part of R8
T1	Transformer, output	32-8384*
W1	Line cord	L-2183
WS1	Wafer switch, radio-phono	42-1949
Z1	Transformer, 1st i-f	32-4160A
Z2	Transformer, 2nd i-f	32-4454-1A

MISCELLANEOUS

Description	Service Part No.
Backplate assembly	76-6232
Cabinet, complete	10840-2
Hinge (2)	56-6603
Lid	54-4838
Lid support	56-6604
Changer Mounting Hardware	
Sleeve, rubber (3)	54-7798
Speed nut (3)	W-2554
Spring, heavy, top (3)	56-7059FA9
Spring, light, bottom (3)	56-7059-1FJ47
Dial scale	54-5107
Knob, off-on-volume	54-4843
Knob, phono-radio	54-4842
Knob, tuning	54-4841
Pilot lamp socket assembly	76-1179-1
Fastener, pilot lamp shield	W2235-1FA9
Pointer	56-5630-31
Spring, pointer drive	56-2617
Socket, Loktal (3)	27-6207
Socket, octal (2)	27-6174
Tuning shaft	56-8370

MODEL 5-DS-001

PRIVAT-EAR INSTRUCTION AND SERVICE NOTES

OPERATION - To place the PRIVAT-EAR radio in operation, pull out the plastic bead on top of case. This extends the built-in telescopic antenna. When all four telescoping sections are exposed, the receiver power is automatically turned "ON". The radio is turned "OFF" by pushing the plastic bead down until all sections of the telesoopic antenna are inside the case.

Note: The set is not turned "ON" and "OFF" by means of volume control knob.

EARPHONE - Place earphone on ear so that it fits comfortably.

VOLUME CONTROL - This control appears above the VOL marking on the case. Turn the knob about 3/4 of its full clockwise rotation.

STATION SELECTOR - The right hand knob is the station s elector. Numbers 6 and 9 and 16 on the case correspond to approximately 600, 900 and 1600 kilocycles. Turn knob slowly until maximum volume of desired station is obtained. Adjust the volume control to desired volume.

NOTE: DO NOT TRY TURNING SET "ON" OR "OFF" BY ROTATING VOLUME CONTROL BEYOND STOP.

RECOMMENDED SERVICE PROCEDURE

1. Set Does Not Work:
   a) Remove bottom half of back and check batteries.
   b) With antenna fully extended, press down on metal contact which is actuated by antenna section. If set plays when the contact is pressed, it indicates a dirty contact or insufficient pressure. A slight bend near the riveted section of this contact will increase the pressure.

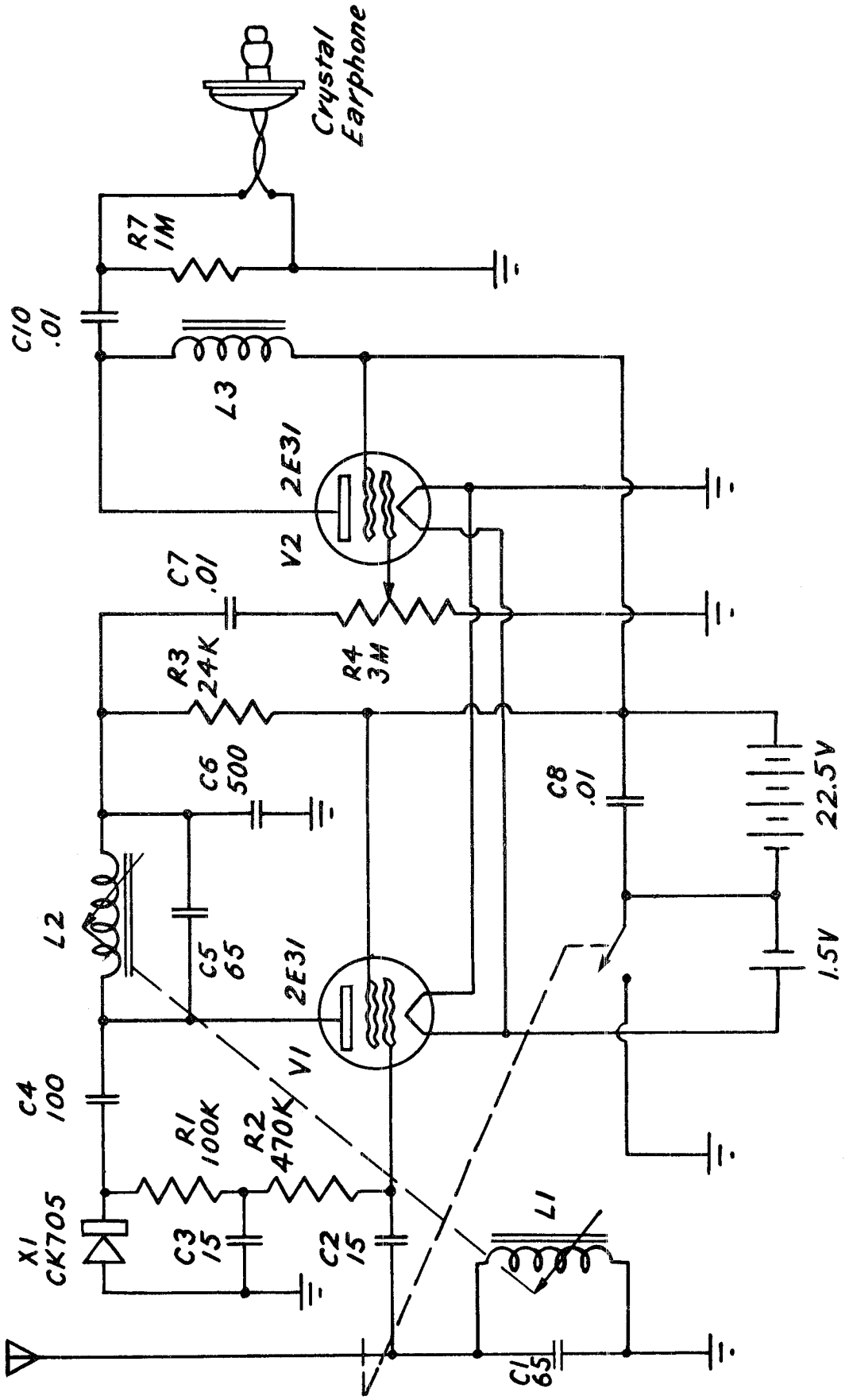
2. Set Performs, But Is Weak:
   a) Check batteries.
   b) Set may be operating in a poor reception area.
   c) Antenna may not be extended fully.

3. Receiver Alignment:

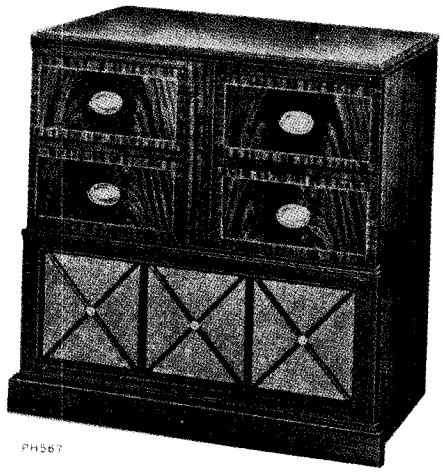
   NOTE: The receiver was properly aligned before it left the factory. Actual alignment will be required if a coil is being replaced or if it has become loose.

   a) Remove upper half of back of case.
   b) Adjust modulated signal generator to 1600 kilocycles.
   c) Place "hot" side of generator output lead about 2 inches away from telescopic antenna.
   d) Turn station selector knob so that iron slugs are as far as possible outside the coils.
   e) Move each coil relative to the slug until maximum signal from the signal generator is heard.
   f) Carefully fasten coils to plastic chassis, using a quick drying radio cement.

MODEL 5-DS-001



MODEL A-101,
Ch. RC-1096



PH567

FOR RECORD CHANGER SERVICE INFORMATION REFER TO RP-190 SERIES SERVICE DATA FOR 45 R.P.M. AND MODEL 960282 SERVICE DATA FOR 78/33⅓ R.P.M.

Specifications

Tuning Range

Standard Broadcast (AM) ..... 540-1,600 kc.
Frequency Modulation (FM) ..... 88-108 mc.
Intermediate Frequencies ..... AM—455 kc., FM—10.7 mc.

Tube Complement

(1) RCA 6CB6..... R-F Amplifier
(2) RCA 6J6..... Mixer and Oscillator
(3) RCA 6BA6..... I-F Amplifier
(4) RCA 6AU6..... Driver
(5) RCA 6AL5..... Ratio Detector
(6) RCA 6AV6..... AM Det.—AVC—A-F Amplifier
(7) RCA 6C4..... Ph. Inv.
(8) RCA 6V6GT..... Output
(9) RCA 6V6GT..... Output
(10) RCA 5Y3GT..... Rectifier

Dial Lamps (2).....Type No. 51, 6-8 volts, 0.2 amp.
Jewel Lamp ..... Type No. 51, 6-8 volts, 0.2 amp.

Tuning Drive Ratio .....10:1 (5 turns of knob)

Power Supply Rating ..... 115 volts, 60 cycles, 115 watts

Loudspeaker (92569-12W)
Size and type ..... 12 in. PM
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output
(Radio) Undistorted 8 watts.....Maximum 9 watts
(Phono.) Undistorted 10 watts..... Maximum 11 watts

Weight .....97 lbs.

Cabinet Dimensions
Height 32 in. Width 32 in. Depth 19¾ in.

Record Changer (RP-190-2)
Turntable speed ..... 45 r.p.m.
Pickup (RP-190—Stock No. 75575) .....Crystal

Record Changer 960282-4 or 5
Turntable speed .....78 or 33⅓ r.p.m.
Pickup (Stock No. 75475) ..... Crystal

Socket Voltages

Voltages measured with Chanalyst or VoltOhmyst and should hold within ±20% with rated line voltage. Tuning condenser closed—no signal input.

Tube	Terminal	Voltage		
		Phono	A.M.	F.M.
V1 6CB6 R.F. Amp.	Plate 5	—	203	132
	Screen 6	—	48	39
	Cathode 2	—	0.2	0.2
	Grid 1	—	−1.1	−0.9
V2 6J6 Mixer and Osc.	Plate 2	—	55	51
	Grid 5	—	−1.4	−1.2
	Plate 1	—	33	27
	Grid 6	—	−2.1	−1.9
V3 6BA6 I.F. Amp.	Plate 5	—	192	188
	Screen 6	—	106	101
	Cathode 7	—	0.9	
	Grid 1	—	−1.1	−0.35
V4 6AU6 Driver	Plate 5	—	186	180
	Screen 6	—	122	120
	Cathode 7	—	1.05	1.07
V5 6AL5 Ratio Det.	—— ——	—	—	—
V6 6AV6 A.F. Amp.	Plate 7	112	94	94
	Grid 1	−0.7	−0.7	−0.7
V7 6C4 Ph. Inverter	Plate 1–5	125	87	85
	Grid 6	−19.2	−16	−16
	Cathode 7	−11.1	−11.4	−11.4
V8 6V6GT or Output V9	Plate 3	305	295	298
	Screen 4	299	208	204
	Grid 5	−19.2	−16	−16
V10 5Y3GT Rectifier	Filament 2	314	313	313

Cathode Currents (Ma.)

Tube	Terminal	Phono	A.M.	F.M.
V1 6CB6	2	—	3	3
V2 6J6	7	—	2.6	2.6
V3 6BA6	7	—	13.2	14.7
V4 6AU6	7	—	9.3	9
V5 6AL5	1 & 5	—	—	—
V6 6AV6	2	0.8	0.5	0.5
V7 6C4	7	2.2	1.5	1.5
V8 6V6GT	8	35.6	17.8	17.7
V9 6V6GT	8	35.6	17.8	17.7
10 5Y3GT	2	74 %	73.6	74.2

MODEL A-101,
Ch. RC-1096

ALIGNMENT PROCEDURE—CIRCUIT DESCRIPTION—LEAD DRESS

Alignment Procedure

CORRECT ALIGNMENT OF THE FM BAND REQUIRES THAT THE AM BAND BE ALIGNED FIRST

Alignment Indicators:

An RCA VoltOhmyst or equivalent meter is necessary for measuring developed d-c voltage during FM alignment. Connections are specified in the alignment tabulation. An output meter is also necessary to indicate minimum audio output during FM Ratio Detector alignment. Connect the output meter across the speaker voice coil.

The RCA VoltOhmyst can also be used as an AM alignment indicator, either to measure audio output or to measure a-v-c voltage.

When audio output is being measured the volume control should be turned to maximum.

Signal Generator:

For all alignment operations connect the low side of the signal generator to the receiver chassis. The output should be adjusted to provide accurate resonance indication at all times. If output measurement is used for AM alignment the output of the signal generator should be kept as low as possible to avoid a-v-c action.

Circuit Description

This instrument has a ten-tube (including rectifier) chassis which is very similar to those used in other RCA Victor radio-phonograph combinations designed for AM-FM reception.

The selector switch has five functions:

(1) Selection of tuning range.

(2) Selection and distribution of a.v.c. voltages.

(3) Application of B+ voltage to tubes.

In "Phono 78/33" and "Phono 45" positions the B+ voltage is removed from tubes V1, V2, V3 and V4.

(4) Selection of audio input applied to the volume control.

(5) Change in output tube bias.

In Radio positions R6 is in parallel with R42.

This receiver has built-in antennas for standard broadcast (AM) and frequency modulation (FM) reception.

Provision is made for the use of external antennas if desired.

Critical Lead Dress

Note: The leads listed may not be critical in all receivers. However, by dressing the leads as specified, unusual difficulties will be minimized.

1. The 2.2 meg mixer grid resistor (R10) should have a minimum practicable amount of lead extending on the grid end.
2. The first A.M. and first F.M. I.F. plate leads should be dressed away from the range switch wafer.
3. The ground strap between the R.F. shelf and the main chassis should be well soldered and kept as short as practicable.
4. Arrange wiring to prevent the filament wire between the mixer (6J6) and 1st I.F. (6BA6) tubes from passing near either the mixer grid, or the A.V.C. wiring.
5. Dress filament wires away from all audio coupling condensers.
6. Dress A.C. power switch wires away from the audio coupling condenser (C20) which is wired to the volume control.
7. Dress the mixer grid coupling condenser (C7) away from the lugs on the front range switch wafer.
8. The 1st I.F. tube A.V.C. by-pass condenser (C16) should ground at the same point as the cathode neutralizing loop.
9. The driver tube plate and screen by-pass condensers (C27, C28) should ground at the same point as the neutralizing loop.
10. The mixer plate by-pass condenser (C15) should ground as close to the R.F. shelf ground strap as practicable.
11. The shielded audio leads connecting to the front function switch wafer should have a minimum of exposed lead on the function switch end.

FM Alignment

FUNCTION SWITCH IN FM POSITION—VOLUME CONTROL MAXIMUM

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for max. output
1	Connect the d-c probe of a VoltOhmyst to the negative lead of the 2 mfd. capacitor C40 and the common lead to chassis. Adjust sig. gen. output to provide approx. —3 v. indication during alignment.			
2	Pin #1 of 6AU6 (V4) in series with .01 mf.	10.7 mc AM modulated	—	Top of driver trans. T5 for max. d-c voltage
3				† Bottom of driver trans. T5 for min. audio output
4	Repeat steps 2 and 3			
5	Thru 470 ohms to C1-3. Connect gnd. end of cable close to V2 cathode ground on r-f shelf	10.7 mc	88 mc	* Top (sec.) & bottom (pri.) cores of T3 * Top (sec.) & bottom (pri.) cores of T3
6	To FM antenna terminals thru 120 ohms in each side of line	90 mc	90 mc	L8 (osc.)
7		106 mc	106 mc Signal	C1-6 trimmer (ant.) and C1-3 trimmer (r. f.)
8		90 mc	90 mc Signal	L1 (ant.) and L2 (r. f.)
9	Repeat steps 6, 7 and 8			
10	Connect a sweep generator to the antenna terminals thru 120 ohms in each side of line. Connect an oscilloscope to junction of R44 and C41 to check response and linearity of FM band. Peak to peak separation should not be less than 180 kc.			

† Two or more points may be found which lower the audio output. At the correct point the minimum audio output is approached rapidly and is much lower than at any incorrect point.

* Use a 680 ohm resistor to load the plate winding while the grid winding of the same trans. is being peaked. Then the grid winding is loaded with the 680 ohm resistor while the plate winding is being peaked. When windings are loaded, it is necessary to increase the 10.7 mc input to maintain the —3 volts indication.

L8, L1 and L2 are adjustable by increasing or decreasing the spacing between turns. Oscillator signal tracks above signal frequency.

MODEL A-101,
Ch. RC-1096

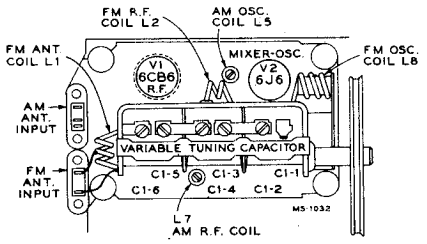
AM Alignment

FUNCTION SWITCH IN AM POSITION

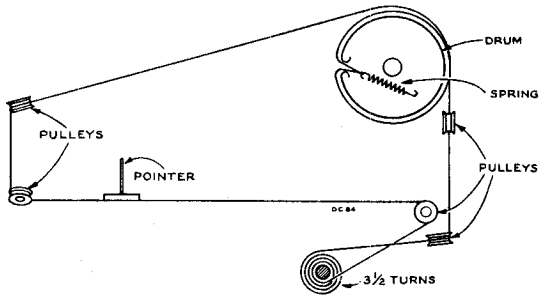
Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for max. output
1	Stator of C1-4	455 KC	Quiet point at low freq. end.	† Bottom (sec.) & top (pri.) cores of T4 † Top (sec.) & bottom (pri.) cores of T2
2	AM ant. terminal thru 200 mmf.	1620 KC	Extreme high frequency end.	C1-2 trimmer (osc.)
3		1400 KC	1400 KC Signal	C1-4 trimmer (r. f.) C1-5 trimmer (ant.)
4		600 KC	600 KC Signal	‡ L5 (osc.) L7 (r. f.)
5	Repeat steps 2, 3 and 4			

† First peak T2 and T4 then starting with T4, use alternate loading. Connect a 47,000-ohm resistor across the primary to load the plate winding while the grid winding of the same transformer is being peaked. Then load the grid winding with the 47,000-ohm resistor while the plate winding is being peaked.

‡ With a 10,000-ohm resistor shunted across C1-4, peak the oscillator core L5, simultaneously "rocking" the gang condenser for maximum output. Then, remove the 10,000-ohm shunt resistor and peak L7 for maximum output.

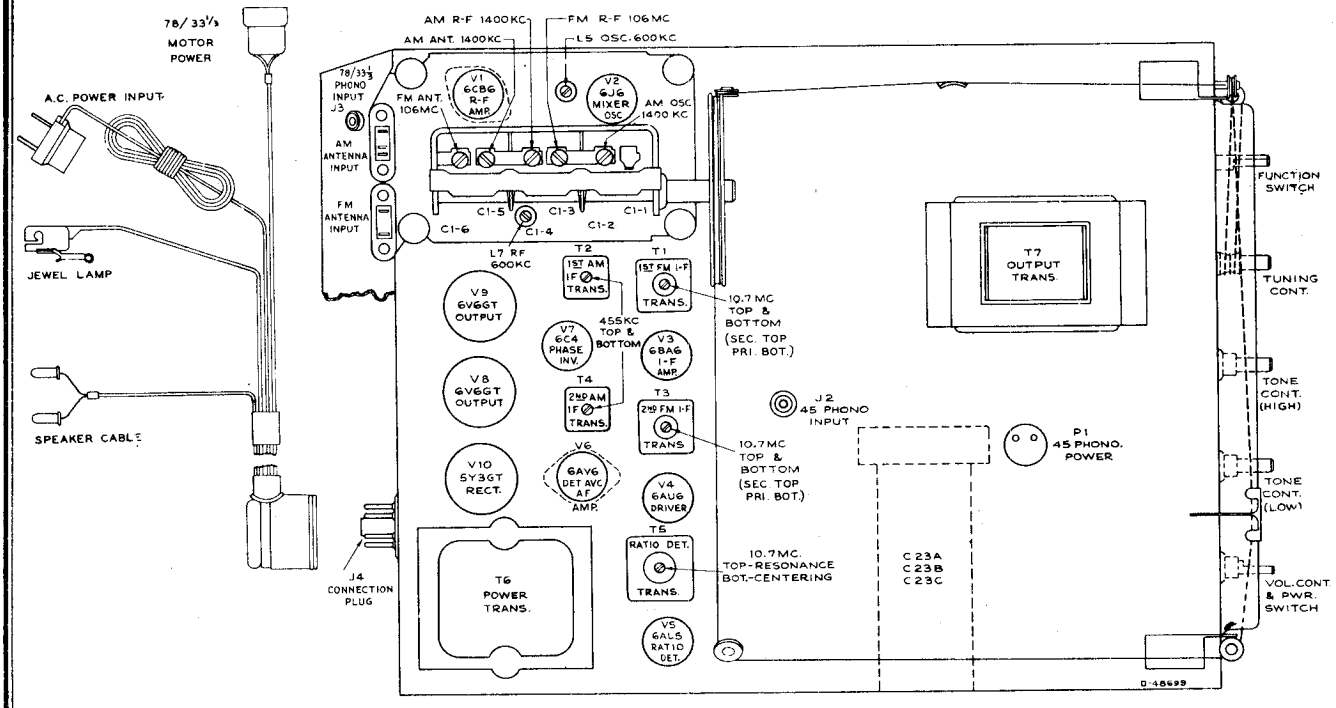


F. M. Coil Locations



Dial Cord and Drive Assembly

TUBE AND TRIMMER LOCATIONS



Tube and Trimmer Locations

MODEL A-101,
Ch. RC-1096

MISC. SERVICE INFORMATION—REPLACEMENT PARTS

Record Changer Mounting

Each record changer is mounted in a roll-out carriage. The changer mechanisms are mounted on rubber grommets (45 r.p.m.) or springs (78/33 r.p.m.) and should be free floating.

Two shipping screws hold the 45 r.p.m. changer to its roll-out carriage. They are accessible from the under-side of the carriage and should be REMOVED at time of installation.

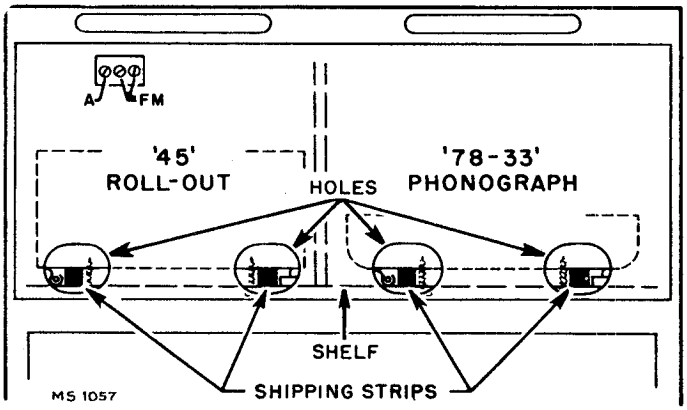
Two shipping screws hold the 78/33 r.p.m. changer to its roll-out carriage. They are accessible after the turntable is lifted off and should be LOOSENED at time of installation.

Roll-out Carriage Removal

Each roll-out carriage has two stop pins, (one at the back end of each slide) held in place by retaining spring. To remove roll-out carriage, it is first necessary to pull the retaining springs out of the slides with a pair of long nose pliers, the stop pins are then easily removed. The roll-out carriage may then be removed from the front of the cabinet after disconnecting its connecting cables.

Roll-out Carriage Travel

The roll-out carriages have a normal movement limitation of approximately 10 inches. If they do not have this amount of movement, it may be due to an obstruction or from slippage or creeping of the balls of the slide mechanism. Travel restriction due to slippage or creeping of balls in the slide mechanism can be corrected by exerting slightly greater pull until the normal travel limitation is reached. The carriage should then operate to its full travel with normal pull.



Rear View of Cabinet

Before attempting to operate mechanism remove shipping bolts and strips. Slide shipping strips out through the elongated holes which have been cut in the cabinet back cover.

Replacement Parts

STOCK NO.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1096
75567	Capacitor—Variable tuning capacitor complete with drive drum (C1-1, C1-2, C1-3, C1-4, C1-5, C1-6)
74733	Capacitor—Ceramic, 3 mmf. (C10)
75613	Capacitor—Ceramic, 5 mmf. (C13)
39396	Capacitor—Ceramic, 100 mmf. (C4)
75609	Capacitor—Ceramic, 47 mmf. (C45)
75612	Capacitor—Ceramic, 68 mmf. (C9, C11)
39396	Capacitor—Ceramic, 100 mmf. (C4)
75437	Capacitor—Ceramic, 100 mmf. (C31)
75614	Capacitor—Ceramic, 150 mmf. (C14, C30, C43, C54)
75611	Capacitor—Ceramic, 220 mmf. (C3)
39640	Capacitor—Mica, 330 mmf. (C37, C38)
39644	Capacitor—Mica, 470 mmf. (C7)
75610	Capacitor—Ceramic, 1500 mmf. (C19)
74850	Capacitor—Ceramic, 1800 mmf. (C17)
73473	Capacitor—Ceramic, 5000 mmf. (C2, C5, C6, C15, C24, C25, C27, C28, C29, C34, C36)
73801	Capacitor—Tubular, paper, .001 mfd, 400 volts (C8)
70642	Capacitor—Tubular, paper, .001 mfd, 1000 volts (C42, C44)
71926	Capacitor—Tubular, paper, .005 mfd, 200 volts (C26, C39, C41)
73920	Capacitor—Tubular, paper, .005 mfd, 400 volts (C33)
71925	Capacitor—Tubular, paper, .01 mfd, 400 volts (C32)
72120	Capacitor—Tubular, paper, .015 mfd, 200 volts (C22)
58476	Capacitor—Tubular, paper, oil impregnated, .018 mfd, 400 volts (C21)
74010	Capacitor—Tubular, paper, .02 mfd, 400 volts (C20, C35)
73553	Capacitor—Tubular, paper, .05 mfd, 400 volts (C16)
73747	Capacitor—Electrolytic 2 mfd, 50 volts (C40)
72052	Capacitor—Electrolytic comprising 1 section of 30 mfd, 450 volts, 1 section of 30 mfd, 350 volts and 1 section of 40 mfd, 25 volts (C23A, C23B, C23C)
73935	Clip—Mounting clip for A-M, I-F transformers
75627	Clip—Clip for main cable—on rear of chassis
75569	Coil—Oscillator coil (A-M) complete with adjustable core (L3, L4, L5)
75570	Coil—R.F. coil complete with adjustable core (L6, L7)
71942	Coil—Filament choke coil (L9)
75615	Coil—Antenna coil—F-M (L1)
74815	Coil—R.F. coil—F-M (L2)
74817	Coil—Oscillator coil—F-M (L8)
35787	Connector—Single contact female connector for phono cables (J2, J3)
75542	Connector—8 contact male connector for power input cable (J4)
75543	Connector—2 contact female connector for 45 RPM motor cable (P1)
74879	Connector—2 contact female connector for antenna leads
75537	Control—Volume control and power switch (R22, S2)
75561	Control—Tone control—L.F. (R19)
75562	Control—Tone control—H.F. (R34)
†72953	Cord—Drive cord (approx. 66" overall length required)
75564	Coupling—Spring coupling for function switch extension shaft
75556	Cover—Insulating cover for electrolytic capacitor #72052
74839	Fastener—Push fastener for mounting R.F. shelf (4 req'd)
16058	Grommet—Rubber grommet for mounting R.F. shelf (4 req'd)
75547	Grommet—Rubber grommet to mount slide mechanism to bottom—rear (2 req'd)
75548	Grommet—Rubber grommet to mount slide mechanism to bottom—front (2 req'd)
11765	Lamp—Dial lamp—Mazda 51
75544	Nut—Rivnut to fasten screw for mounting chassis (4 req'd)
18469	Plate—Bakelite mounting plate for electrolytic capacitor #72052
75535	Plate—Dial back plate complete with three (3) pulleys
75536	Pointer—Station selector indicator

† Stock No. 72953 is a reel containing 250 feet of cord.

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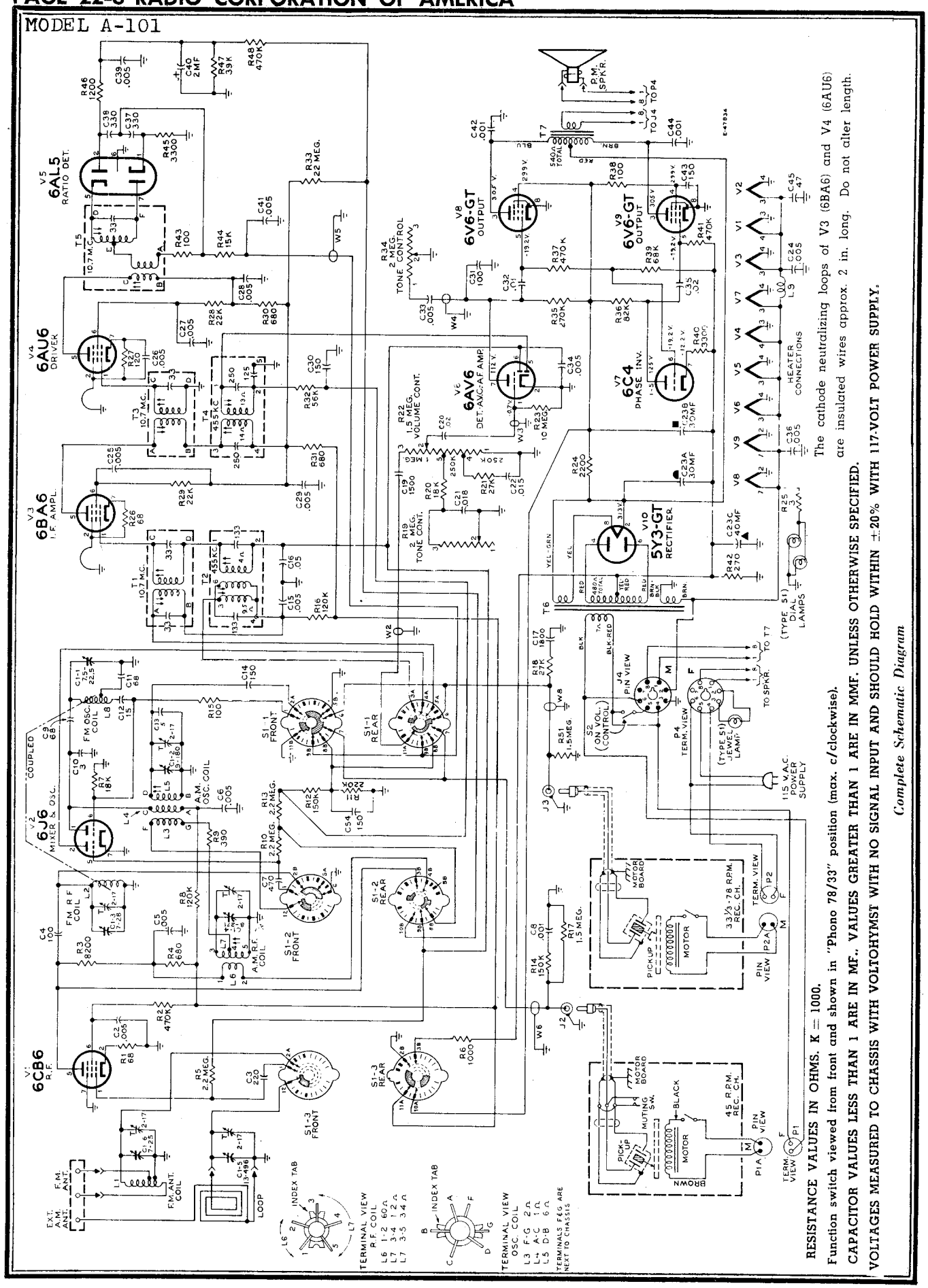
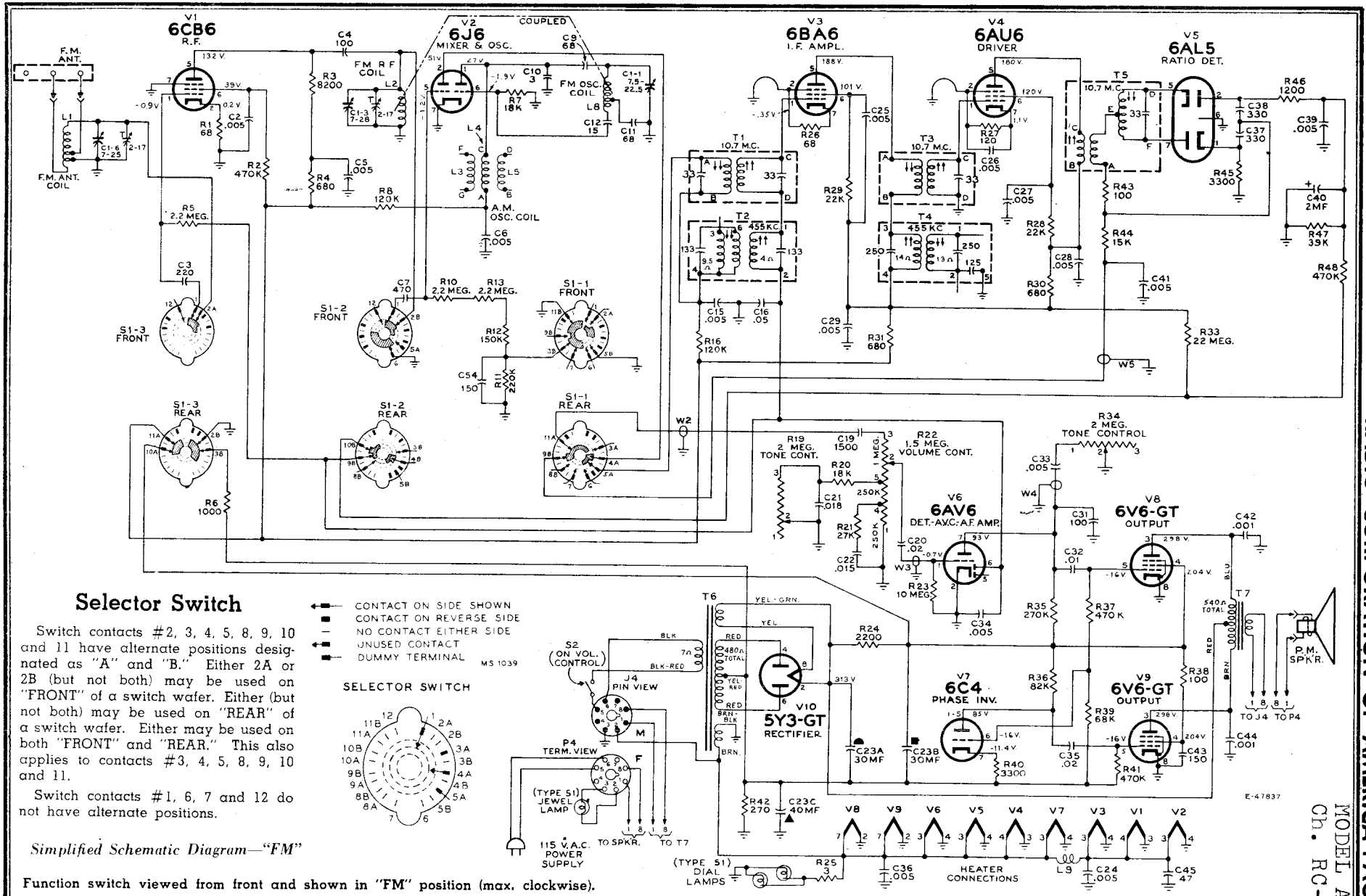
Replacement Parts—Concluded

STOCK NO.	DESCRIPTION
72602	Pulley—Drive cord pulley
72323	Resistor—Wire wound, 3 ohms, ½ watt (R25)
73637	Resistor—Wire wound, 2200 ohms, 5 watts (R24)
	Resistor—Fixed, composition:—
	68 ohms, ±10%, ½ watt, (R1, R26)
	100 ohms, ±10%, ½ watt (R15, R38, R43)
	120 ohms, ±10%, ½ watt (R27)
	270 ohms, ±5%, 2 watts (R42)
	390 ohms, ±10%, ½ watt (R9)
	680 ohms, ±10%, ½ watt (R4)
	680 ohms, ±20%, ½ watt (R30, R31)
	1000 ohms, ±10%, ½ watt (R6)
	1200 ohms, ±5%, ½ watt (R46)
	3300 ohms, ±5%, ½ watt (R40, R45)
	8200 ohms, ±10%, 1 watt (R3)
	15,000 ohms, ±10%, ½ watt (R44)
	18,000 ohms, ±10%, ½ watt (R7, R20)
	22,000 ohms, ±10%, ½ watt (R28, R29)
	27,000 ohms, ±10%, ½ watt (R18, R21)
	39,000 ohms, ±5%, ½ watt (R47)
	56,000 ohms, ±10%, ½ watt (R32)
	68,000 ohms, ±10%, ½ watt (R39)
	82,000 ohms, ±10%, ½ watt (R36)
	120,000 ohms, ±10%, ½ watt (R8, R16)
	150,000 ohms, ±10%, ½ watt (R12, R14)
	220,000 ohms, ±20%, ½ watt (R11)
	270,000 ohms, ±10%, ½ watt (R35)
	470,000 ohms, ±10%, ½ watt (R2, R37, R41, R48)
	1.5 megohm, ±10%, ½ watt (R17, R51)
	2.2 megohm, ±20%, ½ watt (R5, R10, R13)
	10 megohm, ±20%, ½ watt (R23)
	22 megohm, ±20%, ½ watt (R33)
75540	Shaft—Tuning knob shaft
75565	Shaft—Extension shaft for function switch
73584	Shield—Tube shield for V1 and V6
75546	Slide—Slide mechanism complete for radio chassis bottom
31251	Socket—Tube socket, octal, wafer
73117	Socket—Tube socket, 7 pin, miniature
74179	Socket—Tube socket, 7 pin, miniature for 6CB6 and 6J6 tubes only.
31364	Socket—Dial lamp socket
75563	Spring—Retaining spring for function switch extension shaft
74038	Spring—Drive cord spring
74847	Support—Polystyrene support for F-M oscillator coil complete with mounting bracket
75602	Switch—Function switch (S1-1, S1-2, S1-3)
75557	Transformer—Ouput transformer (T7)
73743	Transformer—Ratio detector transformer (T5)
75558	Transformer—First I-F transformer (A-M) complete with adjustable cores (T2)
73037	Transformer—Second I-F transformer (A-M) complete with adjustable cores (T4)
75559	Transformer—First I-F transformer (F-M) complete with adjustable cores (T1)
75560	Transformer—Second I-F transformer (F-M) complete with adjustable cores (T3)
75566	Transformer—Power transformer, 117 volts, 60 cycle (T6)
33726	Washer—"C" washer for tuning knob shaft
	RADIO ROLLOUT CARRIAGE
75603	Decal—Function decal for controls
75572	Dial—Polystyrene dial scale
75571	Frame—Moulded frame (maroon) for mounting radio chassis and 45 RPM record changer—for mahogany or walnut instruments
75684	Frame—Moulded frame (light brown) for mounting radio chassis and 45 RPM record changer—for oak instruments
75551	Handle—Metal pullout handle for mounting frame.
75555	Screw—#8-32 x 5/8" cross recessed pan head machine screw to mount radio chassis (4 req'd)

STOCK NO.	DESCRIPTION
	SPEAKER ASSEMBLY **Stamped 92569—12W RMA 274** **RL 111-A1**
13867	Cap—Dust cap
75682	Cone—Cone and voice coil assembly (3.2 ohms)
75681	Speaker—12" P.M. speaker complete with cone and voice coil (3.2 ohms)
	NOTE:—If stamping on speaker does not agree with above number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71864	Antenna—F-M antenna
75705	Antenna—Antenna loop complete less cable
75898	Back—Back cover—maroon—for 33⅓/78 RPM record changer compartment—for mahogany or walnut instruments (assembled to rollout)
75901	Back—Back cover—light brown—for radio—45 RPM record changer compartment—for oak instruments (assembled to rollout)
75900	Back—Back cover—maroon—for radio—45 RPM record changer compartment—for mahogany or walnut instruments (assembled to rollout)
73680	Board—"A—F-M" terminal board
75694	Bracket—Stop bracket (less rubber bumper) for rollouts
71599	Bracket—Pilot lamp bracket
75696	Bumper—Rubber bumper for record changer rollout stop bracket
75919	Button—Rosette button for speaker grille
74296	Cable—Shielded pickup cable complete with pin plug for 33⅓/78 RPM record changer
72437	Cable—Shielded pickup cable complete with pin plug for 45 RPM record changer
13103	Cap—Pilot lamp cap
71892	Catch—Bullet catch and strike for cabinet door
X3189	Cloth—Grille cloth for mahogany or walnut instruments
X3093	Cloth—Grille cloth for oak instruments
74882	Connector—2 contact (polarized) male connector for antenna loop cable
74752	Connector—2 contact male connector for FM antenna terminal board cable
75709	Connector—8 contact female connector for main cable (less shell) (P4)
30868	Connector—2 contact female connector for 33⅓/78 RPM record changer motor cable (P2)
75474	Connector—Single contact male connector for speaker cable (2 req'd)
71984	Decal—Trade mark decal (RCA Victor)
74273	Decal—Trade mark decal (Victrola)
74838	Grommet—Power cord strain relief (1 set)
37396	Grommet—Rubber grommet for mounting speaker
75697	Grommet—Rubber grommet for mounting 45 RPM changer
75551	Handle—Metal pullout handle for 33⅓/78 RPM record changer mounting frame
74308	Hinge—Cabinet door hinge (1 set)
75712	Knob—Tuning control, tone control or volume control and power switch knob—maroon—for mahogany or walnut instruments
75713	Knob—Tuning control, tone control or volume control and power switch knob—tan—for oak instruments
75714	Knob—Function switch knob—maroon—for mahogany or walnut instruments
75715	Knob—Function switch knob—tan—for oak instruments
11765	Lamp—Pilot lamp—Mazda #51
75917	Nail—Rosette headnail for grille (3 required)
73634	Nut—Speed nut for speaker mounting screw
75916	Pull—Door pull
74279	Screw—#8-32 x 7/8" trimit head screw for door pull
75708	Shell—Shell for 8 contact female connector #75709
75546	Slide—Slide mechanism for 33⅓/78 RPM record changer mounting frame
31364	Socket—Pilot lamp socket and lead
74734	Spring—Retaining spring for knobs
75902	Spring—Suspension spring for main cable
72936	Stop—Cabinet door stop

MODEL A-101





Selector Switch

Switch contacts #2, 3, 4, 5, 8, 9, 10 and 11 have alternate positions designated as "A" and "B." Either 2A or 2B (but not both) may be used on "FRONT" of a switch wafer. Either (but not both) may be used on "REAR" of a switch wafer. Either may be used on both "FRONT" and "REAR." This also applies to contacts #3, 4, 5, 8, 9, 10 and 11.

Switch contacts #1, 6, 7 and 12 do not have alternate positions.

CONTACT ON SIDE SHOWN
CONTACT ON REVERSE SIDE
NO CONTACT EITHER SIDE
UNUSED CONTACT
DUMMY TERMINAL

MS 1039

SELECTOR SWITCH

Simplified Schematic Diagram—"FM"

Function switch viewed from front and shown in "FM" position (max. clockwise).

CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHYMST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

MODEL A-101,
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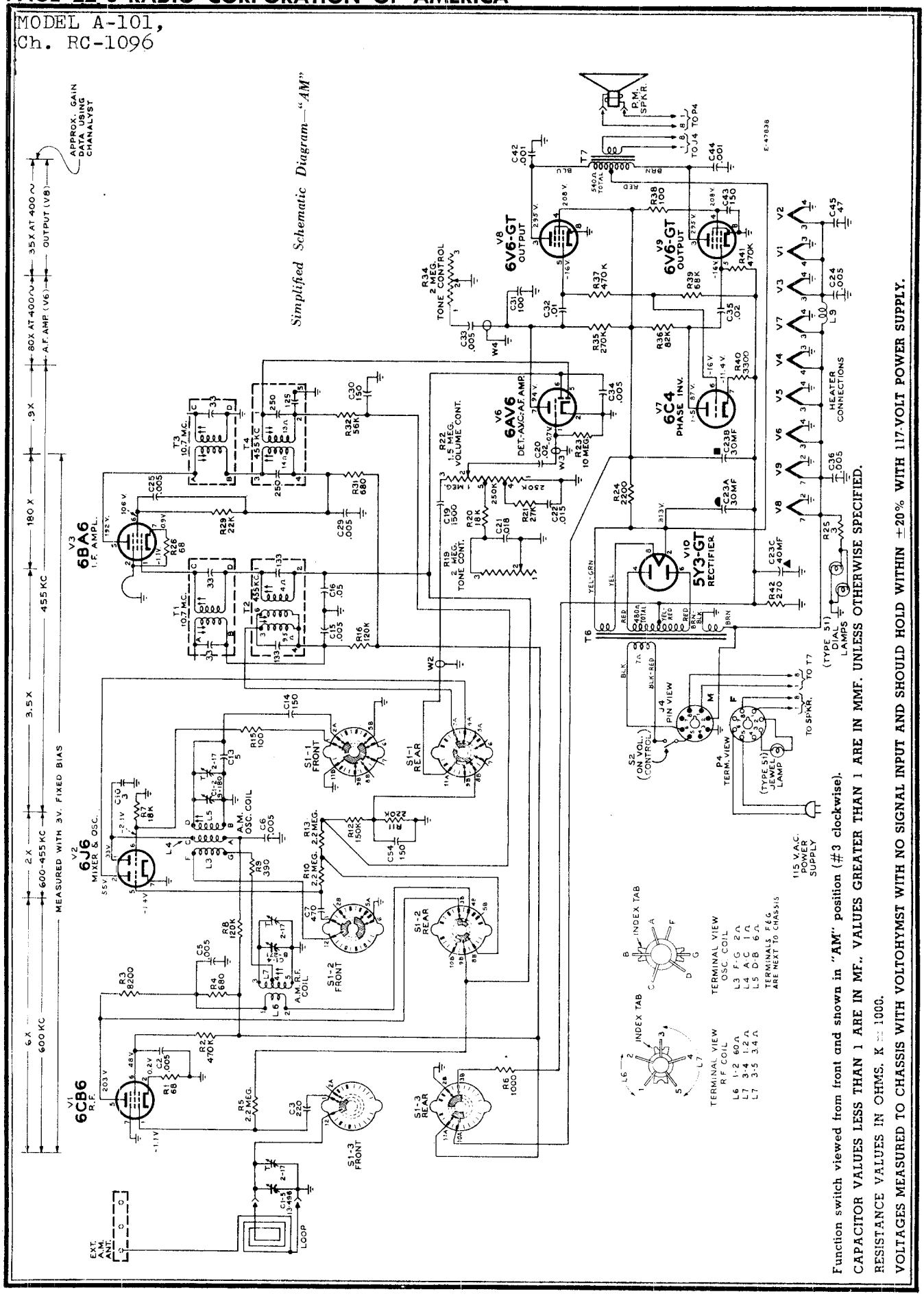
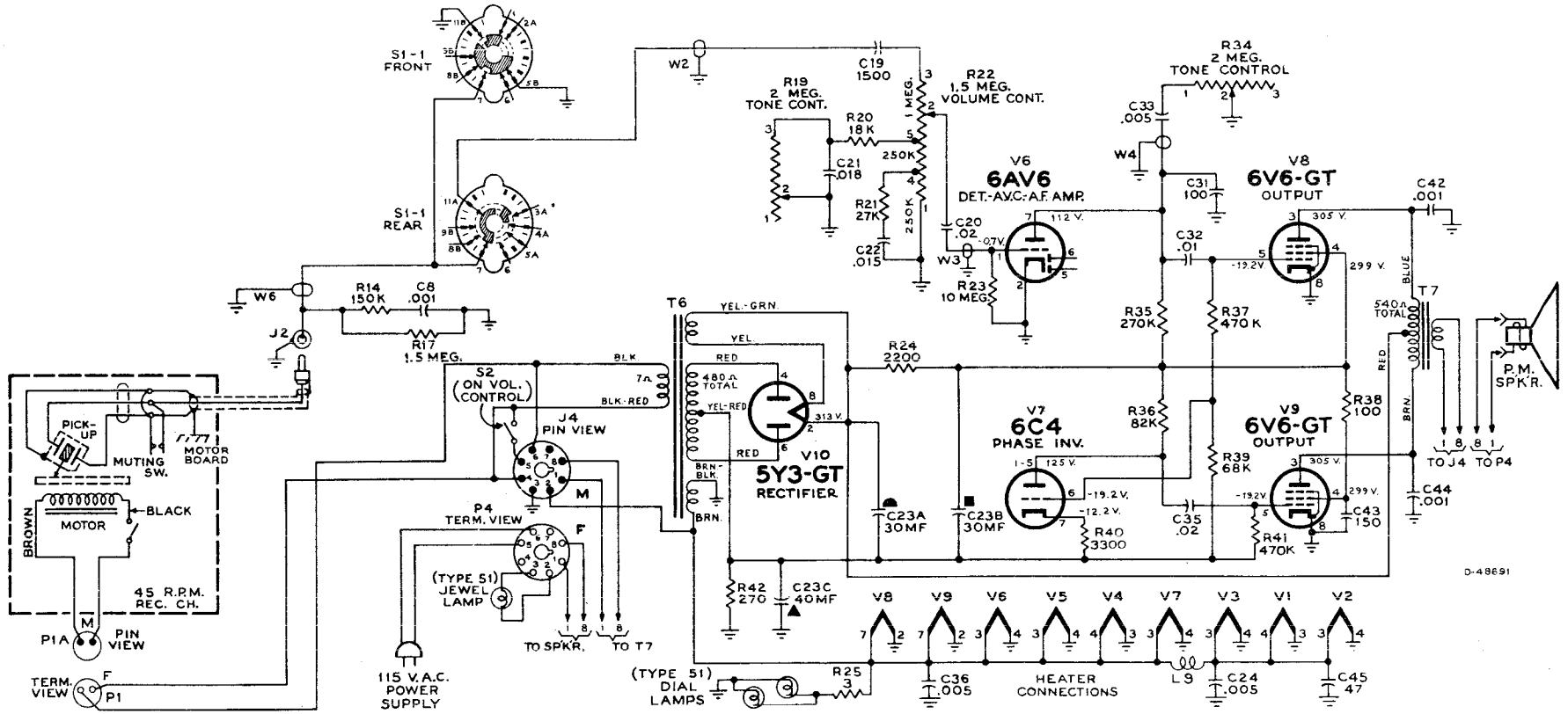


Function switch viewed from front and shown in "AM" position (#3 clockwise).

CAPACITOR VALUES LESS THAN 1 ARE IN MF.. VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHYMST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.



Note:

When the function switch is in "Phono 45" or "Phono 78/33" position the B+ supply voltage to tubes V1, V2, V3 and V4 is disconnected at switch section S1-3 rear. This results in higher plate and screen voltages on V6, V7, V8 and V9.

The bias resistor R6 (in parallel with R42 in AM and FM positions) is also disconnected at S1-3 rear. This results in higher grid bias voltage on V8 and V9.

FUNCTION SWITCH VIEWED FROM FRONT AND SHOWN IN "PHONO 45" POSITION (#2 CLOCKWISE).

CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHYMST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

Simplified Schematic Diagram—"Phono 45"

RECORD CHANGER: Model RP-190-2,
Pgs. RCD.CH.21-1 to RCD.CH.21-11.

MODEL A-101,
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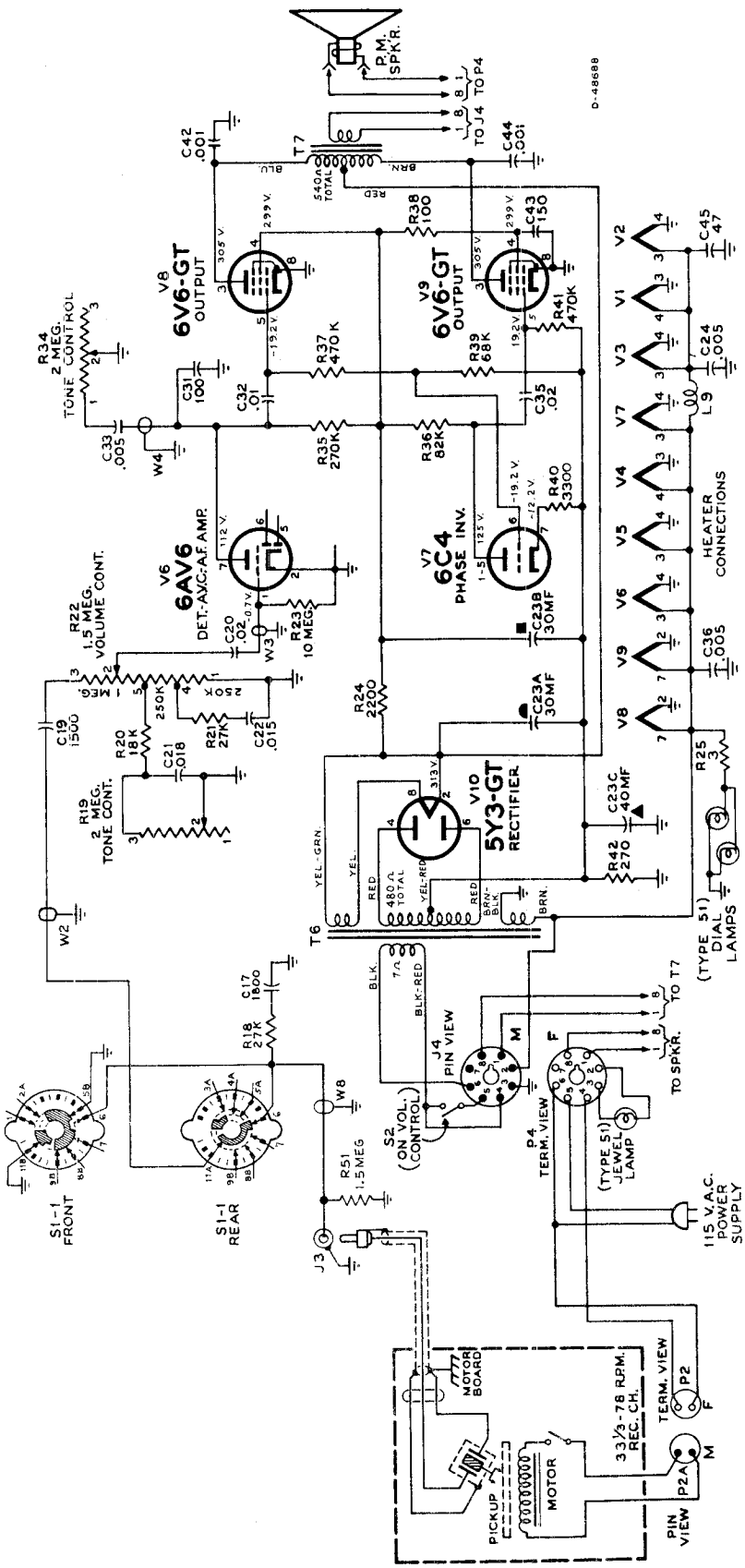


Note:

When the function switch is in "Phono 45" or "Phono 78/33" position the B+ supply voltage to tubes V1, V2, V3 and V4 is disconnected at switch section S1-3 rear. This results in higher plate and screen voltages on V6, V7, V8 and V9.

The bias resistor R6 (in parallel with R42 in AM and FM positions) is also disconnected at S1-3 rear. This results in higher grid bias voltage on V8 and V9.

FUNCTION SWITCH VIEWED FROM FRONT AND SHOWN IN "PHONO 78/33" POSITION (MAX. C/CLOCKWISE).

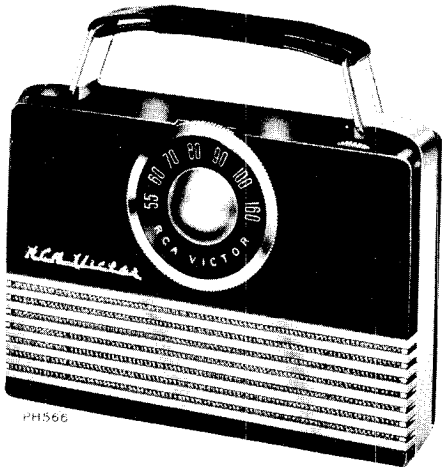
CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHYMST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

RECORD CHANGER: Model 960282-4, *Simplified Schematic Diagram—"Phono 78/33"*
See Pgs. RCD.CH.21-18 to RCD.Ch. 21-33.

MODELS B-411, Ch. RC-1098, RC-1098A



Specifications

Tuning Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc

Tube complement:
1. RCA 1R5 ..... Converter
2. RCA 1U4 ..... I.F. Amplifier
3. RCA 1U5 ..... 2nd Det.-A.F. Amp.-A.V.C.
4. RCA 3V4 ..... Output

Loudspeaker
Size and type ..... 2" x 3" P.M.
Voice coil impedance ..... 11¾ ohms at 1000 cycles

Batteries Required:

Type of Battery	Current Consumption	Approx. Life (Intermittent Service)
"A"—1.5 volt RCA VS 036 or VS 001	0.25 amp.	7 to 10 hrs.
"B"—67.5 volts RCA VS 016	8.45 ma.	40 to 60 hrs.

Power Output:
Undistorted ..... .075 watt
Maximum ..... 0.10 watt
Dimensions (over-all) ..... 5½" x 7⅝" x 2⅛"
Weight (with batteries) ..... slightly under 3 lbs.

Production Changes:

There are three types of case assemblies in use (two types are stocked) using two types of case backs (one type is stocked). SEE PAGE 4 FOR EXPLANATION OF CASE ASSEMBLY DIFFERENCES.

Two chassis have been used; RC-1098 has all individual resistors and capacitors, RC-1098A has two "Printed Circuit" units which replace ten individual resistors and capacitors.

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1098, RC 1098A
75778	Antenna—Ferrite rod antenna (L1)
75783	Capacitor—Variable tuning capacitor (C1-1, C1-2)
73153	Capacitor—Ceramic, 4 mmf. (C5)
75784	Capacitor—Ceramic, 56 mmf. (C2, C7)
75785	Capacitor—Ceramic, 82 mmf. (C9, C10)
73960	Capacitor—Ceramic, 10,000 mmf. (C4)
73964	Capacitor—Electrolytic, 10 mfd., 70 volts (C15)
72792	Capacitor—Tubular, paper, .001 mfd., 200 volts (C12)
72315	Capacitor—Tubular, paper, .002 mfd., 200 volts (C11, C14)
73961	Capacitor—Tubular, paper, .003 mfd., 200 volts (C6)
71928	Capacitor—Tubular, paper, .02 mfd., 200 volts (C13)
73553	Capacitor—Tubular, paper, .05 mfd., 400 volts (C8)
75781	Clip—"A" Battery mounting clip (negative)
75010	Clip—Output transformer mounting screw clip
75774	Coil—Oscillator coil complete with adjustable core (L2, L3)
75782	Contact—"A" Battery contact (positive)
75773	Control—Volume control and power switch (R6, S1)
37396	Grommet—Rubber grommet for antenna rod
75779	Knob—Volume control knob—less set screw (early type—does not have "ON" indication)
76321	Knob—Volume control knob—less set screw (late type—has "ON" indication)
75786	Lead—"B" battery lead complete with connector
76372	Plate—Four element "Printed Circuit" plate stamped 942660-1 (diode filter unit C7, C9, R4, R5)
76371	Plate—Six element "Printed Circuit" plate stamped 942659-1 (audio coupling unit C10, C12, R2, R7, R9, R10)
	Resistor—Fixed, composition:—
	390 ohms, ±10%, ½ watt (R11)
	1000 ohms, ±20%, ½ watt (R12)
	15,000 ohms, ±10%, ½ watt (R2)
	47,000 ohms, ±20%, ½ watt (R5)
	100,000 ohms, ±20%, ½ watt (R1)
	1 megohm, ±20%, ½ watt (R9)
	3.3 megohm, ±20%, ½ watt (R4, R10)
	4.7 megohm, ±20%, ½ watt (R3, R7)
	10 megohm, ±20%, ½ watt (R8)
70527	Screw—#6-32 x 3/16" socket head set screw for volume control knob
75780	Socket—Tube socket, 7 pin, miniature
75775	Transformer—First I-F transformer (T1)
75776	Transformer—Second I-F transformer (T2)
75777	Transformer—Output transformer (T3)
	SPEAKER ASSEMBLY 92523-4
76373	Speaker—2" x 3" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
75787	Back—Case back
75647	Case—Case assembly (front and back) complete with metal side trim, metal grille and emblem—less handle and links (early type—does not have "ON" indication opening)
76320	Case—Case assembly (front and back) complete with metal side trim, metal grille and emblem—less handle and links (late type has "ON" indication opening)
75651	Emblem—"RCA Victor" emblem
75648	Grille—Metal grille
75649	Handle—Carrying handle
75788	Knob—Dial knob less spring clip
75650	Link—Carrying handle link
75801	Screen—Crinoline screen (black) for case front
74734	Spring—Spring clip for dial knob

MODELS B-411, Ch.
RC-1098, RC-1098A

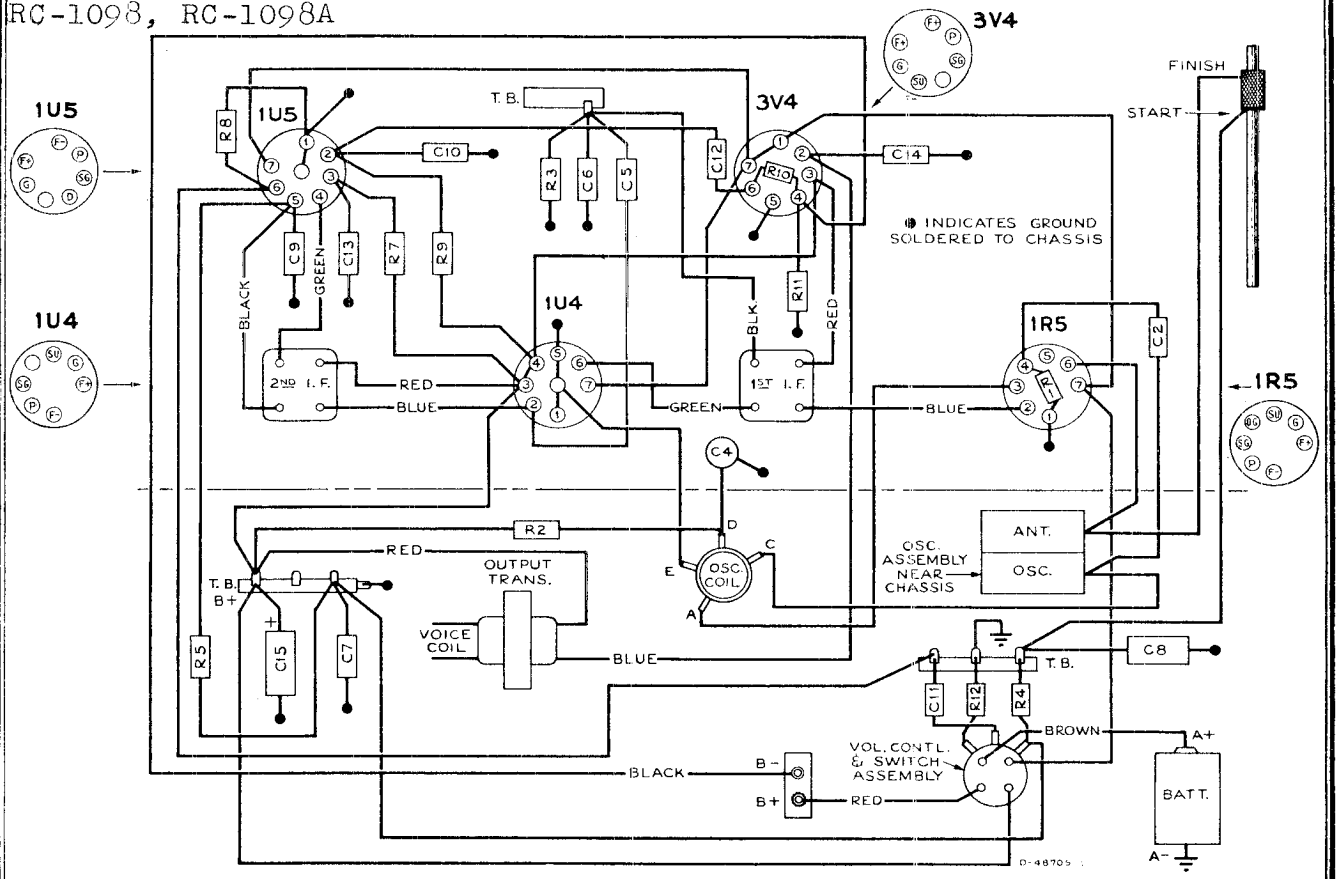


Fig. 1—Connection Diagram

In late production chassis:

"Printed Circuit" unit stamped 942659-1 replaces individual parts C10, C12, R2, R7, R9 and R10.
"Printed Circuit" unit stamped 942660-1 replaces individual parts C7, C9, R4 and R5.

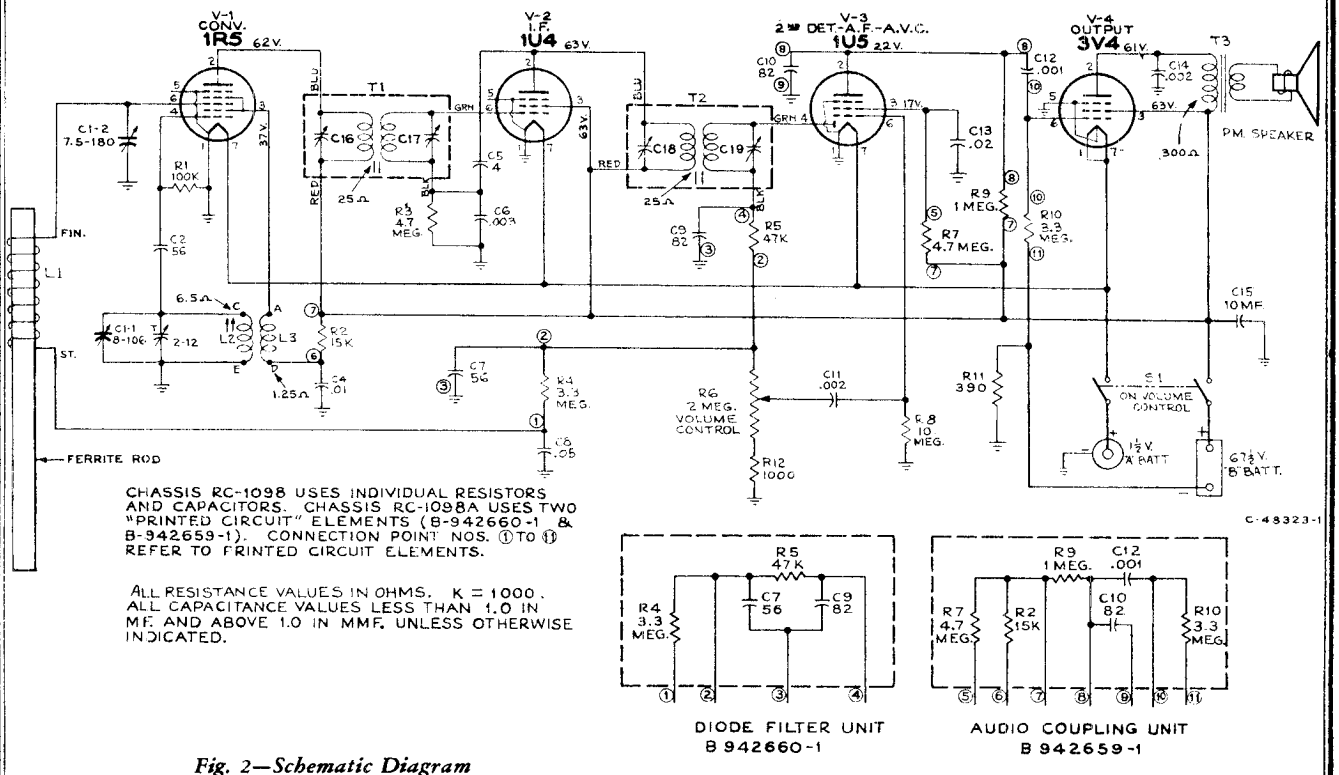


Fig. 2—Schematic Diagram

MODELS B-411, Ch. RC-1098, RC-1098A

Alignment Procedure

Output Meter.—Connect meter from No. 2 terminal of V4 (plate of 3V4) to ground. Turn volume control to maximum position.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Note:—The inductance of the antenna coil is adjusted by sliding the coil along the Ferrite rod. This ant. coil is supplied pre-adjusted and cemented to rod. This makes further adjustment unnecessary. However when replacing ant. assembly make certain that the coil end of the rod extends two inches beyond the tube shelf.

CRITICAL LEAD DRESS

1. Dress all I-F transformer leads down to base and push any excess lead back in can.
2. Black lead from 1st I-F should lay down against top of tube shelf with capacitor C6 over it.
3. Dress neutralizing capacitor C5 direct and above chassis base, avoid lead length.
4. Dress blue lead from volume control and green lead from terminal board near volume control down to base and under gang frame diagonally to termination.
5. Dress blue lead from output transformer under clamp on back of gang condenser and direct to terminal 2 of V4.
6. Adjust Ferrite antenna so that coil end of rod extends two inches beyond tube shelf.
7. Dress all bare wires, pigtail leads and non-insulated components to prevent shorts.

Steps	Connect the high side of test osc. to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Connection lug of C1-2 located on rear of gang in series with .01 mf.	455 kc	Quiet point near 1600 kc	C18, C19 2nd I-F trans.
2				C16, C17 1st I-F trans.
		Repeat steps 1 and 2		
4	*Antenna coupling loop (Chassis in case)	1400 kc	14 Rock gang	C1-1T (osc.)
5		600 kc	60 Rock gang	L2 (osc.)
6		Repeat steps 4 and 5		

*Steps 4 and 5 require a coupling loop from the signal generator to feed a signal into the receiver ant. coil. This loop should be loosely coupled to the receiver antenna coil so as not to disturb the receiver ant. coil inductance.

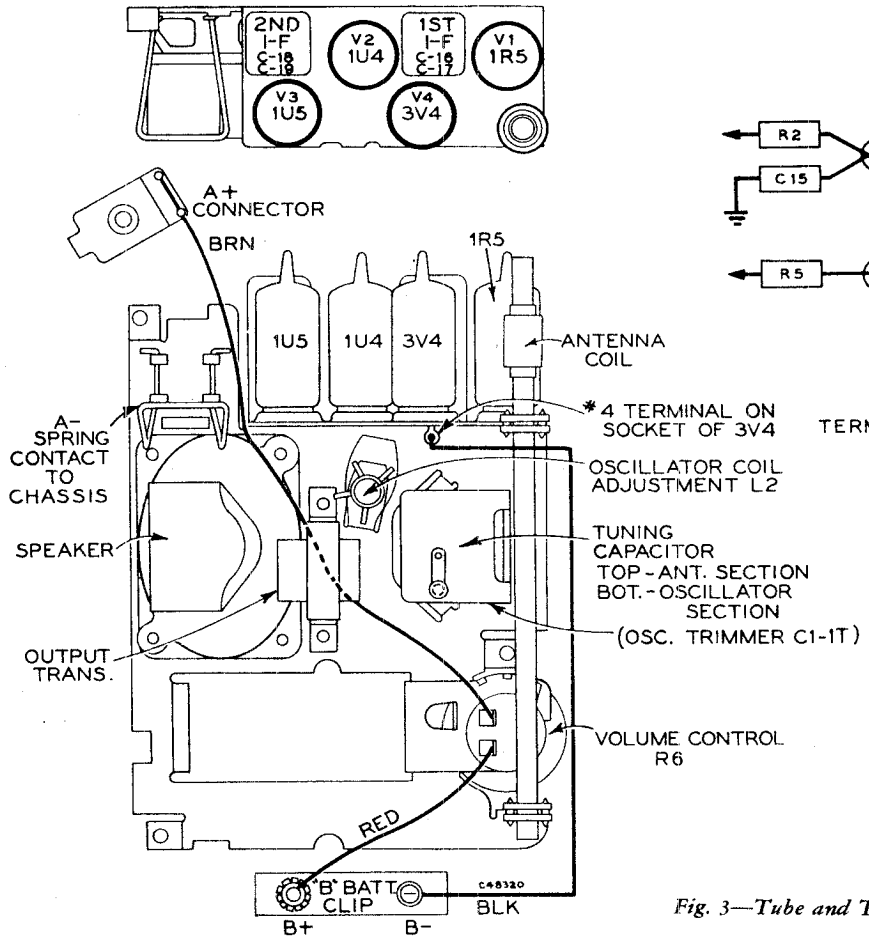


Fig. 3—Tube and Trimmer Locations

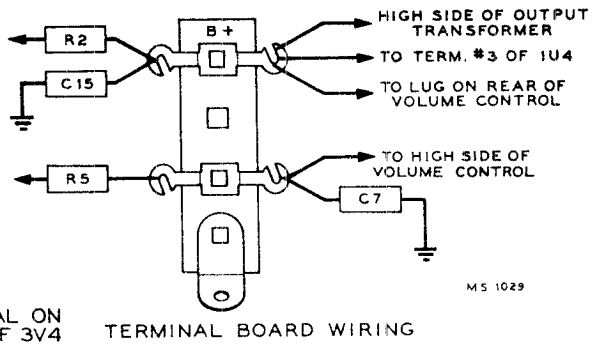
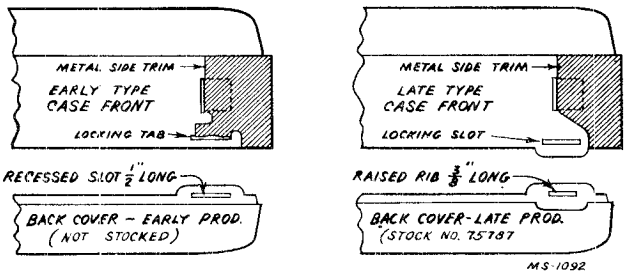


Fig. 4—Terminal Strip

MODELS B-411, Ch. RC-1098, RC-1098A

CHANGES IN CASE ASSEMBLIES:

1. The original back (not stocked) had slots in the bottom edge which engaged with extension tabs of the metal trim of the case front.
2. Late production backs (Stock No. 75787) have molded lips on the bottom edge which fit into slots of the case front. When installing this back on early type case fronts, it will be necessary to break off the locking tabs on each side of the original trim strip.
3. The latest production of case assemblies (Stock No. 76320) have an "ON" indication opening in front of the volume control knob. Volume control knob (Stock No. 76321) is used with this case assembly.



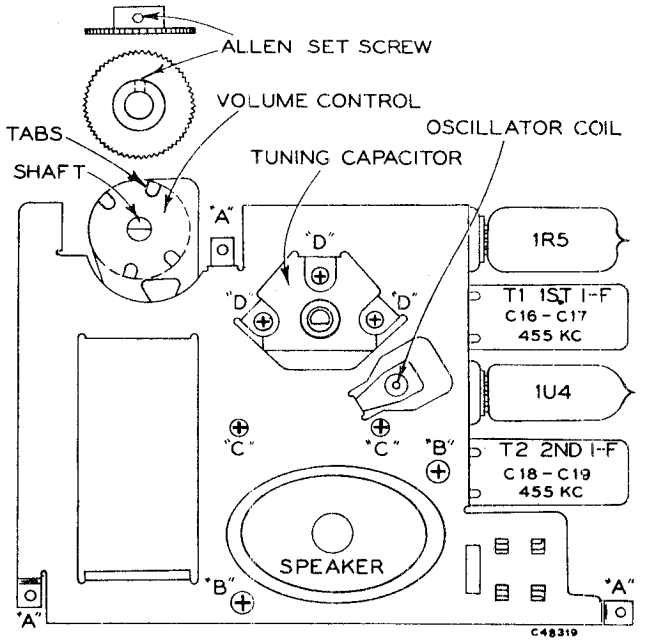


Fig. 5—Chassis assembly

REPLACEMENT OF COMPONENT PARTS

I. To Remove Back Cover

a. Depress top of case midway between the handle supports, until the top end of the back separates from the main case.
b. Pull the back cover back and up, thereby unhooking the retaining lugs in the bottom of the main case.

II. To Replace Batteries

a. Remove back cover.
b. Remove either or both "A" and "B" batteries as may be necessary. The "B" battery snap fasteners can best be removed by inserting a screwdriver under the snap fastener strip and prying upward.
c. The "A" battery can easily be removed by pulling back on the spring wire and lifting out.

III. To Remove Main Case

a. Remove front dial. (Just Pull).
b. Remove back cover.
c. Remove the three screws "A".
d. Remove "A+" clip (Squeeze and lift out of slot in case).
e. Grasp the assembly by the speaker housing and pull the bottom end of the chassis outward then down so the Volume Control knob clears the case.

IV. To Replace Front Metal Grille

a. Remove front dial.
b. Remove back cover.
c. Remove chassis.
d. Bend small tabs inside case and separate metal strips from cabinet.
e. Bend small tabs inside case and separate grille from cabinet. Insert new grille and bend tabs.
Note:—A black non-metallic screen is placed between the grille and the cabinet.

V. To Remove Handle

a. Remove handle by separating the square spring wire clips on each end of handle and lift out.

VI. To Remove Tubes

There is very little room in the cabinet so it is suggested the chassis be removed from the cabinet to replace tubes.

a. Remove front dial.
b. Remove back cover.
c. Remove chassis
d. Remove tubes.

VII. To Remove Speaker

a. Remove front dial.
b. Remove back cover.
c. Remove chassis from cabinet.
d. Unsolder voice coil leads.
e Remove two screws "B" and lift speaker out.

VIII. To Remove Output Transformer

a. Remove front dial.
b. Remove back cover.
c. Remove chassis from cabinet.
d. Unsolder leads.
e. Remove two screws "C" and lift transformer out.

IX. To Remove Volume Control

a. Remove front dial.
b. Remove back cover.
c. Remove chassis from cabinet.
d. Unsolder leads.
e. Loosen Allen Set screw on Volume Control knob and remove knob. (Just Pull).
f. Bend tabs holding Volume Control to chassis and lift the Volume Control out.

X. To Remove Tuning Capacitor

a. Remove front dial.
b. Remove back cover.
c. Remove chassis from cabinet.
d. Unsolder leads to tuning capacitor.
e. Remove three screws "D" holding capacitor and lift out.

XI. To Remove Oscillator Coil

a. Remove front dial.
b. Remove back cover.
c. Remove chassis
d. Unsolder leads to coil.
e. Remove coil by unsnapping mounting clips from angle bracket.

XII. To Remove First I-F Transformer

a. Remove front dial.
b. Remove back cover.
c. Remove chassis.
d. Remove the mounting screws of both speaker and output transformer and move the speaker and transformer as found necessary for access to 1st I-F transformer leads.
e. Unsolder four leads from transformer.
1. Blue lead from #2 terminal (Plate of 1R5 tube).
2. Red lead from #3 terminal (Screen grid of 3V4 tube).
3. Green lead from #6 terminal (Control grid of 1U4 tube).
4. Black lead from lug on small terminal board on top of tube shelf.
f. Bend one mounting lug and unsolder the other lug from the chassis and lift the transformer out.

XIII. To Remove 2nd I-F Transformer

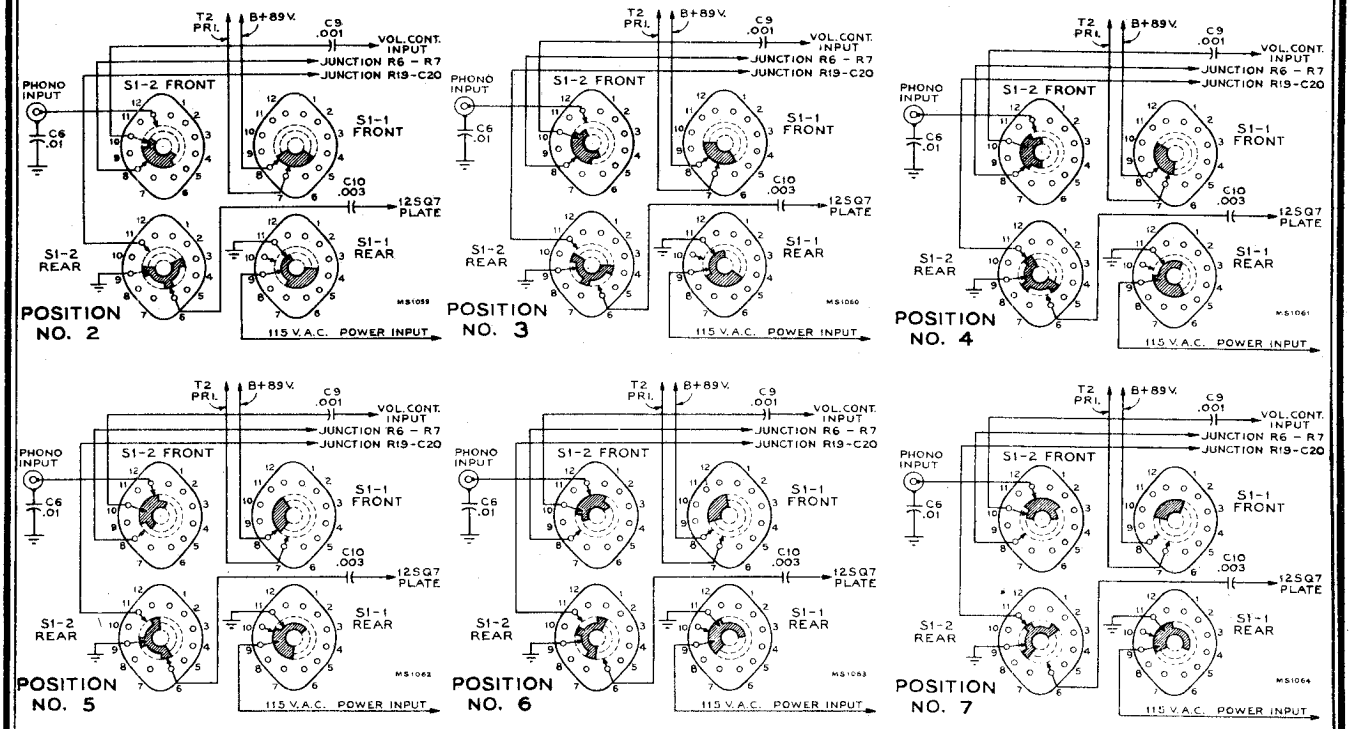
a. Remove front dial.
b. Remove back cover.
c. Remove chassis.
d. Remove the mounting bolts of both speaker and output transformer and move the speaker and transformer as found necessary for access to 2nd I-F transformer leads.
1. Blue lead from #2 terminal (Plate of 1U4 tube).
2. Red lead from #3 terminal (Screen grid of 1U4 tube).
3. Green lead from #4 terminal (Diode of 1U5 tube).
4. Black lead from #5 terminal (Dummy terminal of 1U5 tube).

Unsolder the tabs from the chassis and lift the transformer out.

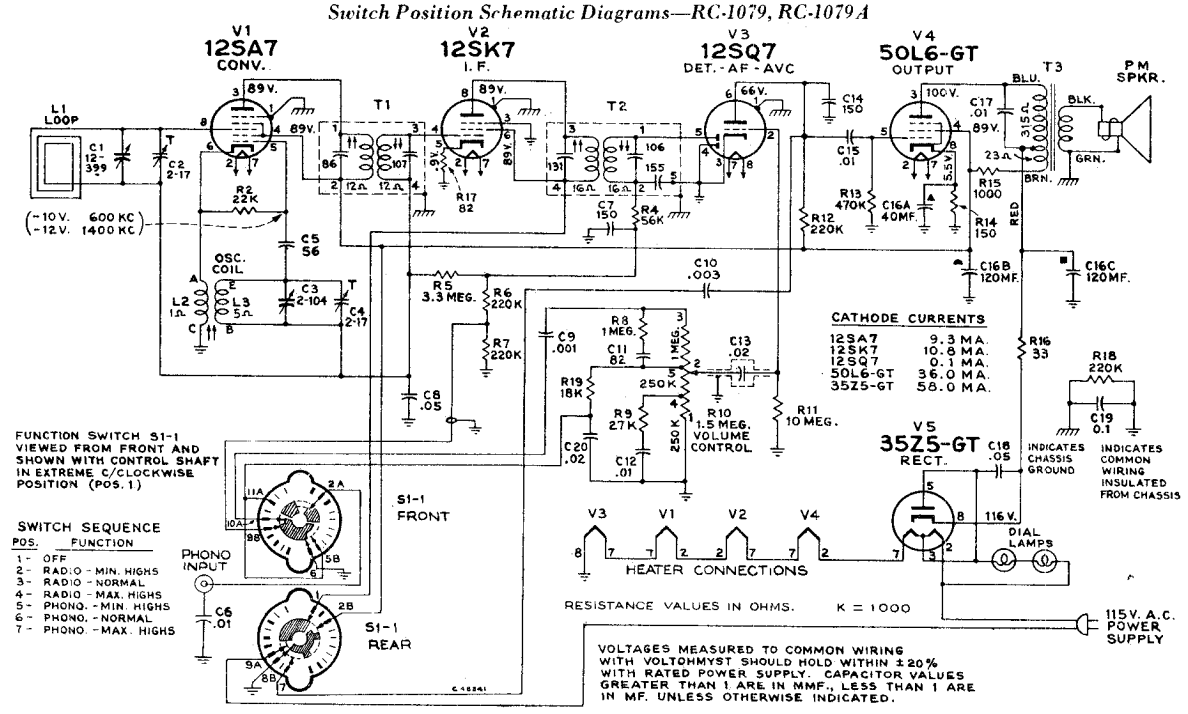
NOTE: For Add. data, See 9X571, on Pgs. 20-17 to 20-18.

Stock No.	DESCRIPTION
75936	Switch—Function switch for RC-1079E, RC-1079F S1
	SPEAKER ASSEMBLIES
	STAMPED 92586-4W
74759	Cone—Cone and voice coil assembly
74664	Speaker—8" P.M. speaker complete with cone and voice coil

MODELS 9X571, Ch. RC-1079E; 9X572, Ch. RC-1079A, RC-1079F



Switch Position Schematic Diagrams—RC-1079, RC-1079A



Schematic Diagram—RC-1079E, RC-1079F

SPEAKER GRILLE DIFFUSER RINGS

In early production the speaker diffuser rings were fastened in place to the metal speaker grille with speed nuts slipped over plastic tabs protruding through the metal grille base.

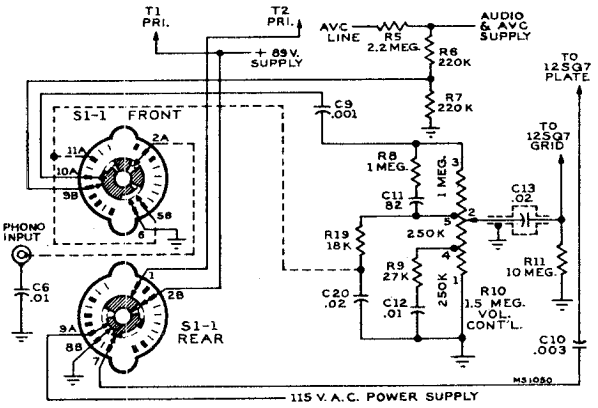
In late production these protruding plastic tabs are deformed by heat application, securely fastening the diffuser rings to the metal grille base.

If replacement of any of the diffuser rings is required, it is only necessary to tightly press the rings against the cabinet, and deform the plastic tabs from the inside with a hot soldering iron.

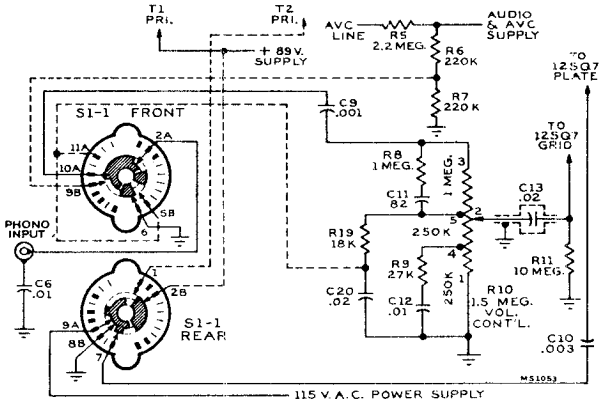
Any ring may be removed or installed without removing any of the other rings. This may be done by pressing on opposite outer edges to form an ellipse large enough to slip over the next smaller ring. Before any ring can be removed, it is necessary to unfasten the plastic tabs which project into the cabinet.

CHASSIS RC-1079A, RC-1079E, RC-1079F

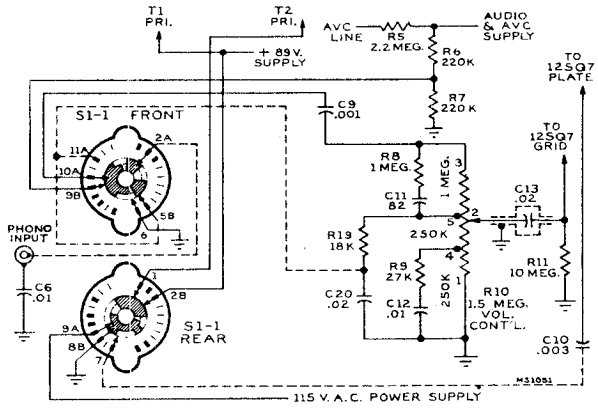
Loudspeaker (92586-2W or 92586-4W)
Size and Type..... 8 in. PM
Voice Coil Impedance..... 3.2 ohms at 400 cycles



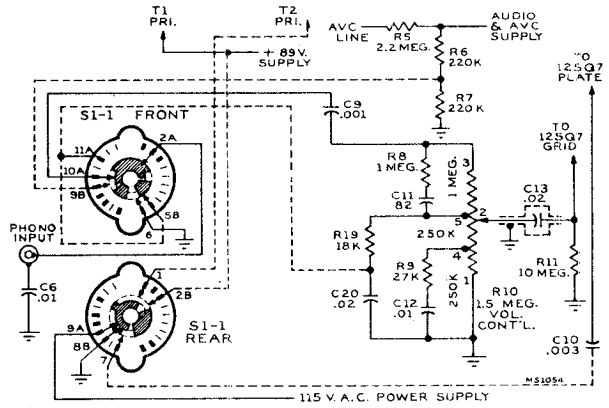
POSITION No. 2—RADIO MIN. HIGHS



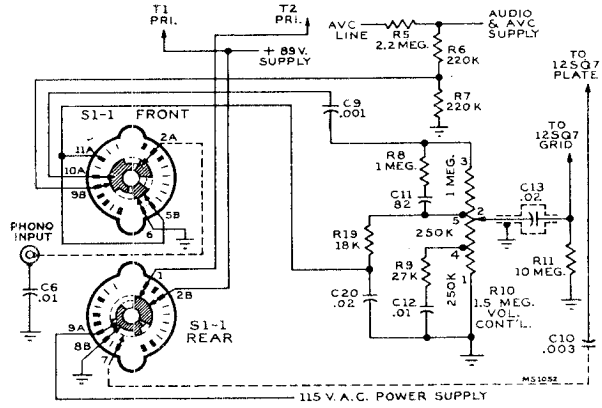
POSITION No. 5—PHONO MIN. HIGHS



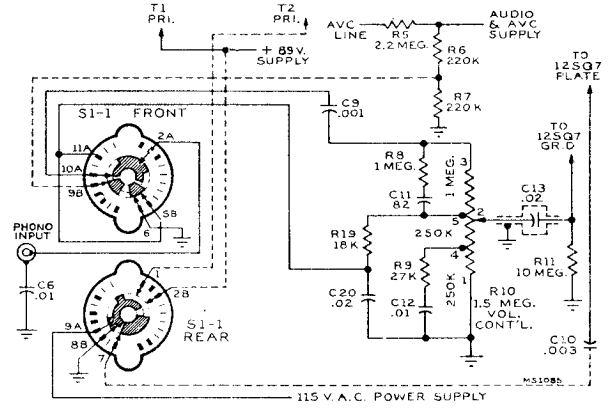
POSITION No. 3—RADIO NORMAL



POSITION No. 6—PHONO NORMAL



POSITION No. 4—RADIO MAX. HIGHS



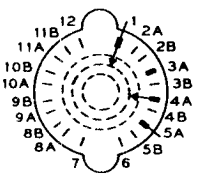
POSITION No. 7—PHONO MAX. HIGHS

Selector Switch

Switch contacts #2, 3, 4, 5, 8, 9, 10 and 11 have alternate positions designated as "A" and "B." Either 2A or 2B (but not both) may be used on "FRONT" of a switch wafer. Either (but not both) may be used on "REAR" of a switch wafer. Either may be used on both "FRONT" and "REAR." This also applies to contacts #3, 4, 5, 8, 9, 10 and 11.

Switch contacts #1, 6, 7 and 12 do not have alternate positions.

SELECTOR SWITCH



Switch Position Schematic Diagrams
Chassis RC-1079E, RC-1079F

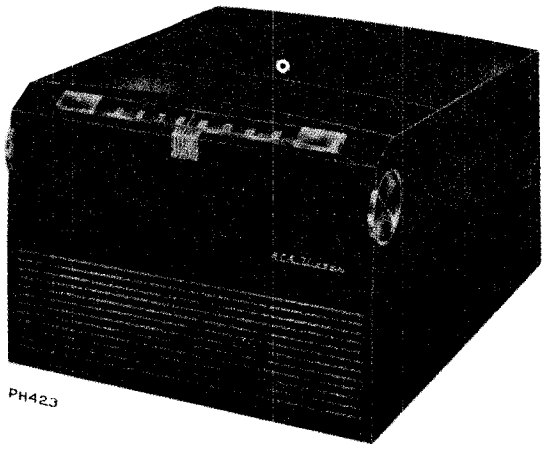
- CONTACT ON SIDE SHOWN
- CONTACT ON REVERSE SIDE
- NO CONTACT EITHER SIDE
- UNUSED CONTACT
- DUMMY TERMINAL

MS-1039

HUM REDUCTION

Due to the excellent bass reproduction of these instruments the critical lead dress should be closely observed to obtain minimum hum. The outside foil polarity of capacitors in the audio circuit should not be reversed.

MODEL 9Y511,
Ch. RC-1077B



Specifications

Tuning Range ..... 540-1600 kc

Intermediate Frequency ..... 455 kc

Tube Complement

1. RCA-12BE6 ..... Converter
2. RCA-12BA6 ..... I-F Amplifier
3. RCA-12AV6 ..... Det., AVC., A-F Amplifier
4. RCA-50L6GT ..... Output
5. RCA-35W4 ..... Rectifier

Power Supply Rating ..... 115 volts, 60 cycles a.c., 60 watts

Dial Lamps (2) ..... Mazda type 1490, 3.2 volts, 0.16 amp.

Loudspeaker (92585-1)

Size and type ..... 5" x 7" P.M.
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output

Undistorted ..... 1 watt
Maximum ..... 1.5 watts

Cabinet Dimensions

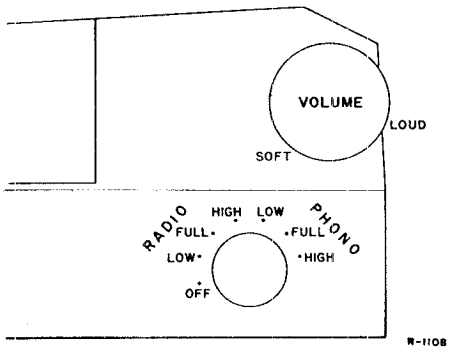
Height 7¾" Width 12⅜" Depth 14¼"

Tuning Drive Ratio ..... 7½:1 (3¾ turns of knob)

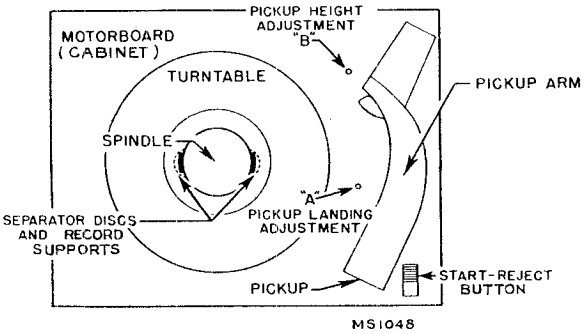
Record Changer (RP 168K-4)

Turntable speed ..... 45 r.p.m.
Records used ..... RCA—7 in. fine groove
Record capacity ..... Up to 10 records
Pickup (Stock No. 74068) ..... Crystal (medium output)

FOR RECORD CHANGER SERVICE INFORMATION —REFER TO RP 168 SERIES SERVICE DATA



Controls—End View



Record Changer—Top View

Care of Stylus

The record changer stylus is protected by a permanent metal guard. LINT MAY COLLECT TO CLOG THE OPENING IN THE GUARD AT THE STYLUS POINT AND CAUSE POOR RECORD REPRODUCTION. This may require occasional cleaning of the guard opening—clean by carefully brushing with a small soft brush.

Service Hints

The tubes and the dial lamps are accessible by removing the panel in the front of the record changer compartment.

The chassis metal mounting plate should be flush against the front of the cabinet.

The position of the speaker is adjustable. When correctly positioned, it should set firmly against the front of the cabinet but with no undue strain on the speaker.

RECORD CHANGER: See Model RP-168 Series, Pgs. RCD.CH.19-1 to 19-8.

MODEL 9Y511,
Ch. RC-1077B

Alignment Procedure

Output Meter—Connect meter across speaker voice coil. Turn volume control to maximum.

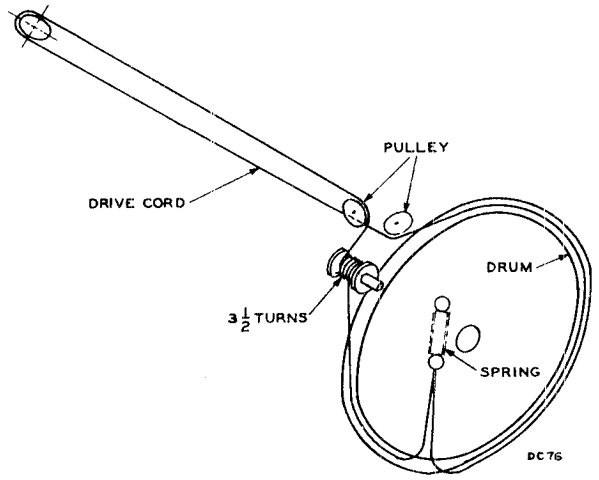
Test Oscillator—Connect low side of test oscillator to common wiring in series with a .1 mf. capacitor. If the test oscillator is a.c. operated it may be necessary to use an isolation transformer for the receiver during alignment and the low side of the test oscillator connected directly to common wiring at the electrolytic capacitor. Keep the oscillator output low to prevent a-v-c action.

Dial Pointer Adjustment—Rotate tuning condenser until the plates are fully open. Adjust indicator pointer to 1630 kc (extreme high frequency end of the scale).

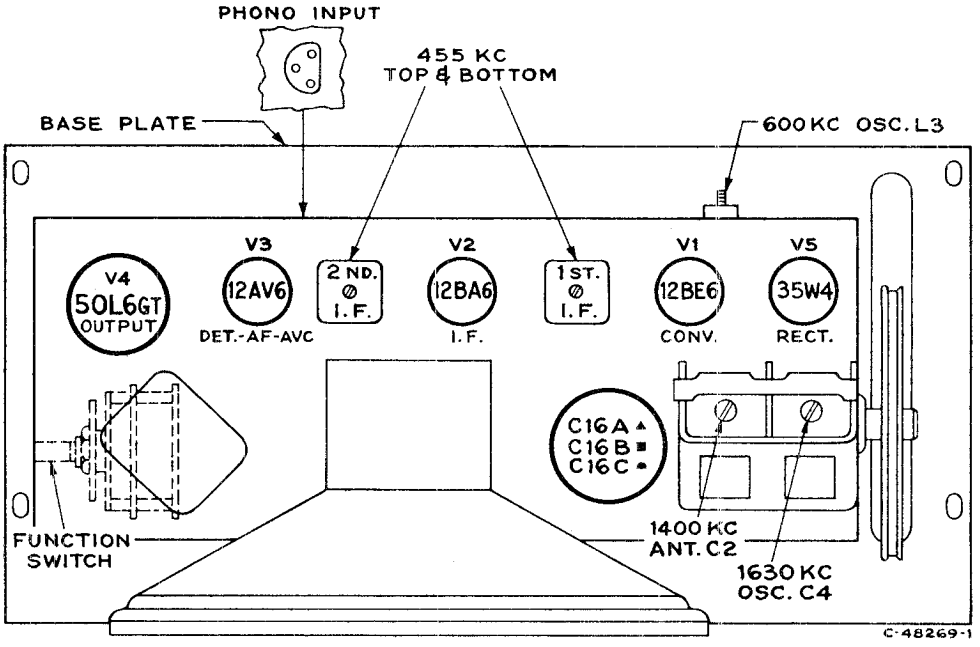
Steps	Connect the high side of test to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	I.F. grid, in series with .1 mfd.	455 kc	Quiet point 1,600 kc end of dial	Pri. & Sec. 2nd I.F. transformer
2	Converter grid in series with .1 mfd.			Pri. & Sec. 1st I.F. transformer
NOTE—ANTENNA LOOP AND RECORD CHANGER MUST BE IN CABINET FOR THE FOLLOWING				
3	Short wire placed near loop for radiated signal	1,630 kc	Extreme R. H. end (gang open)	1,630 KC trimmer (osc.)
		1,400 kc	1,400 kc	1,400 KC trimmer (ant.)
5		600 kc	600 kc	Osc. Coil L3 Rock gang
6	Repeat steps 3, 4, & 5 if necessary			

LEAD DRESS

1. Dress all heater leads and pilot light leads down to chassis and as far as possible from all audio grid and plate wiring.
2. Dress all exposed leads away from each other and away from chassis to prevent short circuits.
3. Dress lead from R.F. section of gang to V1 pin 7 direct but away from chassis base to reduce capacity, also away from fuse resistor.
4. Dress lead from oscillator section of gang to oscillator coil direct but away from chassis base to reduce capacity.
5. Connect capacitor C20 with short leads between gang frame and mounting bracket.
6. Dress output transformer leads down to base.
7. Dress loop antenna leads away from gang plates and tubes.
8. Dress 33 ohm limiting resistor away from chassis.

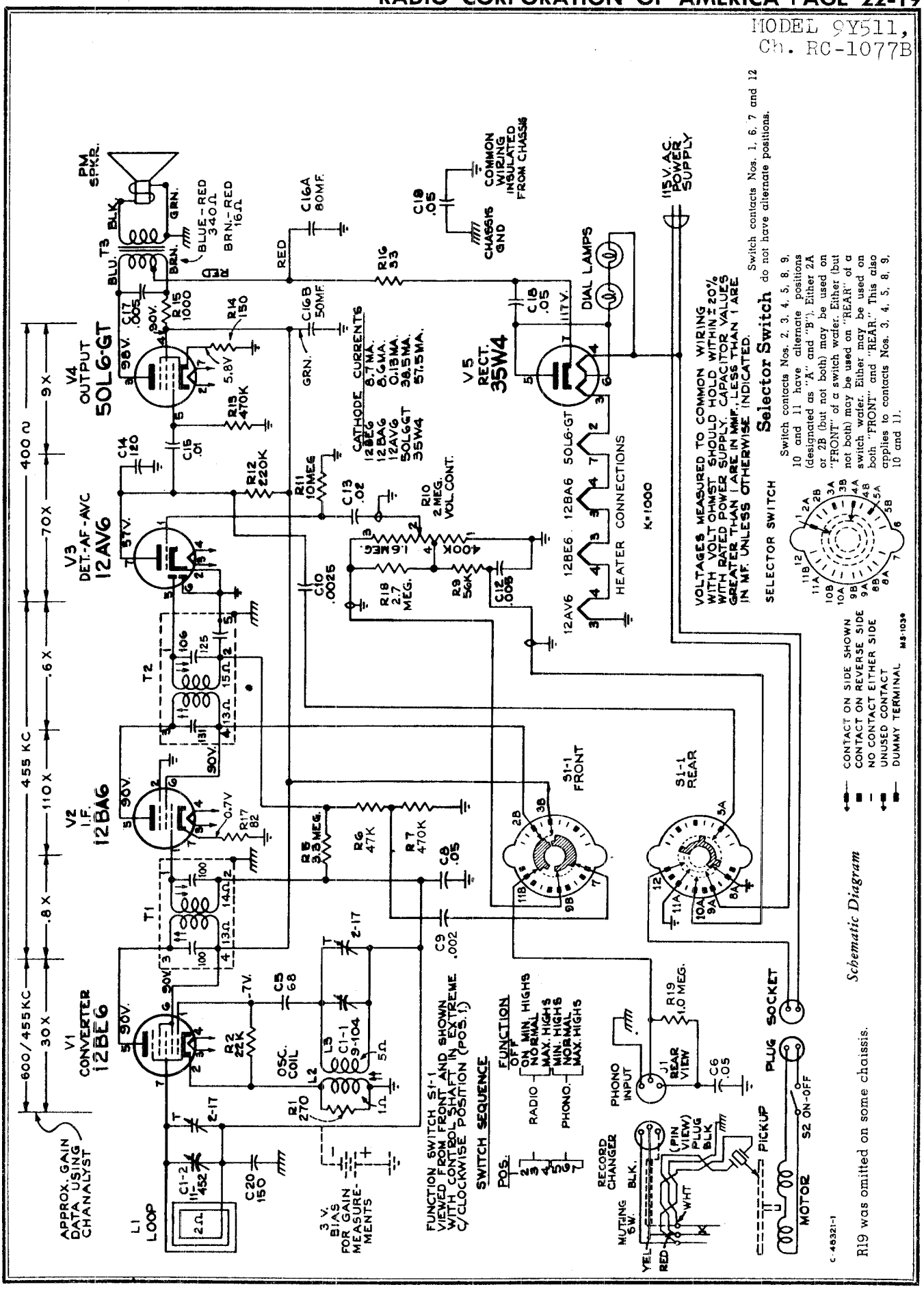


Dial Drive Mechanism



Tube and Trimmer Locations

MODEL 9Y511,
Ch. RC-1077B



MODEL 9Y511,
Ch. RC-1077B

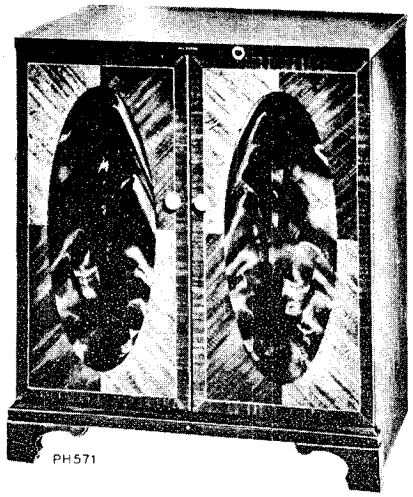
Replacement Parts

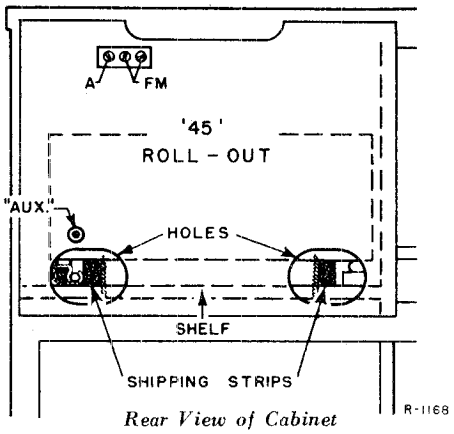
STOCK NO.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1077B
74703	Antenna—Antenna loop assembly L1
74705	Bracket—Drive cord pulley bracket (R.H.) complete with two (2) pulleys less long bracket.
74704	Capacitor—Variable tuning capacitor—less bracket ..C1-1, C1-2
39624	Capacitor—Mica, 68 mmf C5
39630	Capacitor—Mica, 120 mmf C14
39632	Capacitor—Mica, 150 mmf C20
73803	Capacitor—Tubular, paper, .002 mfd, 400 volts C9
73599	Capacitor—Tubular, paper, .0025 mfd, 400 volts C10
73920	Capacitor—Tubular, paper, .005 mfd, 400 volts C12, C17
73561	Capacitor—Tubular, paper, .01 mfd., 200 volts C15
73562	Capacitor—Tubular, paper, .02 mfd., 400 volts C13
73553	Capacitor—Tubular, paper, .05 mfd., 400 volts, C6, C8, C18, C19
75911	Capacitor—Electrolytic comprising 1 section of 80 mfd., 150 volts and 1 section of 50 mfd, 150 volts C16A, C16B
73935	Clip—Mounting clip for I.F. transformer
74448	Coil—Oscillator coil L2
36422	Connector—3 contact female connector for phono input cable, J1
30868	Connector—2 contact female connector for motor cable, P3
74702	Control—Volume control R10
†72953	Cord—Drive cord (approx. 49" over-all length required)
70392	Cord—Power cord and plug
74454	Gasket—Rubber gasket between speaker and cabinet
74838	Grommet—Strain relief grommet (1 set)
72283	Grommet—Rubber grommet to mount tuning capacitor
72602	Pulley—Drive cord pulley
72313	Resistor—Fuse type, 33 ohms R16
	Resistor—Fixed, composition:
	82 ohms, ±10%, ½ watt R17
	150 ohms, ±10%, ½ watt R14
	270 ohms, ±10%, ½ watt R1
	1000 ohms, ±10%, 1 watt R15
	22,000 ohms, ±20%, ½ watt R2
	47,000 ohms, ±20%, ½ watt R6
	56,000 ohms, ±10%, ½ watt R9
	220,000 ohms, ±20%, ½ watt R12
	470,000 ohms, ±20%, ½ watt R7, R13
	1.0 megohm, ±10%, ½ watt R19
	2.7 megohms, ±10%, ½ watt R18
	3.3 megohms, ±20%, ½ watt R5
	10 megohms, ±20%, ½ watt R11
74701	Shaft—Tuning knob shaft and pulley
73584	Shield—Tube shield for 12AV6
70827	Socket—Tube socket, octal, wafer
73117	Socket—Tube socket, 7 pin, miniature
72998	Socket—Dial lamp socket and lead
74038	Spring—Drive cord spring
75910	Switch—Function switch S1-1

STOCK NO.	DESCRIPTION
74654	Transformér—Output transformer T3
75486	Transformer—First I.F. transformer complete with adjustable cores T1
75487	Transformer—Second I.F. transformer complete with adjustable cores T2
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92585-1
74706	Speaker—5" x 7" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
Y2137	Cabinet—Plastic cabinet—maroon—less lid, lid support, meta grille and hinge assemblies
74713	Clamp—Dial clamp (2 req'd)
73508	Clip—Spring clip for knob #74710
74719	Clip—Spring clip for radio compartment back panel
74192	Connector—3 contact male connector for phono cable
74682	Decal—Function switch decal
74273	Decal—Trade mark decal (Victrola)
74722	Dial—Polystyrene dial scale
74782	Emblem—"RCA Victor" emblem
72894	Foot—Rubber foot (4 req'd)
74707	Grille—Metal grille
72692	Hinge—Cabinet lid hinge (2 req'd)
74709	Indicator—Station selector indicator
74710	Knob—Volume control or tuning knob
74210	Knob—"Start-Reject" Knob
74711	Knob—Function switch knob
71116	Lamp—Dial lamp—Type 1490
74940	Lever—"Start-Reject" actuating lever
74720	Lid—Cabinet lid only
74717	Mask—End mask for dial (2 req'd)
74708	Motif—Decorative motif for front of cabinet
74623	Mounting—One set of hardware consisting of 3 rubber grommets, 3 flat washers, and 3 eyelets to mount record changer
74212	Nut—Speed nut for reject knob
74788	Nut—Speed nut for "Start-Reject" actuating lever
72765	Nut—Speed nut to fasten motif (1 req'd) or to fasten dial (2 req'd)
74715	Panel—Radio compartment back panel
74721	Plate—Dial back plate—less dial
73728	Screen—Ventilation screen
74716	Screw—#6-32 x ¼" cross recessed oval head machine screw for radio compartment back panel (3 req'd)
76000	Screw—#6-32 x ¼" special head screw to mount hinges
74718	Spring—Return spring for "Start-Reject" actuating lever
14270	Spring—Retaining spring for knob #74711
71824	Stud—Cabinet lid hinge stud and screw (2 req'd)
74714	Support—Lid support

† Stock No. 72953 is a reel containing 250 feet of cord.

MODEL 45-W-10,
Ch. RC-1096A





Rear View of Cabinet

FOR RECORD CHANGER SERVICE INFORMATION REFER TO RP-190 SERIES SERVICE DATA.

Specifications

Tuning Range

Standard Broadcast (AM) ..... 540-1,600 kc.

Frequency Modulation (FM) ..... 88-108 mc.

Intermediate Frequencies ..... AM—455 kc., FM—10.7 mc.

Tube Complement

(1) RCA 6CB6..... R-F Amplifier
(2) RCA 6J6..... Mixer and Oscillator
(3) RCA 6BA6..... I-F Amplifier
(4) RCA 6AU6..... Driver
(5) RCA 6AL5..... Ratio Detector
(6) RCA 6AV6..... AM Det.—AVC—A-F Amplifier
(7) RCA 6C4..... Ph. Inv.
(8) RCA 6V6GT..... Output
(9) RCA 6V6GT..... Output
(10) RCA 5Y3GT..... Rectifier

Dial Lamps (2).....Type No. 51, 6-8 volts, 0.2 amp.
Jewel Lamp .....Type No. 51, 6-8 volts, 0.2 amp.

Tuning Drive Ratio .....10:1 (5 turns of knob)

Power Supply Rating ..... 115 volts, 60 cycles, 115 watts

Loudspeaker (92569-12W)

Size and type ..... 12 in. PM
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output

(Radio) Undistorted 8 watts.....Maximum 9 watts
(Phono.) Undistorted 10 watts..... Maximum 11 watts

Weight .....97 lbs.

Cabinet Dimensions

Height 32 in. Width 29¼ in. Depth 19¾ in.

Record Changer (RP-190-2)

Turntable speed ..... 45 r.p.m.
Pickup crystal .....Stock No. 75575

MISC. SERVICE INFORMATION

Roll-out Carriage Removal

Each roll-out carriage has two stop pins, (one at the back end of each slide) held in place by retaining spring. To remove roll-out carriage, it is first necessary to pull the retaining springs out of the slides with a pair of long nose pliers, the stop pins are then easily removed. The roll-out carriage may then be removed from the front of the cabinet after disconnecting its connecting cables.

Roll-out Carriage Travel

The roll-out carriages have a normal movement limitation of approximately 10 inches. If they do not have this amount of movement, it may be due to an obstruction or from slippage or creeping of the balls of the slide mechanism. Travel restriction due to slippage or creeping of balls in the slide mechanism can be corrected by exerting slightly greater pull until the normal travel limitation is reached. The carriage should then operate to its full travel with normal pull.

Pickup Height Adjustment

Adjust knurled nut (A) until the distance (during change cycle) between the top of the turntable and the stylus point is approximately 1⅛".

Pickup Landing Adjustment

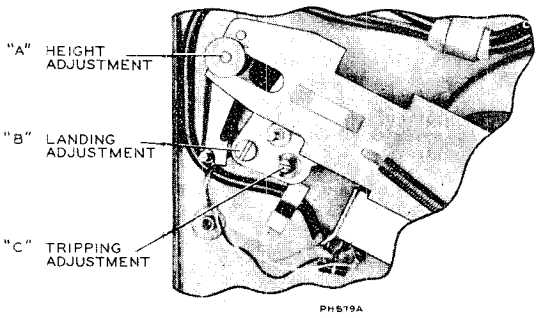
Adjust the screw driver landing adjustment stud (B) so the stylus lands $2\frac{5}{8}" \pm \frac{1}{64}"$ from the side of the center post.

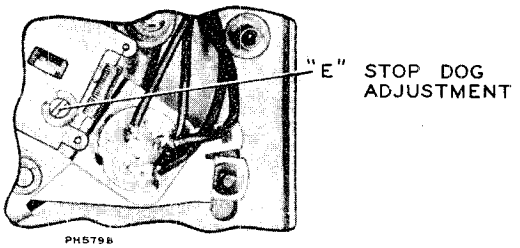
Tripping Adjustment

Adjust the eccentric tripping stud (C) until the mechanism trips when the stylus is $1\frac{19}{32}"$ from the side of the center post.

Stop Dog Adjustment

Turn the eccentric screw (E) until the record drops to the turntable without striking the pickup arm.





MODEL 45-W-10,
Ch. RC-1096A

ALIGNMENT PROCEDURE—CIRCUIT DESCRIPTION—LEAD DRESS

Alignment Procedure

CORRECT ALIGNMENT OF THE FM BAND REQUIRES THAT THE AM BAND BE ALIGNED FIRST

Alignment Indicators:

An RCA VoltOhmyst or equivalent meter is necessary for measuring developed d-c voltage during FM alignment. Connections are specified in the alignment tabulation. An output meter is also necessary to indicate minimum audio output during FM Ratio Detector alignment. Connect the output meter across the speaker voice coil.

The RCA VoltOhmyst can also be used as an AM alignment indicator, either to measure audio output or to measure a-v-c voltage.

When audio output is being measured the volume control should be turned to maximum.

Signal Generator:

For all alignment operations connect the low side of the signal generator to the receiver chassis. The output should be adjusted to provide accurate resonance indication at all times. If output measurement is used for AM alignment the output of the signal generator should be kept as low as possible to avoid a-v-c action.

Circuit Description

This instrument has a ten-tube (including rectifier) chassis which is very similar to those used in other RCA Victor radio-phonograph combinations designed for AM-FM reception.

The selector switch has five functions:

(1) Selection of tuning range.

(2) Selection and distribution of a.v.c. voltages.

(3) Application of B+ voltage to tubes.

In "Phono Aux." and "Phono 45" positions the B+ voltage is removed from tubes V1, V2, V3 and V4.

(4) Selection of audio input applied to the volume control.

(5) Change in output tube bias.

In Radio positions R6 is in parallel with R42.

This receiver has built-in antennas for standard broadcast (AM) and frequency modulation (FM) reception.

Provision is made for the use of external antennas if desired.

Critical Lead Dress

Note: The leads listed may not be critical in all receivers. However, by dressing the leads as specified, unusual difficulties will be minimized.

1. The 2.2 meg mixer grid resistor (R10) should have a minimum practicable amount of lead extending on the grid end.
2. The first A.M. and first F.M. I.F. plate leads should be dressed away from the range switch wafer.
3. The ground strap between the R.F. shelf and the main chassis should be well soldered and kept as short as practicable.
4. Arrange wiring to prevent the filament wire between the mixer (6J6) and 1st I.F. (6BA6) tubes from passing near either the mixer grid, or the A.V.C. wiring.
5. Dress filament wires away from all audio coupling condensers.
6. Dress A.C. power switch wires away from the audio coupling condenser (C20) which is wired to the volume control.
7. Dress the mixer grid coupling condenser (C7) away from the lugs on the front range switch wafer.
8. The 1st I.F. tube A.V.C. by-pass condenser (C16) should ground at the same point as the cathode neutralizing loop.
9. The driver tube plate and screen by-pass condensers (C27, C28) should ground at the same point as the neutralizing loop.
10. The mixer plate by-pass condenser (C15) should ground as close to the R.F. shelf ground strap as practicable.
11. The shielded audio leads connecting to the front function switch wafer should have a minimum of exposed lead on the function switch end.

AM Alignment

FUNCTION SWITCH IN AM POSITION

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for max. output
1	Stator of C1-4	455 KC	Quiet point at low freq. end.	† Bottom (sec.) & top (pri.) cores of T4 † Top (sec.) & bottom (pri.) cores of T2
2	AM ant. terminal thru 200 mmf.	1620 KC	Extreme high frequency end.	C1-2 trimmer (osc.)
3		1400 KC	1400 KC Signal	C1-4 trimmer (r. f.) C1-5 trimmer (ant.)
4		600 KC	600 KC Signal	‡ L5 (osc.) L7 (r. f.)
5	Repeat steps 2, 3 and 4			

† First peak T2 and T4 then starting with T4, use alternate loading. Connect a 47,000-ohm resistor across the primary to load the plate winding while the grid winding of the same transformer is being peaked. Then load the grid winding with the 47,000-ohm resistor while the plate winding is being peaked.

‡ With a 10,000-ohm resistor shunted across C1-4, peak the oscillator core L5, simultaneously "rocking" the gang condenser for maximum output. Then, remove the 10,000-ohm shunt resistor and peak L7 for maximum output.

FM Alignment

FUNCTION SWITCH IN FM POSITION—VOLUME CONTROL MAXIMUM

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for max. output
1	Connect the d-c probe of a VoltOhmyst to the negative lead of the 2 mfd. capacitor C40 and the common lead to chassis. Adjust sig. gen. output to provide approx. —3 v. indication during alignment.			
2	Pin #1 of 6AU6 (V4) in series with .01 mf.	10.7 mc AM modulated	—	Top of driver trans. T5 for max. d-c voltage
3				† Bottom of driver trans. T5 for min. audio output
4	Repeat steps 2 and 3			
5	Thru 470 ohms to C1-3. Connect gnd. end of cable close to V2 cathode ground on r-f shelf	10.7 mc	88 mc	* Top (sec.) & bottom (pri.) cores of T3 * Top (sec.) & bottom (pri.) cores of T3
6	To FM antenna terminals thru 120 ohms in each side of line	90 mc	90 mc	L8 (osc.)
7		106 mc	106 mc Signal	C1-6 trimmer (ant.) and C1-3 trimmer (r. f.)
8		90 mc	90 mc Signal	L1 (ant.) and L2 (r. f.)
9	Repeat steps 6, 7 and 8			
10	Connect a sweep generator to the antenna terminals thru 120 ohms in each side of line. Connect an oscilloscope to junction of R44 and C41 to check response and linearity of FM band. Peak to peak separation should not be less than 180 kc.			

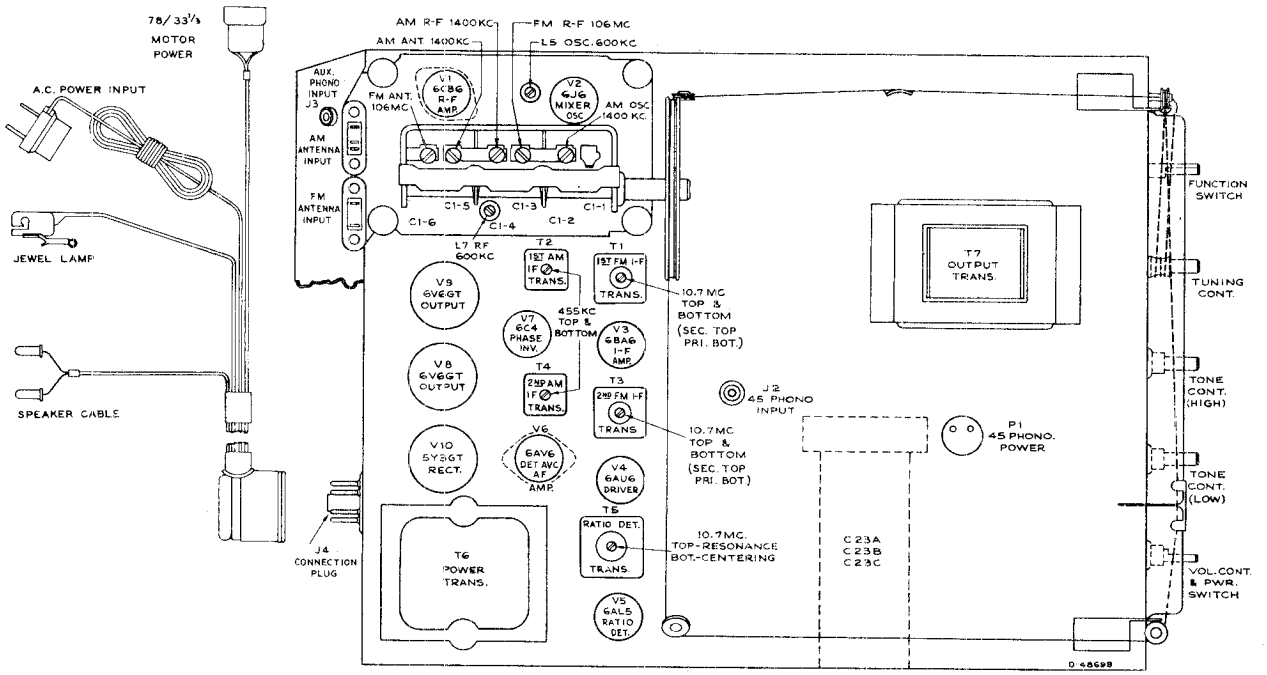
† Two or more points may be found which lower the audio output. At the correct point the minimum audio output is approached rapidly and is much lower than at any incorrect point.

* Use a 680 ohm resistor to load the plate winding while the grid winding of the same trans. is being peaked. Then the grid winding is loaded with the 680 ohm resistor while the plate winding is being peaked. When windings are loaded, it is necessary to increase the 10.7 mc input to maintain the —3 volts indication.

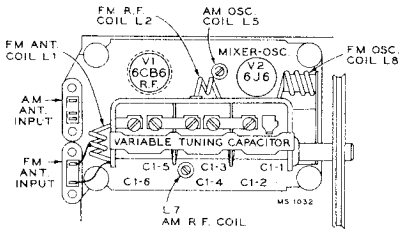
L8, L1 and L2 are adjustable by increasing or decreasing the spacing between turns. Oscillator signal tracks above signal frequency.

MODEL 45-W-10,
Ch. RC-1096A

TUBE AND TRIMMER LOCATIONS—VOLTAGE DATA



Tube and Trimmer Locations

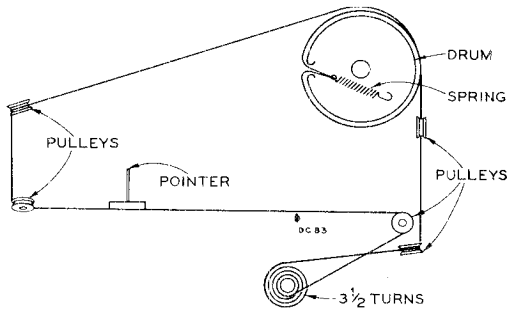


F. M. Coil Locations

Socket Voltages

Voltages measured with Chanalyst or VoltOhmyst and should hold within ±20% with rated line voltage. Tuning condenser closed—no signal input.

Tube	Terminal	Voltage		
		Phono	A.M.	F.M.
V1 6CB6 R.F. Amp.	Plate 5	—	203	132
	Screen 6	—	48	39
	Cathode 2	—	0.2	0.2
	Grid 1	—	-1.1	-0.9
V2 6J6 Mixer and Osc.	Plate 2	—	55	51
	Grid 5	—	-1.4	-1.2
	Plate 1	—	33	27
	Grid 6	—	-2.1	-1.9
V3 6BA6 I.F. Amp.	Plate 5	—	192	188
	Screen 6	—	106	101
	Cathode 7	—	0.9	
	Grid 1	—	-1.1	-0.35
V4 6AU6 Driver	Plate 5	—	186	180
	Screen 6	—	122	120
	Cathode 7	—	1.05	1.07
V5 6AL5 Ratio Det.	—— ——	—	—	—
V6 6AV6 A.F. Amp.	Plate 7	112	94	94
	Grid 1	-0.7	-0.7	-0.7
V7 6C4 Ph. Inverter	Plate 1–5	125	87	85
	Grid 6	-19.2	-16	-16
	Cathode 7	-11.1	-11.4	-11.4
V8 6V6GT or Output V9	Plate 3	305	295	298
	Screen 4	299	208	204
	Grid 5	-19.2	-16	-16
V10 5Y3GT Rectifier	Filament 2	314	313	313

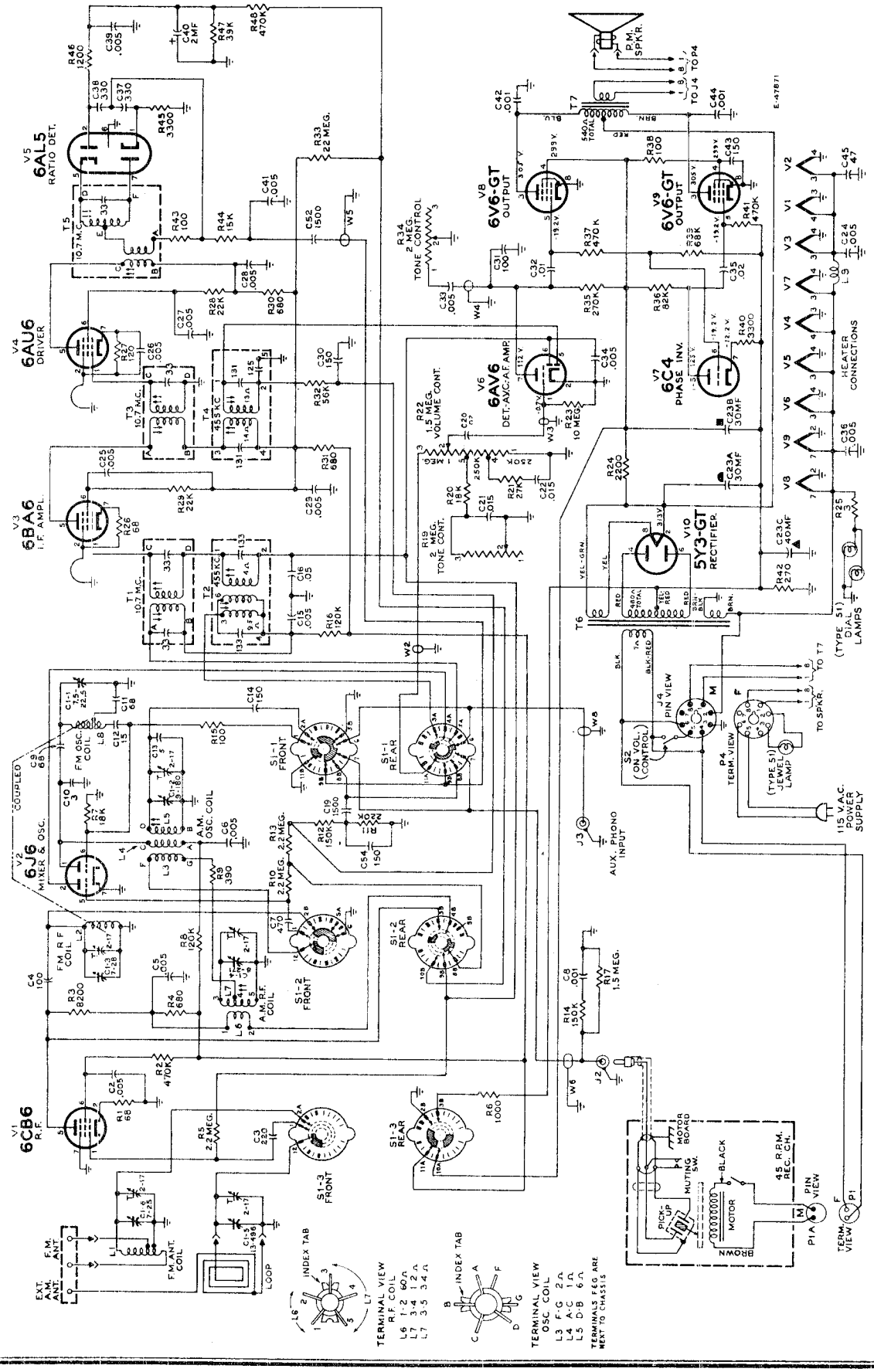


Dial Cord and Drive Assembly

Cathode Currents (Ma.)

Tube	Terminal	Phono	A.M.	F.M.
V1 6CB6	2	—	3	3
V2 6J6	7	—	2.6	2.6
V3 6BA6	7	—	13.2	14.7
V4 6AU6	7	—	9.3	9
V5 6AL5	1 & 5	—	—	—
V6 6AV6	2	0.8	0.5	0.5
V7 6C4	7	2.2	1.5	1.5
V8 6V6GT	8	35.6	17.8	17.7
V9 6V6GT	8	35.6	17.8	17.7
10 5Y3GT	2	74.2	73.6	74.2

MODEL 45-W-10,
Ch. RC-1096A



Function switch viewed from front and shown in "Phone Aux." position (max. c/clockwise).

CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

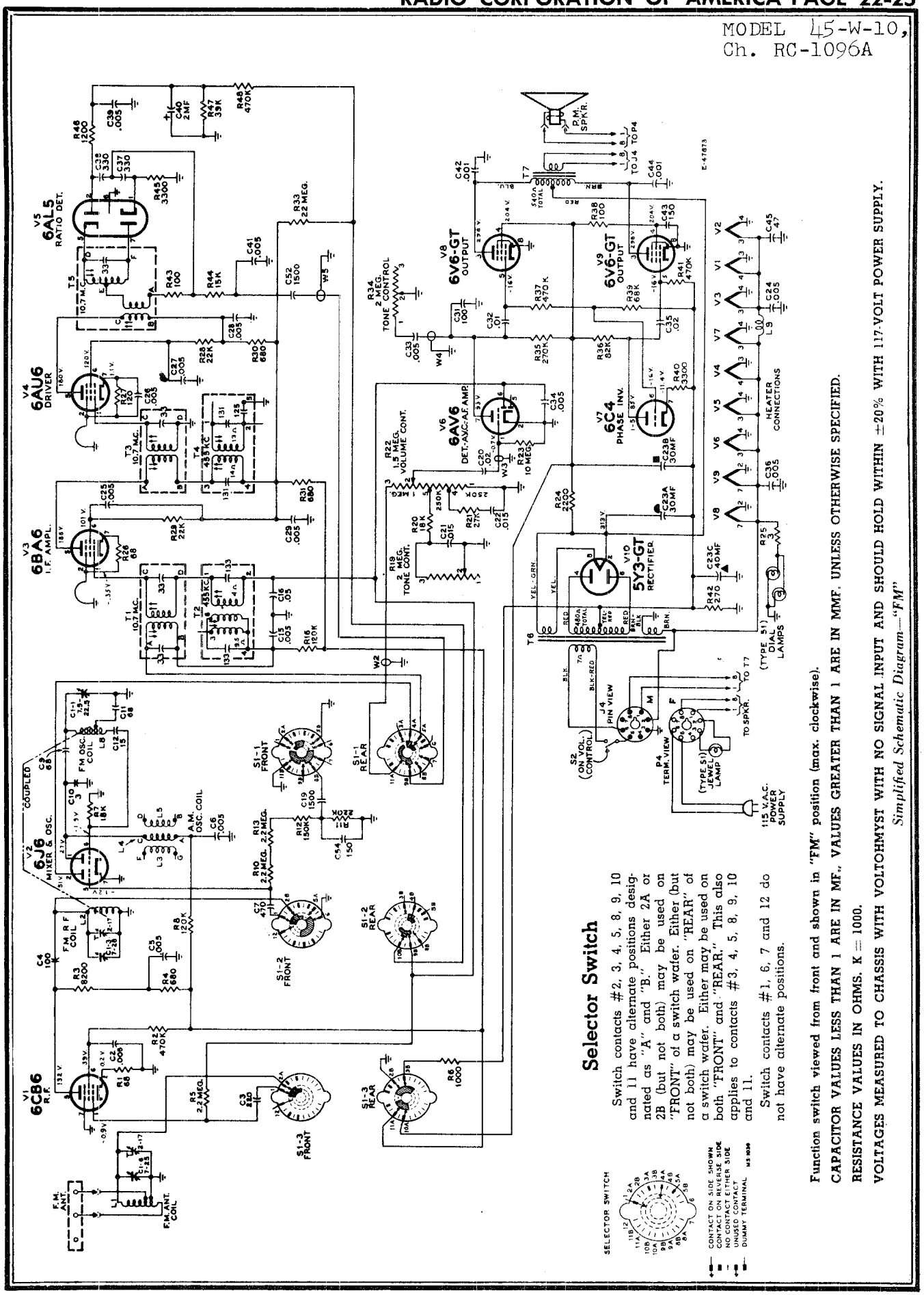
RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHMYST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

The cathode neutralizing loops of V3 (6BA6) and V4 (6AU6) are insulated wires approx. 2 in. long. Do not alter length.

Complete Schematic Diagram

MODEL 45-W-10,
Ch. RC-1096A



Selector Switch

Switch contacts #2, 3, 4, 5, 8, 9, 10 and 11 have alternate positions designated as "A" and "B." Either 2A or 2B (but not both) may be used on "FRONT" of a switch wafer. Either (but not both) may be used on "REAR" of a switch wafer. Either may be used on both "FRONT" and "REAR." This also applies to contacts #3, 4, 5, 8, 9, 10 and 11.

Switch contacts #1, 6, 7 and 12 do not have alternate positions.

SELECTOR SWITCH

CONTACT ON SIDE SHOWN
CONTACT ON REVERSE SIDE
NO CONTACT EITHER SIDE
UNUSED CONTACT
DUMMY TERMINAL

Function switch viewed from front and shown in "FM" position (max. clockwise).

CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

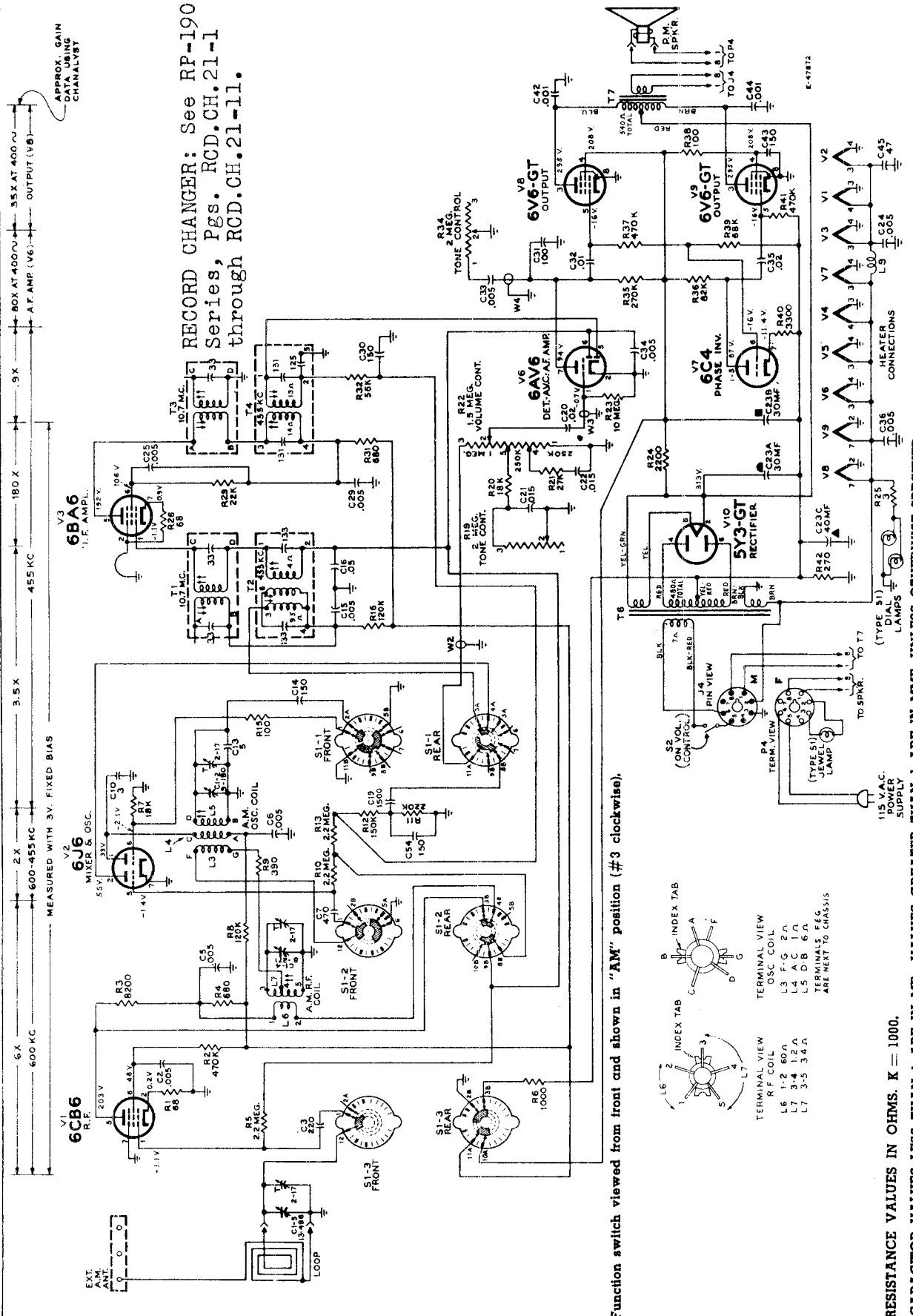
RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHMYST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

Simplified Schematic Diagram—"FM"

MODEL 45-W-10,
Ch. RC-1096A

RECORD CHANGER: See RP-190 Series, Pgs. RCD.CH.21-1 through RCD.CH.21-11.



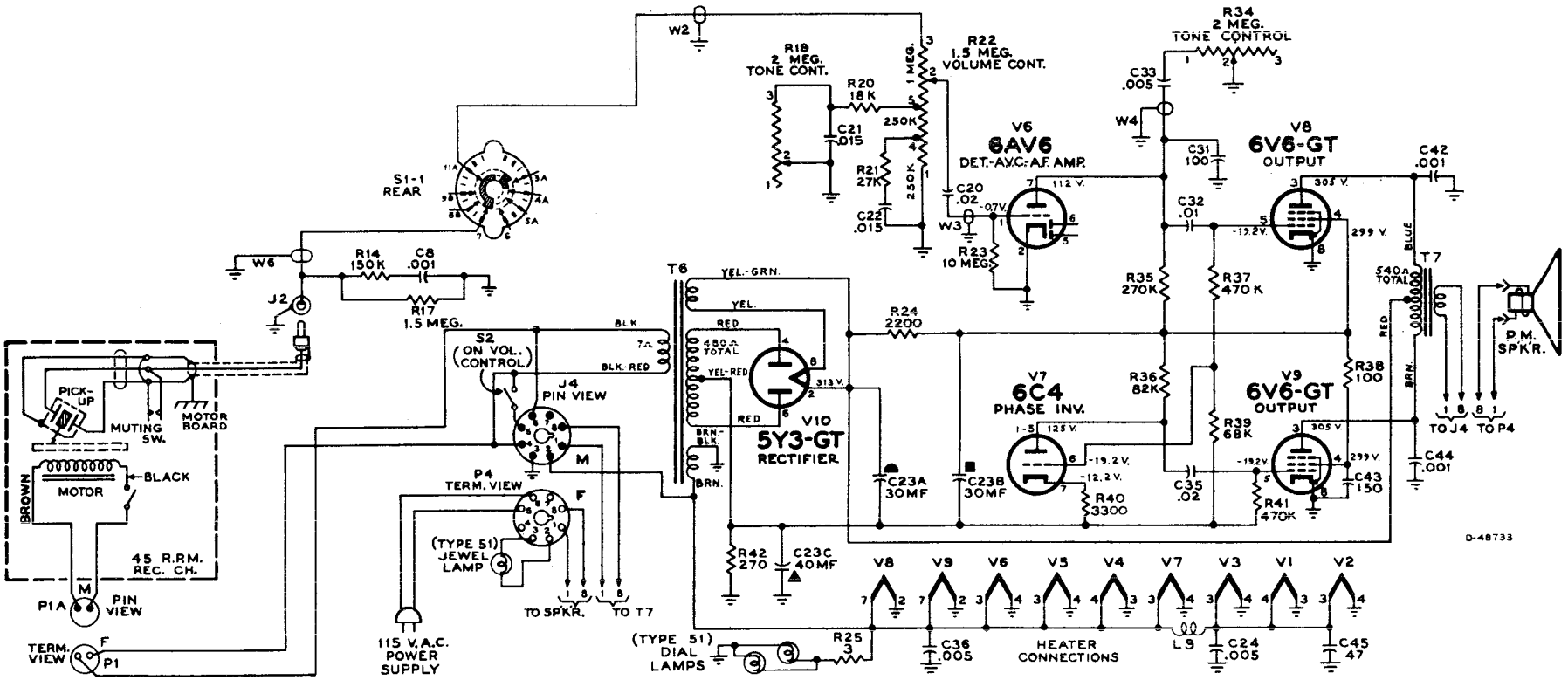
Function switch viewed from front and shown in "AM" position (#3 clockwise).

RESISTANCE VALUES IN OHMS. K = 1000.

CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHMYST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

Simplified Schematic Diagram—"AM"



Note:

When the function switch is in "Phono 45" or "Phono Aux." position the B+ supply voltage tubes V1, V2, V3 and V4 is disconnected at switch section S1-3 rear. This results in higher plate and screen voltages on V6, V7, V8 and V9.

The bias resistor R6 (in parallel with R42 in AM and FM positions) is also disconnected at S1-3 rear. This results in higher grid bias voltage on V8 and V9.

FUNCTION SWITCH VIEWED FROM FRONT AND SHOWN IN "PHONO 45" POSITION (#2 CLOCKWISE).

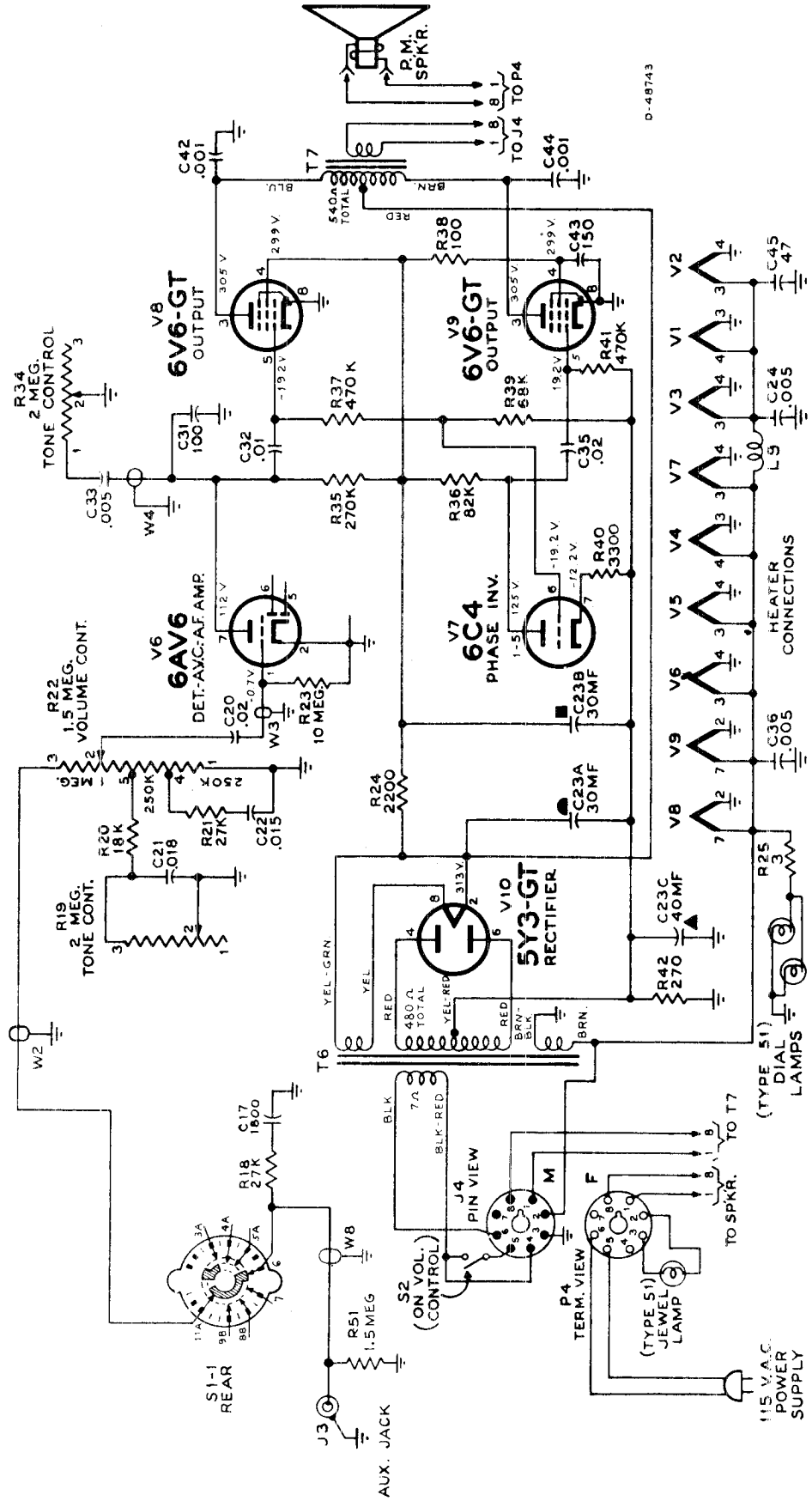
CAPACITOR VALUES LESS THAN 1 ARE IN MF., VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHMYST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

Simplified Schematic Diagram—"Phono 45"

MODEL 45-W-10,
Ch. RC-1096A



Note:

When the function switch is in "Phono 45" or "Phono 78/33" position the B+ supply voltage to tubes V1, V2, V3 and V4 is disconnected at switch section S1-3 rear. This results in higher plate and screen voltages on V6, V7, V8 and V9.

The bias resistor R6 (in parallel with R42 in AM and FM positions) is also disconnected at S1-3 rear. This results in higher grid bias voltage on V8 and V9.

FUNCTION SWITCH VIEWED FROM FRONT AND SHOWN IN "PHONO 78/33" POSITION (MAX. C/CLOCKWISE).

CAPACITOR VALUES LESS THAN 1 ARE IN MF. VALUES GREATER THAN 1 ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

RESISTANCE VALUES IN OHMS. K = 1000.

VOLTAGES MEASURED TO CHASSIS WITH VOLTOHMYST WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 117-VOLT POWER SUPPLY.

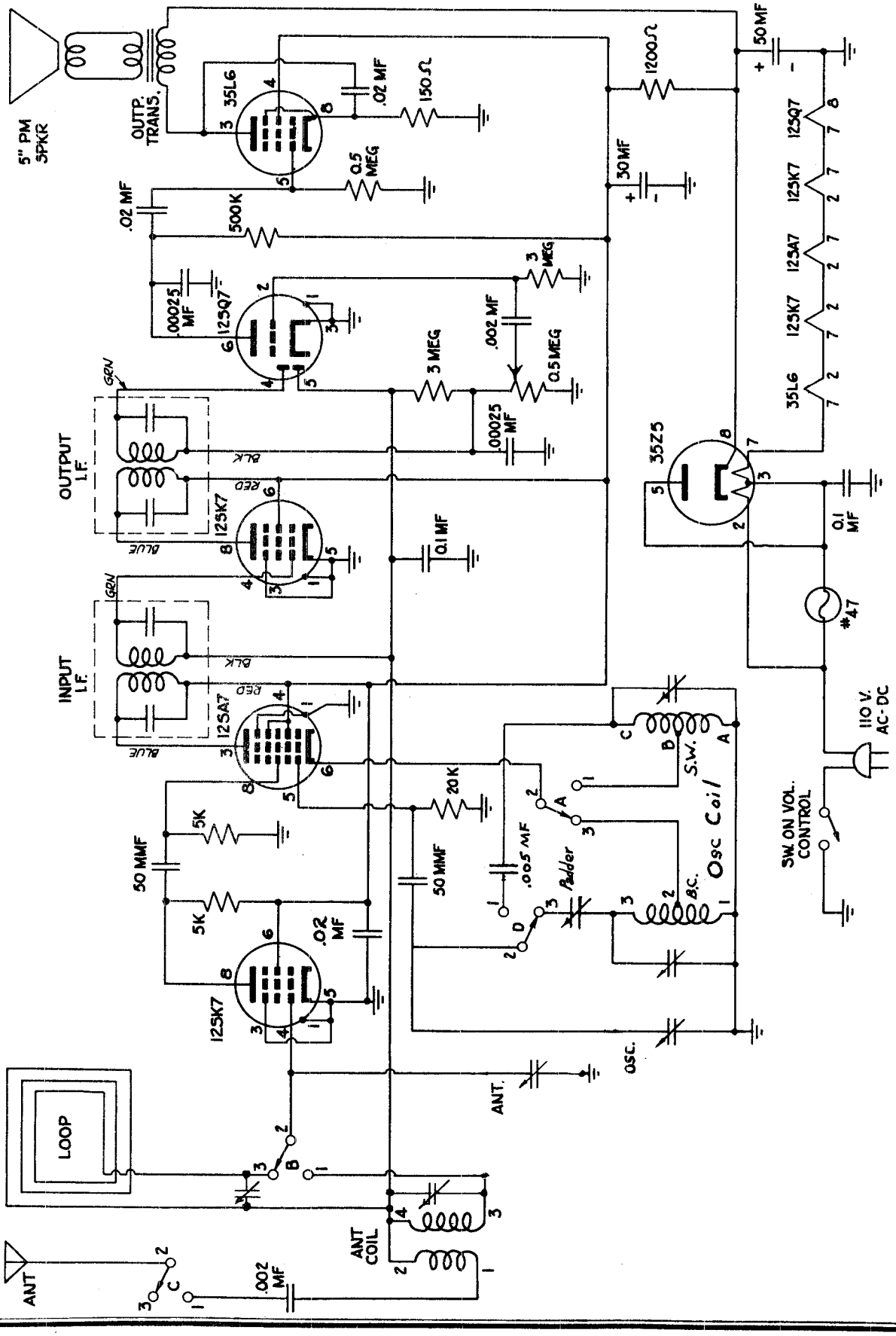
Simplified Schematic Diagram—"Phono Aux."

MODEL 45-W-10,
Ch. RC-1096A

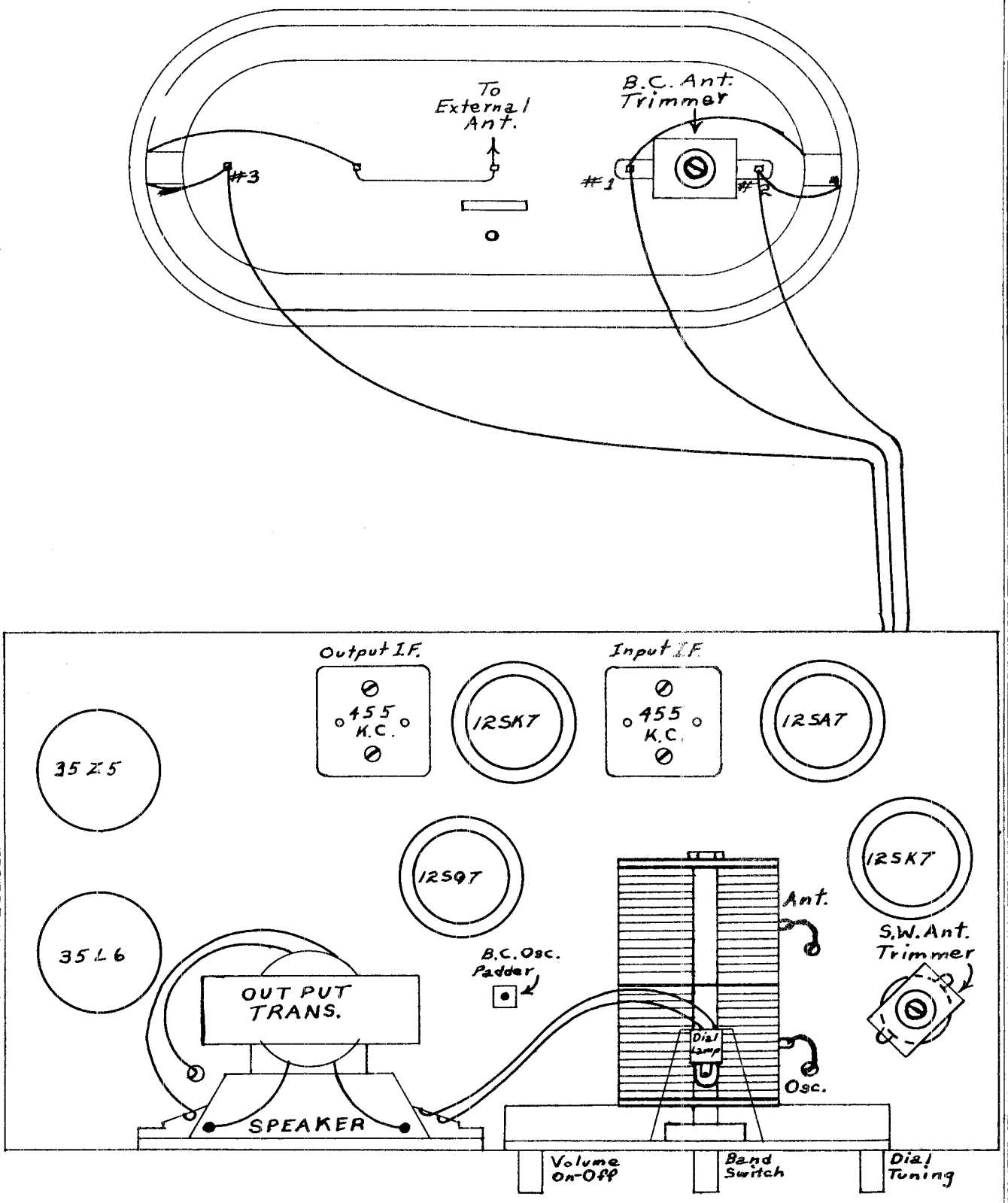
Replacement Parts

STOCK NO.	DESCRIPTION
	CHASSIS ASSEMBLIES RC1096A
75567	Capacitor—Variable tuning capacitor (C1-1, C1-2, C1-3, C1-4, C1-5, C1-6)
74733	Capacitor—Ceramic, 3 mmf. (C10)
75613	Capacitor—Ceramic, 5 mmf. (C13)
39044	Capacitor—Ceramic, 15 mmf. (C12)
75609	Capacitor—Ceramic, 47 mmf. (C45)
75612	Capacitor—Ceramic, 68 mmf. (C9, C11)
39396	Capacitor—Ceramic, 100 mmf. (C4)
75437	Capacitor—Ceramic, 100 mmf. (C31)
75614	Capacitor—Ceramic, 150 mmf. (C14, C30, C43, C54)
75611	Capacitor—Ceramic, 220 mmf. (C3)
39640	Capacitor—Mica, 330 mmf. (C37, C38)
39644	Capacitor—Mica, 470 mmf. (C7)
75610	Capacitor—Ceramic, 1500 mmf. (C19, C52)
73473	Capacitor—Ceramic, 5000 mmf. (C2, C5, C6, C15, C24, C25, C27, C28, C29, C34, C36)
73747	Capacitor—Electrolytic, 2 mfd, 50 volts (C40)
72052	Capacitor—Electrolytic, comprising 1 section of 30 mfd, 450 volts, 1 section of 30 mfd, 350 volts, and 1 section of 40 mfd, 25 volts (C23A, C23B, C23C)
73801	Capacitor—Tubular, paper, .001 mfd, 400 volts (C8)
70642	Capacitor—Tubular, paper, .001 mfd, 1000 volts (C42, C44)
73920	Capacitor—Tubular, paper, .005 mfd, 400 volts (C26, C33, C39, C41)
73561	Capacitor—Tubular, paper, .01 mfd, 400 volts (C32)
73797	Capacitor—Tubular, paper, .015 mfd, 400 volts (C21, C22)
71928	Capacitor—Tubular, paper, .02 mfd, 200 volts (C20)
73562	Capacitor—Tubular, paper, .02 mfd, 400 volts (C35)
73553	Capacitor—Tubular, paper, .05 mfd, 400 volts (C16)
73935	Clip—Mounting clip for A-M, I-F transformers
75569	Coil—Oscillator coil—A.M.—complete with adjustable screws (L3, L4, L5)
75570	Coil—R.F. coil—A.M.—complete with adjustable core (L6, L7)
71942	Coil—Filament choke coil (L9)
75615	Coil—Antenna coil—F-M (L1)
74815	Coil—R-F coil—F-M (L2)
74817	Coil—Oscillator coil—F-M (L8)
35787	Connector—Single contact female connector for phono cables (J2, J3)
75542	Connector—8 contact male connector for power input cable (J4)
75543	Connector—2 contact female connector for 45 RPM motor cable (P1)
74879	Connector—2 contact female connector for antenna leads
75537	Control—Volume control and power switch (R22, S2)
75561	Control—Tone control—L.F. (R19)
75562	Control—Tone control—H.F. (R34)
†72953	Cord—Drive cord (approx. 66" overall)
75564	Coupling—Spring coupling for function switch extension shaft
75556	Cover—Insulating cover for electrolytic
74839	Fastener—Push fastener for mounting R.F. shelf (4 req'd)
16058	Grommet—Rubber grommet for mounting R.F. shelf (4 req'd)
75547	Grommet—Rubber grommet to mount slides to bottom—rear (2 req'd)
75548	Grommet—Rubber grommet to mount slides to bottom—front (2 req'd)
11765	Lamp—Dial lamp—Mazda #51
75544	Nut—Rivnut to fasten screw for mounting chassis (4 req'd)
18469	Plate—Bakelite mounting plate for elecrolytic
75535	Plate—Dial back plate complete with three (3) pulleys
75536	Pointer—Station selector indicator
72602	Pulley—Drive cord pulley
72323	Resistor—Wire wound, 3 ohms, ½ watt (R25)
73637	Resistor—Wire wound, 2200 ohms, 5 watts (R24)
	Resistor—Fixed, composition:—
	68 ohms, ±10%, ½ watt (R1, R26)
	100 ohms, ±10%, ½ watt (R15, R38, R3)
	120 ohms, ±10%, ½ watt (R27)
	270 ohms, ±5%, 2 watts (R42)
	390 ohms, ±10%, ½ watt (R9)
	680 ohms, ±10%, ½ watt (R4)
	680 ohms, ±20%, ½ watt (R30, R31)
	1000 ohms, ±10%, ½ watt (R6)
	1200 ohms, ±5%, ½ watt (R46)
	3300 ohms, ±5%, ½ watt (R40, R45)
	8200 ohms, ±10%, 1 watt (R3)
	15,000 ohms, ±10%, ½ watt (R44)
	18,000 ohms, ±10%, ½ watt (R7, R20)
	22,000 ohms, ±10%, ½ watt (R28, R29)
	27,000 ohms, ±10%, ½ watt (R21)
	39,000 ohms, ±5%, ½ watt (R47)
	56,000 ohms, ±10%, ½ watt (R32)
	68,000 ohms, ±10%, ½ watt (R39)
	82,000 ohms, ±10%, ½ watt (R36)
	120,000 ohms, ±10%, ½ watt (R8, R16)
	150,000 ohms, ±10%, ½ watt (R12, R14)
	220,000 ohms, ±20%, ½ watt (R11)
	270,000 ohms, ±10%, ½ watt (R35)
	470,000 ohms, ±10%, ½ watt (R2, R37, R41, R48)
	1.5 megohm, ±10%, ½ watt (R17)
	2.2 megohm, ±20%, ½ watt (R5, R10, R13)
	10 megohm, ±20%, ½ watt (R23)
	22 megohm, ±20%, ½ watt (R33)
75540	Shaft—Tuning knob shaft
75565	Shaft—Extension shaft for function switch
73584	Shield—Tube shield
75546	Slide—Slide mechanism complete for radio chassis bottom
31251	Socket—Tube socket, octal, wafer
73117	Socket—Tube socket, 7 pin, miniature
74179	Socket—Tube socket, 7 pin, miniature for 6BC6—6J6
31364	Socket—Dial lamp socket
75563	Spring—Retaining spring for function switch extension shaft
74038	Spring—Drive cord spring
74847	Support—Polystyrene support for F-M oscillator coil complete with mounting bracket
75602	Switch—Function switch (S1)
75557	Transformer—Output transformer (T7)
75566	Transformer—Power transformer, 117 volts/60 cycle (T6)
73743	Transformer—Ratio detector transformer (T5)
75558	Transformer—First I-F transformer (A.M.) complete with adjustable screws (T2)
73037	Transformer—Second I-F transformer (A.M.) complete with adjustable screws (T4)
75559	Transformer—First I-F transformer (F.M.) complete with adjustable screws (T1)
75560	Transformer—Second I-F transformer (F.M.) complete with adjustable screws (T3)
33726	Washer—"C" washer for tuning knob shaft
	ROLLOUT MECHANISM
76206	Decal—Control function decal
75572	Dial—Polystyrene dial scale
76161	Frame—Moulded frame—maroon—for mounting radio chassis and 45 RPM changer for mahogany or walnut instruments
76162	Frame—Moulded frame—light brown—for mounting radio chassis and 45 RPM changer for oak instruments
76165	Handle—Metal pullout handle for mounting frame
75555	Screw—#8-32 x ⅝" cross recessed pan head screw to mount radio chassis (4 req'd)
	SPEAKER ASSEMBLIES
	92569-12W
	RL 111A1
13867	Cap—Dust cap
75682	Cone—Cone complete with voice coil (3.2 ohms)
75681	Speaker—12" P.M. speaker complete with cone and voice coil (3.2 ohms)
	NOTE:—If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71864	Antenna—F-M antenna
75705	Antenna—Antenna loop complete less cable
75900	Back—Back cover—maroon—for radio-phono compartment for mahogany or walnut instruments (assembled to rollout)
75901	Back—Back cover—light brown—for radio-phono compartment for oak instruments (assembled to rollout)
73680	Board—"A-F.M." terminal board
75694	Bracket—Stop bracket less rubber bumper for radio phono compartment rollout
71599	Bracket—Pilot lamp bracket
75696	Bumper—Rubber bumper for rollout stop bracket
72437	Cable—Shielded pickup cable complete with pin plug
13103	Cap—Pilot lamp cap
71892	Catch—Bullet catch and strike for cabinet doors
X3144	Cloth—Grille cloth for mahogany or walnut instruments
X3089	Cloth—Grille cloth for oak instruments
74882	Connector—2 contact (polarized) male connector for A-M antenna loop cable
75709	Connector—8 contact female connector less shell for main cable
75474	Connector—Single contact male connector for speaker (2 req'd)
74752	Connector—2 contact male connector for FM antenna terminal board cable
30870	Connector—2 contact male connector for AC power cable for 45 RPM changer
71984	Decal—Trade mark decal (RCA Victor)
74273	Decal—Trade mark decal (Victrola)
37396	Grommet—Rubber grommet for mounting speaker
74838	Grommet—Power cord strain relief (1 set)
75697	Grommet—Rubber grommet for mounting record changer (3 req'd)
74308	Hinge—Cabinet door hinge (1 set)
75714	Knob—Function switch knob—maroon—for mahogany or walnut instruments
75715	Knob—Function switch knob—tan—for oak instruments
75712	Knob—Tuning control, tone control or volume control and power switch knob—maroon—for mahogany or walnut instruments
75713	Knob—Tuning control, tone control or volume control and power switch knob—tan—for oak instruments
11765	Lamp—Pilot lamp—Mazda #51
73634	Nut—Speed nut for speaker mounting screws
75908	Pull—Door pull
75920	Screw—#10-24 x 1" trimit head screw for door pull
75708	Shell—Shell for 8 contact female connector #75709
31364	Socket—Pilot lamp socket
74734	Spring—Retaining spring for knobs
75902	Spring—Suspension spring for main cable
72936	Stop—Cabinet door stop

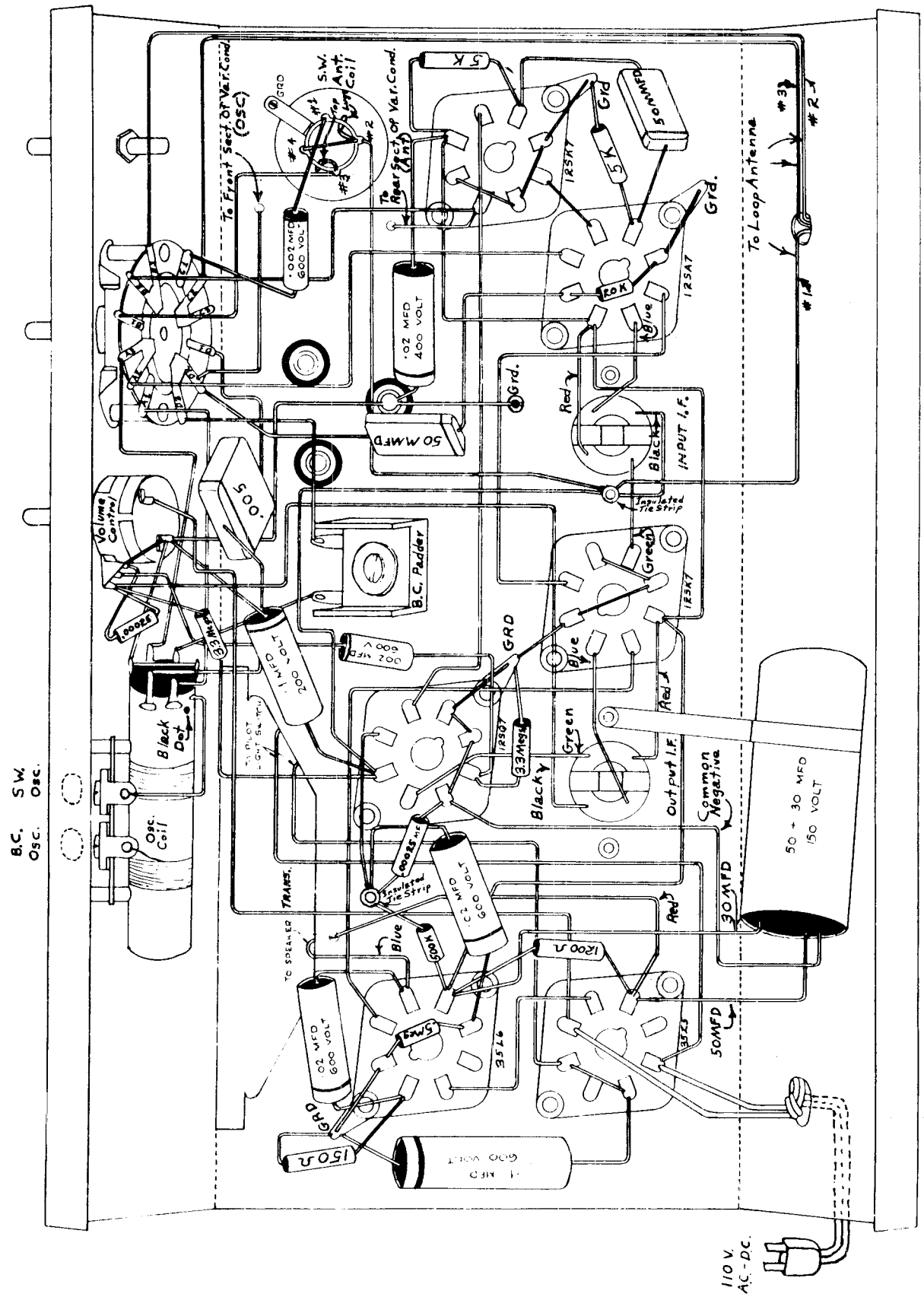
MODEL S6X-1



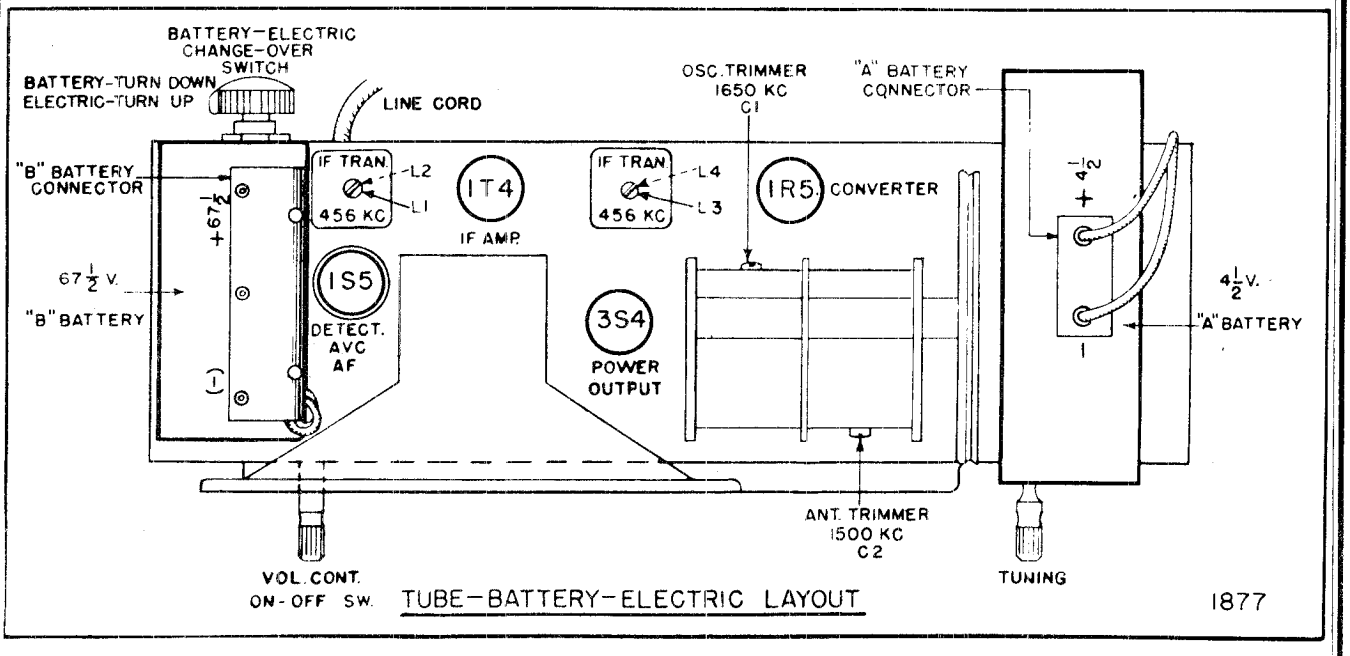
MODEL SÓX-1



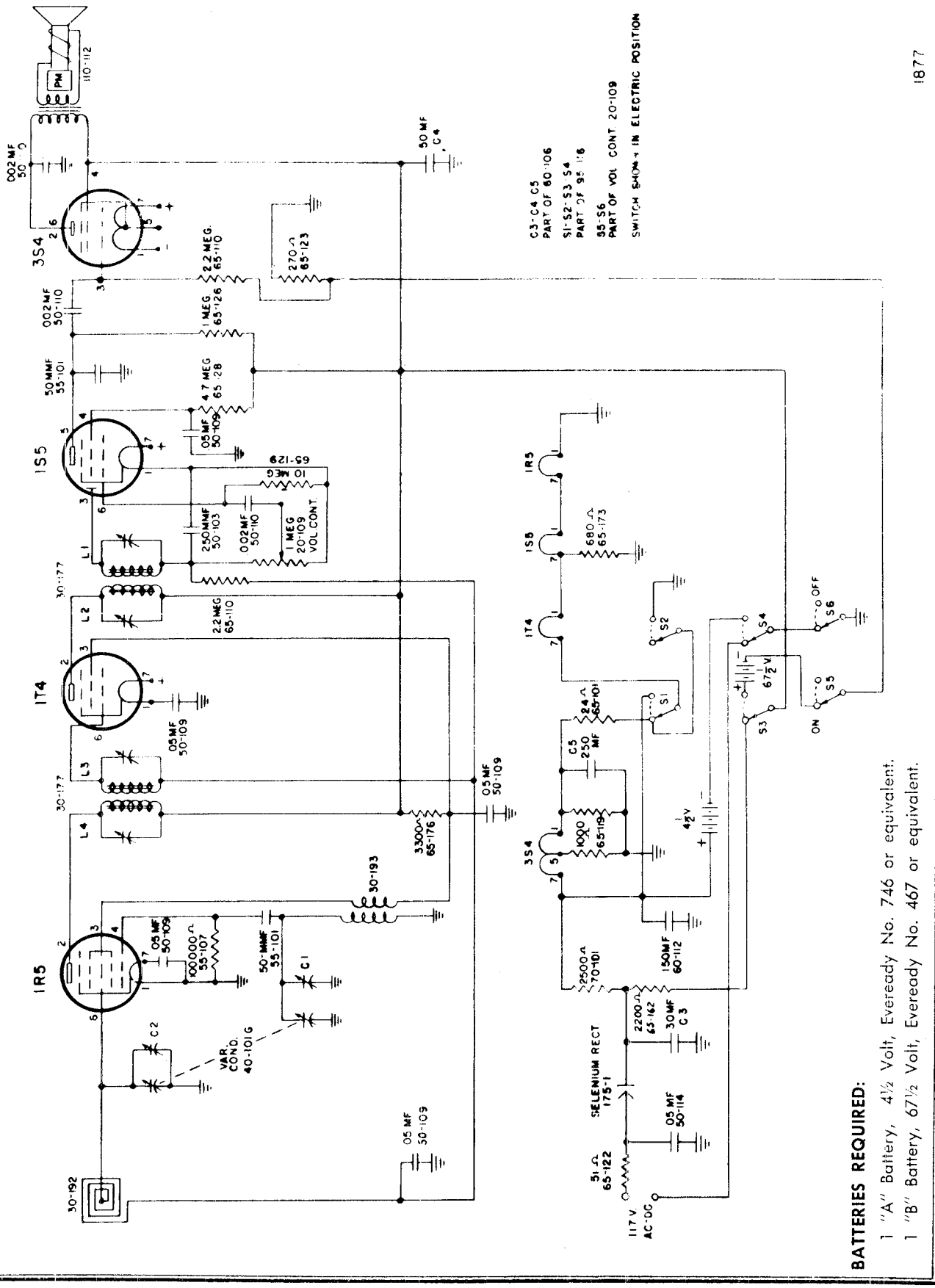
MODEL S6X-1



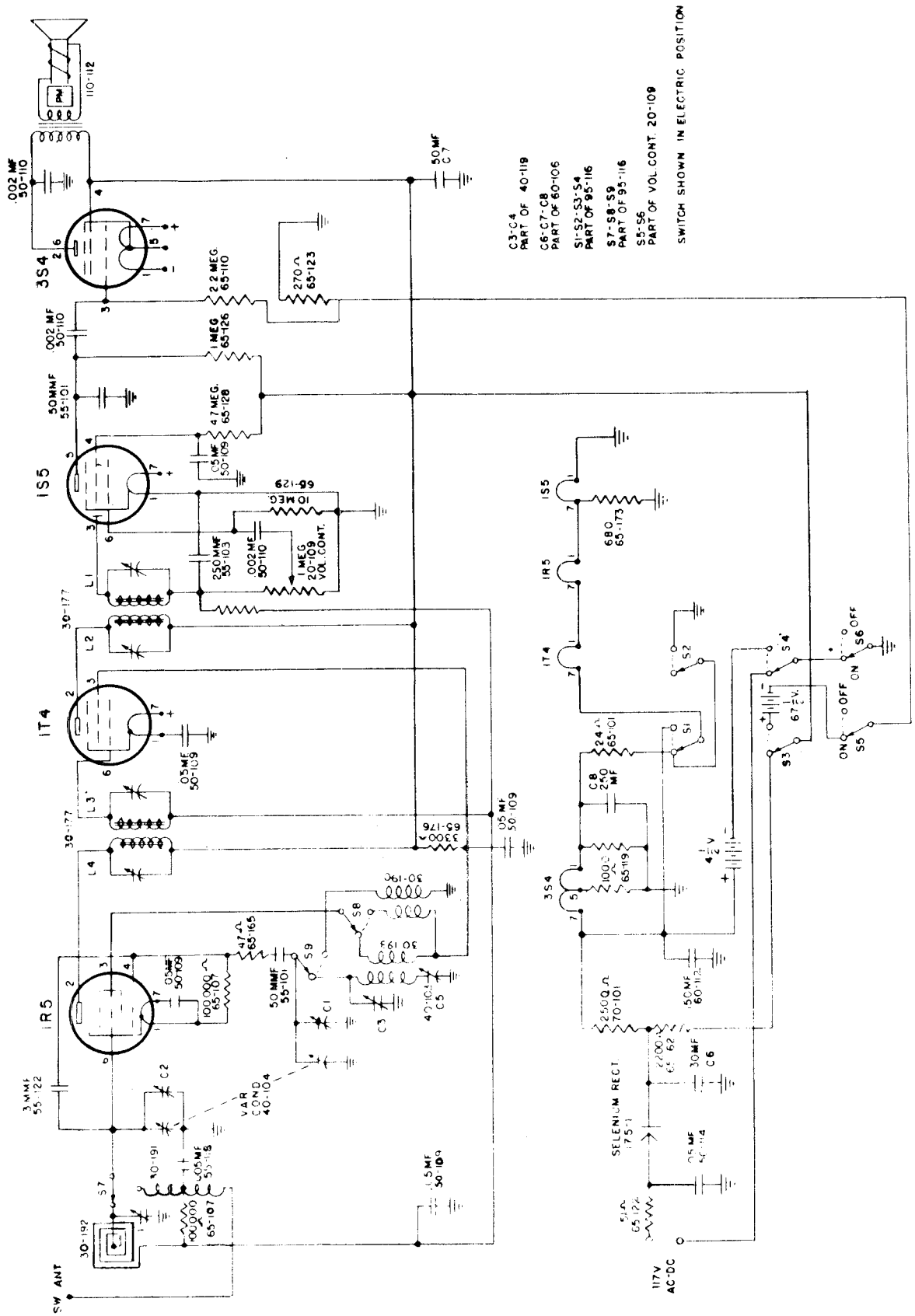

Regal
54 60 70 80 100 120 140 165


BATTERY-ELECTRIC CHANGE-OVER SWITCH
BATTERY-TURN DOWN
ELECTRIC-TURN UP
LINE CORD
OSC. TRIMMER 1650 KC C1
"A" BATTERY CONNECTOR
"B" BATTERY CONNECTOR
IF TRAN.
L2
L1
456 KC
1T4
IF AMP.
IF TRAN.
L4
L3
456 KC
1R5
CONVERTER
+67½
67½ V.
"B" BATTERY
1S5
DETECT. AVC AF
3S4
POWER OUTPUT
(-)
4½
4½ V.
"A" BATTERY
ANT. TRIMMER 1500 KC C2
VOL. CONT. ON-OFF SW.
TUBE-BATTERY-ELECTRIC LAYOUT
TUNING
1877

MODEL 1877



MODEL 1878



MODEL 1878

BATTERIES REQUIRED:

1 "A" Battery, 4½ Volt, Eveready No. 746 or equivalent.
1 "B" Battery, 67½ Volt, Eveready No. 467 or equivalent.

1. INSTALLATION OF "A" BATTERY: To replace or install battery, open rear cover, remove old battery and pull out connector and insert same into new battery; then very carefully push battery into space provided for it, making certain that battery is pushed forward to front of cabinet.

2. INSTALLATION OF "B" BATTERY: Swing down the battery holding clip, remove old battery and pull out connector and insert same into new battery; then slip into space provided for it and swing holding clip upward to press against battery.

3. TO OPERATE ON BATTERIES: Open rear cover, turn changeover switch knob to battery position. The left hand knob in front operates the volume control and turns set on and off. Adjust to desired volume. The right hand knob is calibrated in kilocycles (KC) with the final zero omitted.

4. SW OPERATION: Open rear cover, turn band switch to SW position. It will be necessary to connect an antenna wire of about 30 to 50 feet to the single wire coming through the rear of chassis. The short-wave portion of the dial is calibrated in megacycles (MC) and in meters (M).

5. TO OPERATE ON ELECTRIC: Open rear cover, turn changeover switch knob to electric position. Remove line cord and plug into nearest wall outlet; then proceed to operate receiver as outlined in previous paragraph. A slot is provided in the lower part of the cover so that it may be closed.

6. NOTE — If receiver does not operate on DC after being turned on for a few minutes, reverse the line cord in the wall outlet. If the receiver is to be operated for a long period of time on AC or DC, or it is to be placed in storage, we recommend that the batteries be removed and stored in a cool place. This will insure maximum battery life.

7. CAUTION Be sure to turn the volume control knob "OFF" (extreme counter clock-wise position) when receiver is not in use to avoid discharge of batteries. Do not leave exhausted batteries in receiver.

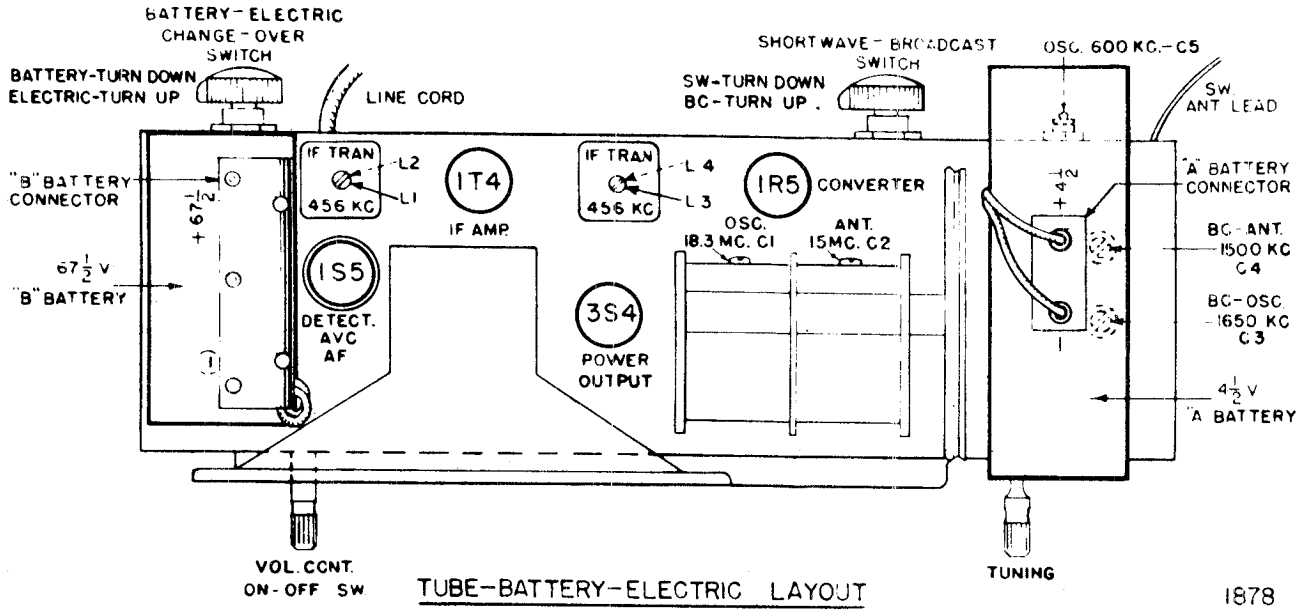
8. REAR COVER WILL NOT STAY CLOSED: This is generally due to batteries not being properly installed. Refer to previous paragraph on battery installation.

9. ELECTRICAL SPECIFICATIONS: This receiver employs a 4-tube superheterodyne circuit of 8 tuned stages. The frequency range is from 1650 to 540 KC, and 18.3 to 5.8 MC. The tube compliment is as follows: 1-1R5, 1-1T4, 1-1S5 and 1-3S4. See diagram for location of batteries and tubes.

10. IF SET DOES NOT OPERATE ON ELECTRIC OR BATTERY Check and be sure tubes are firmly in position in their sockets.

If Tubes have a milky white formation they should be removed and tested or replaced.

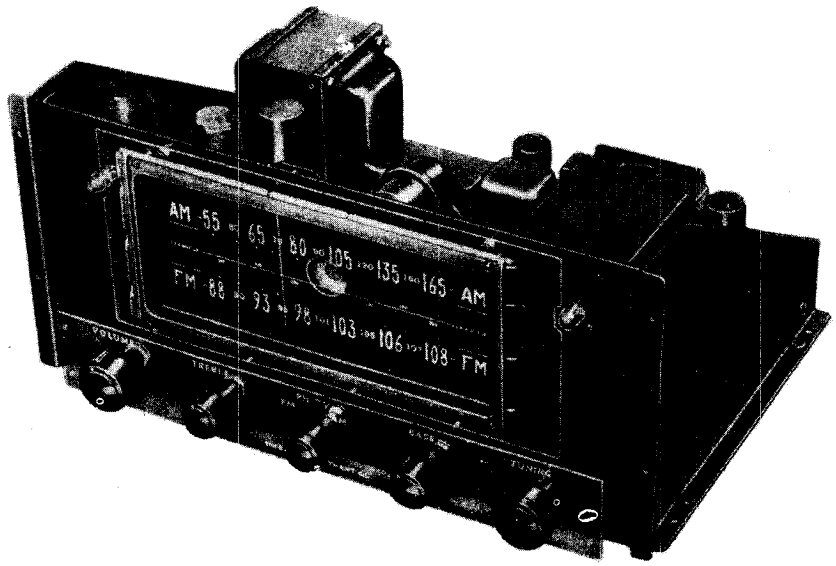
11. SET DEVELOPS MICROPHONIC HOWL Check 1S5 Tube. Replace with new tube if necessary.



TUBE-BATTERY-ELECTRIC LAYOUT

1878

MODEL SR51



GENERAL INFORMATION.

SR 51 has been especially designed to fill the need for a high quality replacement or custom tuner of such mechanical and circuit simplicity as to preclude the possibility of unit obsolescence. Separate standard components are used throughout.

No special instructions for circuit adjustment are necessary. There are no trick circuits. To any technician skilled in AM-FM the allignment procedure is obvious.
Oscillator parallel trimmer adjustment at 1500 KC.
Series padder at 600 KC.

INSTALLATION INSTRUCTIONS.

SR 51 control shafts and escutcheon are designed for a face panel of not more than one quarter of an inch in thickness. Carefully check the unit with the proposed cabinet placement using the furnished paper templet for cut-out marking.

The machine screws which now hold the bronze escutcheon to the transparent dial are for shipping convenience only and may be discarded. Bronze oval head woodscrews are supplied to fasten the escutcheon to the cabinet panel.

The transparent control designation strip should be placed over the control shafts and fastened into place after the tuner is in the cabinet to insure perfect placement.

Chassis mounting screws with retaining washers should not be so tight as to nullify the cushioning effect of the rubber feet.

CAUTION

VENTILATION IS EXTREMELY IMPORTANT. No multi-tube unit should be housed in an insufficiently ventilated cabinet. Damage to the unit and the cabinet will result.

USE ONLY 1½ AMP. FUSE.

ANTENNA REQUIREMENTS.

For best non-directional standard AM broadcast results a single wire ten to twenty ft. in length connected to antenna terminal ANT will be sufficient. Additional selectivity to this efficient input circuit would tend to restrict the wide band reception capabilities of the detector.

For best F.M. results a 100 M.C. dipole should be installed well above surrounding obstructions. The twisted 300 ohm line from the dipole should be connected to antenna terminals D1 and D2. (GND also grounds unit.)
A console type folded dipole is supplied with the tuner and will prove a satisfactory substitute in most cases where an external dipole is impractical.

INPUT JACKS.

All phono or TV audio signals as well as the AM and FM radio are subject to the volume and tone controls of the tuner unless DETECTOR output is used.

The jack marked "MAG" is the input for a properly compensated pre amplifier when using the variable reluctance cartridge.

CRYSTAL is the phono input for a standard crystal pickup.

The TV jack makes it possible to channel the audio of a television tuner thru the radio's amplifier and speaker.

The OUTPUT jack should be connected to the high impedence input control (250,000 to 500,000 ohms) of a quality audio amplifier. Use the prepared shielded lead supplied with the tuner. Choose a speaker capable of wide range reproduction.

A.C.POWER. SR 51 is completely powerized for 110-125 volts 50-60 cycles. The power switch (on the Volume Control) also controls the A.C.recepticle on the back of the chassis for convenience in amplifier installation.

The A.M. or Standard Broadcast section consists of a pre-stage tuned Radio Frequency section and one broad band stage of I.F. terminating in a new LOW DISTORTION detector for those who insist on the best in a Standard Broadcast Receiver. A "Null T" type 10 KC filter eliminates adjacent station whistle without impairing maximum frequency response.

The Frequency Modulation section employs a tuned R. F. stage preceeded by an input coupling tube for added sensitivity and stability. An A.F.C. controlled Triode Oscillator, two stages of permiability tuned I.F. for superior F.M. performance and fully balanced static free Ratio Detector.

Input jacks are for phono pickups, either crystal pickup or properly compensated pre-amp for Variable Reluctance type pickup and a jack for aural television.

Two output jacks, one direct from detector for feeding a high quality recording amplifier, etc., the other allowing for full tuner control. A phono pre-amplifier power supply socket is provided for SR3 or similar unit.

SR51 has the new SR tone-gate circuit for smooth electro-accoustical control of bass and treble emphasis allowing the controls of the audio amplifier to be pre-set. The newest in TWO TUBE tone control. Bass and treble variable from flat, minus 18 DB to plus 18 DB.

A.M. detector distortion only .35% at 400 cycles and .8% at 4000 cycles 100% modulation.

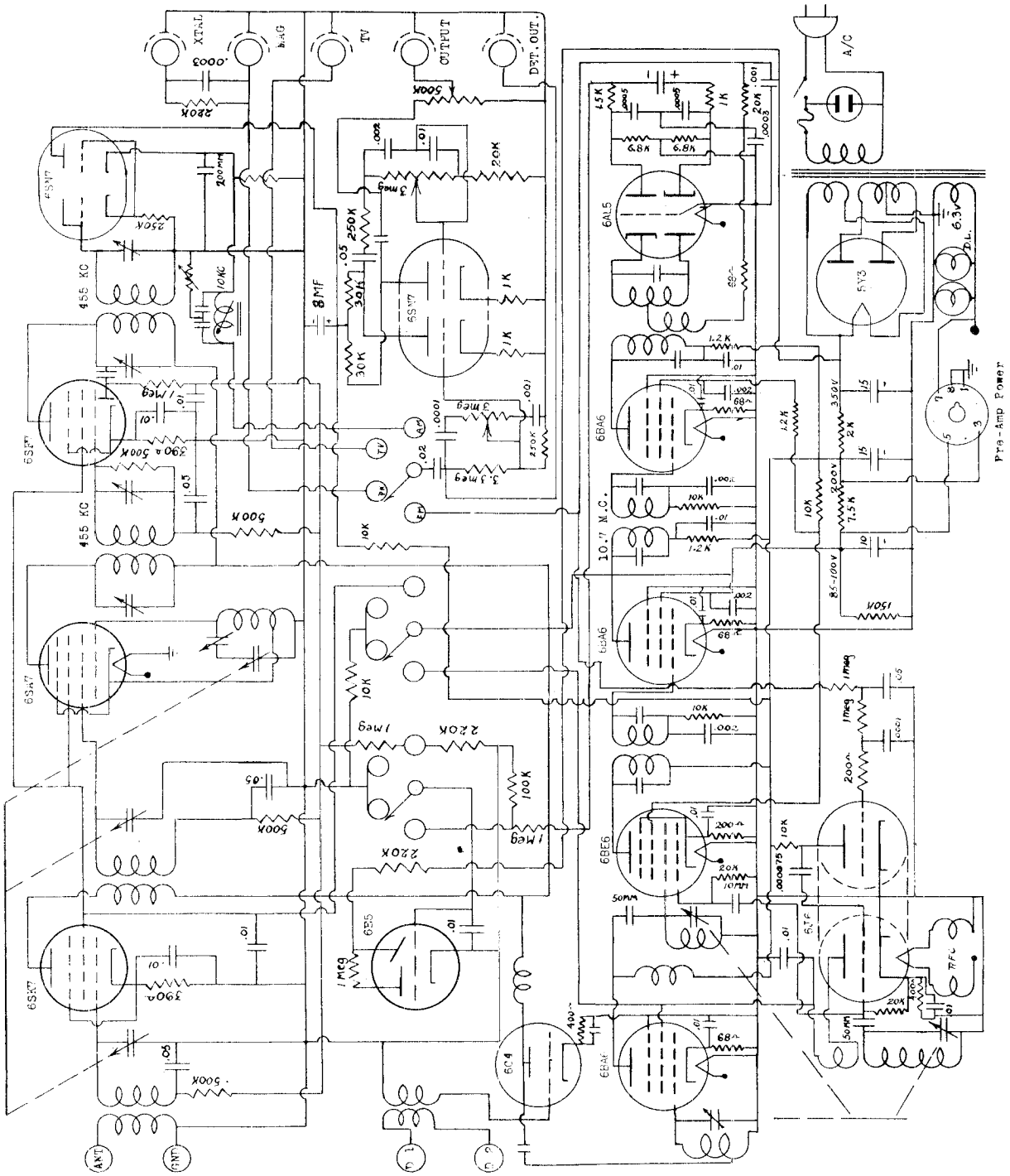
10 K.C. filter attenuation zero at 9 K.C. and -47 DB at 10 K.C.

F.M. Sensitivity: - 5 microvolts. Ratio Detector A.M. absorption 70%.

Tubes: - Three 6BA6; two 6SN7GT and one each 6BE6; 6C4; 6J6; 6AL5; 6SA7; 6SK7; 6SF7; 6E5 and 5Y3.

Power Consumption: - 85 watts, 110-125 volts, 50-60 cycles.

MODEL SR51



MODEL 515

Model 515 Radio-Phonograph

GENERAL FEATURES

The Model 515 is a combination designed for the reception of radio broadcast programs and for the reproduction of phonograph records, and other external sound. The receiver includes the following separate pieces of equipment: (1) radio-phono chassis, (2) power amplifier, (3) record changer, and (4) coaxial high fidelity speaker.

TECHNICAL DATA

Power Input	140-150 watts at 50-60 cycles. (Phono motor 60 cycles, 25 watts additional.) Taps are available to accomodate power line voltages of 105, 125, 150, 210, and 250.
Tubes	Total 11 and 2 rectifiers.
Circuits	Superheterodyne with RF amplifier stage (three gang tuning condenser) on all bands. Two stage AM-IF (455 kc) Push-pull output with 6 db inverse feedback. Separate B plus supplies for power amplifier and tuner sections for reduction of temperatures and to prevent damage to components through surges. Sound input for phono and other external sound.
Tuning Range	AM - 535 - 1620 kc SW - 2 - 6 mc SW - 6 - 18 mc
Output	20 watts (2-6L6 tubes in push-pull). Less than 5% distortion at full output.
Sensitivity	Less than 10 microvolts on any band. (Carrier modulated 30% at 400 cycles. Output 500 milliwatts with 10 db signal to noise ratio.)
Fidelity	Overall 30 to 20,000 cps plus or minus 1 db. Separate bass and treble control. Phono input equalized for elimination of objectionable scratch level.
Speaker	Hi-fidelity 12-inch coaxial PM. 8 ohm voice coil.
General	Tuner chassis 12 1/4" wide x 8 1/2" high x 13" deep. Weight 10 lbs. Polished chrome. Power amplifier chassis 12 1/4" wide x 7" high x 9" deep. Weight 23 lbs. Polished chrome. Five controls - Station Selector, Function Switch, Volume, Treble, Off-On Bass. Hum level 65 db below maximum output. Antenna - AM (built-in) loop and SW (built-in) antenna. Provision for connection of external antenna. Dial counter weighted - slide rule type - illuminated glass scale - full 7 inch travel - color dots to identify function - 0-100 logging scale. Unit construction of chassis, dial escutcheon, and knobs permits complete ease of installation, nothing to remove.

MODEL 515

INSTALLATION

The Model 515 Radio-Phonograph comes complete with all equipment installed and ready for operation after taking the following few precautions:

1. Remove any packing material which may be used to hold the larger tubes in place.

2. Release the hold-down screws which hold the phono mechanism securely for shipment. These screws require only a few turns and when they are in the correct position the mechanism will be observed to float freely on the spring suspension. Do not remove the screws. Remove any tape or rubber bands which may be holding the pickup arm or accessories in place.

3. Check to make sure that power transformer tap is connected for the power line voltage.

4. Plug in the a.c. line cord.

ANTENNA CONNECTION

The Model 515 is equipped with built-in antennas for both AM and SW reception. These antennas will be found adequate in most locations to receive all the stations in the service area. In locations remote from broadcast transmitters, or in locations shielded from the transmitters, outdoor antennas will give improved reception.

For reception under difficult conditions, the installation of a SCOTT Super Double Doublet All-Wave antenna is recommended. When this all-wave antenna system is used, connections to the antenna terminal strip should be as follows: One of the wires in the twisted pair is connected to terminal marked "GND". The other wire in the twisted pair is connected to the terminal marked "2". A short wire jumper should be connected from terminal "1" to terminal "2".

For single wire antenna installation the connections at the antenna terminal strip should be as follows: Connect antenna lead to terminal marked "2". A short wire jumper should be connected from terminal "1" to terminal "2".

OPERATION OF CONTROLS

Station Selector - The large center knob serves to adjust the receiver to the desired station. The dial pointer follows the rotation of the knob and indicates the frequency to which the receiver is tuned. Assigned frequencies of broadcast stations are listed on the radio page of your newspaper.

Volume Control - The knob directly to the left of the large station selector knob serves to adjust the volume of sound. Turned to the right the volume is increased, and turned to the left the volume is decreased. The control is designed as to give a smooth and gradual control of the sound volume.

Service Functions - The knob directly to the right of the large station selector knob serves to adjust for the various functions desired. As indicated on the escutcheon, and identified by colored dots on escutcheon and dial glass, the functions are AM broadcast, shortwave 1, shortwave 2, phono reproduction, and an external connection which may be a separate record player or a crystal microphone.

Treble Control - Second knob to the left of station selector. This control acts to regulate the degree of higher audible tones sent to the loudspeaker. Turned completely to the right gives the maximum of high audio response. Turned to the left gives a minimum. The range of control gives the user an opportunity of adjusting the reproduction to his own desires.

Off-On Bass Control - This knob is the second to the right of the station selector. Turned slightly from its extreme left position it serves to turn on the power to the radio receiver. Turned further to the right it increases the amount of low frequency audio, or bass reproduction. The control may, therefore, be set at the position giving the listener the amount of bass reproduction he desires. Generally the treble and bass controls, being independent, can be individually adjusted for the best balance in reproduction which, naturally, will vary somewhat with individual preferences.

TUNING THE RECEIVER

To receive broadcast stations after the Model 515 is installed proceed as follows:

1. Turn the knob marked "OFF-ON BASS" to the right and advance about half-way. The dial lights will illuminate indicating the receiver is correctly connected to a power source. Allow about thirty seconds as a warm-up time for the radio tubes.

2. Turn the function knob to the position where the arrow points to the blue dot on the escutcheon.

3. Turn the large knob, or station selector, to the frequency position of one of the local broadcasting stations.

4. Turn the knob marked "VOLUME" slowly to the right until the station is heard. Then readjust the large knob until reception is clearest.

5. Adjust "BASS" and "TREBLE" controls until the reproduction is most pleasing.

To receive shortwave stations turn the function knob to the green or yellow positions and proceed exactly as described.

MODEL 515

RECORD CHANGER

The motor of the changer is permanently connected to the 125 volt tap so that it will not be necessary to modify this for various power line voltages. For 50 cycle operation a special drive wheel is required and is available.

FUSE REPLACEMENT

A fuse is provided for protection of the receiver against excessive power line voltages and against failure of any component in the receiver which would cause heavy current drain and fire hazard. This fuse is accessible at the rear panel of the tuner chassis. CAUTION: Always replace the fuse with one of the same rating in the event the fuse is blown. If the fuse continues to blow after replacement trouble is indicated and the equipment should be removed from the cabinet for examination.

TUBE REPLACEMENT

The Model 515 has the following tube complement:

Symbol	Tube	Application	Symbol	Tube	Application
V1	6BA6	RF Amplifier	V7	6SN7	2nd Audio Amplifier
V2	6C4	Converter	V8	6SN7	3rd Audio Amplifier
V3	6C4	Oscillator	V9	6L6G	Audio Power Output
V4	6BA6	IF Amplifier	V10	6L6G	Audio Power Output
V5	6BA6	IF Amplifier	V11	5Y3GT	Rectifier
V6	6SQ7	2nd Detector and 1st Audio Amplifier	V12	25Z6GT	Rectifier
			V13	6SC7	Preamplifier, reluctance pickup

ALIGNMENT PROCEDURE

Test Equipment

1. Electronic type voltmeter for DC measurements - RCA Voltohmyst.
2. AM signal generator for 455 kc, 600 kc, 1000 kc, 1500 kc, 2 mc, 6 mc, and 16 mc.
3. AC voltmeter such as Ballantine Output Meter.
4. An aligning tool is included with each receiver and is taped on the 1st IF transformer can. Additional aligning tools may be ordered under part number 94V4707.

Alignment Procedure

The alignment is preferably performed in the following order: See Figures 1 and 2 for location of adjustments on chassis.

1. 455 KC I.F.
2. Band 1 R.F.
3. Band 2 R.F.
4. Band 3 R.F.

455 KC I.F. Alignment

A signal generator should be connected through a .01 MFD mica capacitor to the junction of converter grid coupling capacitor (C11) and middle gang condenser section (C2) which can be found on band selector switch (SW2). A good ground point for the generator is the rear support bracket of the switch assembly.

The AC voltmeter is connected across the secondary of the audio output transformer, which is loaded with an 8 ohm 10 watt resistor connected in place of the speaker voice coil. In the event this resistor is not available the speaker may be used if the sound volume can be tolerated. The volume, bass, and treble controls must be full on, the band selector switch in Band 1 position, and the receiver dial set at 1600 kc.

Apply sufficient input signal at 455 kc 400 cycles 30% modulation to give an indication of 2 volts r.m.s. AC on the AC output meter. With the use of the aligning tool peak the primary (bottom core) and secondary (top core) of the 455 kc I.F. transformers for maximum reading on the output meter. Begin alignment with peaking 3rd I.F. (T7), next the 2nd I.F. (T6) and last the 1st I.F. (T5). As the I.F. stages approach correct alignment, reduce the input signal level so the output never exceeds 2 volts AC. Repeat above procedure if stages have been found to be badly mis-aligned.

The normal 455 kc I.F. sensitivity is 5 uv for 10 db signal to noise ratio with 400 cycles 30% modulation. An alternative method for determining sensitivity is to measure with the electronic voltmeter the DC voltage applied to the AGC line (solid white wiring in tuner chassis). With this method the 455 kc I.F. input is 15 uv for a reading of 1 V DC

Band 1 R.F. Alignment

Connect the signal generator to terminal 1 on the antenna terminal strip through a .01 MFD mica capacitor. The Band 1 loop antenna must be plugged into the receiver. Operating controls and AC voltmeter connections remain as for 455 kc I.F. alignment.

Set the signal generator and receiver dial at 1000 kc and adjust Band 1 oscillator (T3) core for maximum indication on the output meter. Reset generator and receiver dial at 600 kc and adjust Band 1 low frequency trimmer (C14). Reduce input signal so the output never exceeds 2 V AC.

The Band 1 converter transformer (T1) is now adjusted for maximum reading. The signal generator and receiver dial are re-set to 1500 kc and the Band 1 oscillator trimmer (C58), Band 1 converter trimmer (C55) and Band 1 loop trimmer (C52) are adjusted. Repeak C55 and C52 if considerable increase in output reading has been noted.

Normal sensitivity at any frequency on Band 1 is less than 0.5 uv for 10 db signal to noise ratio with 400 cycles 30% modulation.

Band 2 R.F. Alignment

Connect signal generator to terminal 2 on the antenna terminal strip through a dummy antenna load of 100 ohms resistor in series with 125 MMFD capacitor. Operating controls setting and AC voltmeter connections remain as for Band 1 R.F. alignment.

Set the signal generator and receiver dial at 2.2 mc and adjust in step procedure Band 2 oscillator coil (T4) core, next Band 2 converter transformer (T2) core and Band 2 antenna coil (L2) for maximum reading on output meter.

Reset signal generator and receiver dial at 5 mc and adjust in step procedure Band 2 oscillator trimmer (C59), Band 2 converter trimmer (C56) and Band 2 antenna trimmer (C53). Repeat above procedure until no further adjusting of cores and trimmers is needed.

Normal sensitivity at any frequency on Band 2 is less than 8 uv for 10 db signal to noise ratio with 400 cycles 30% modulation.

MODEL 515

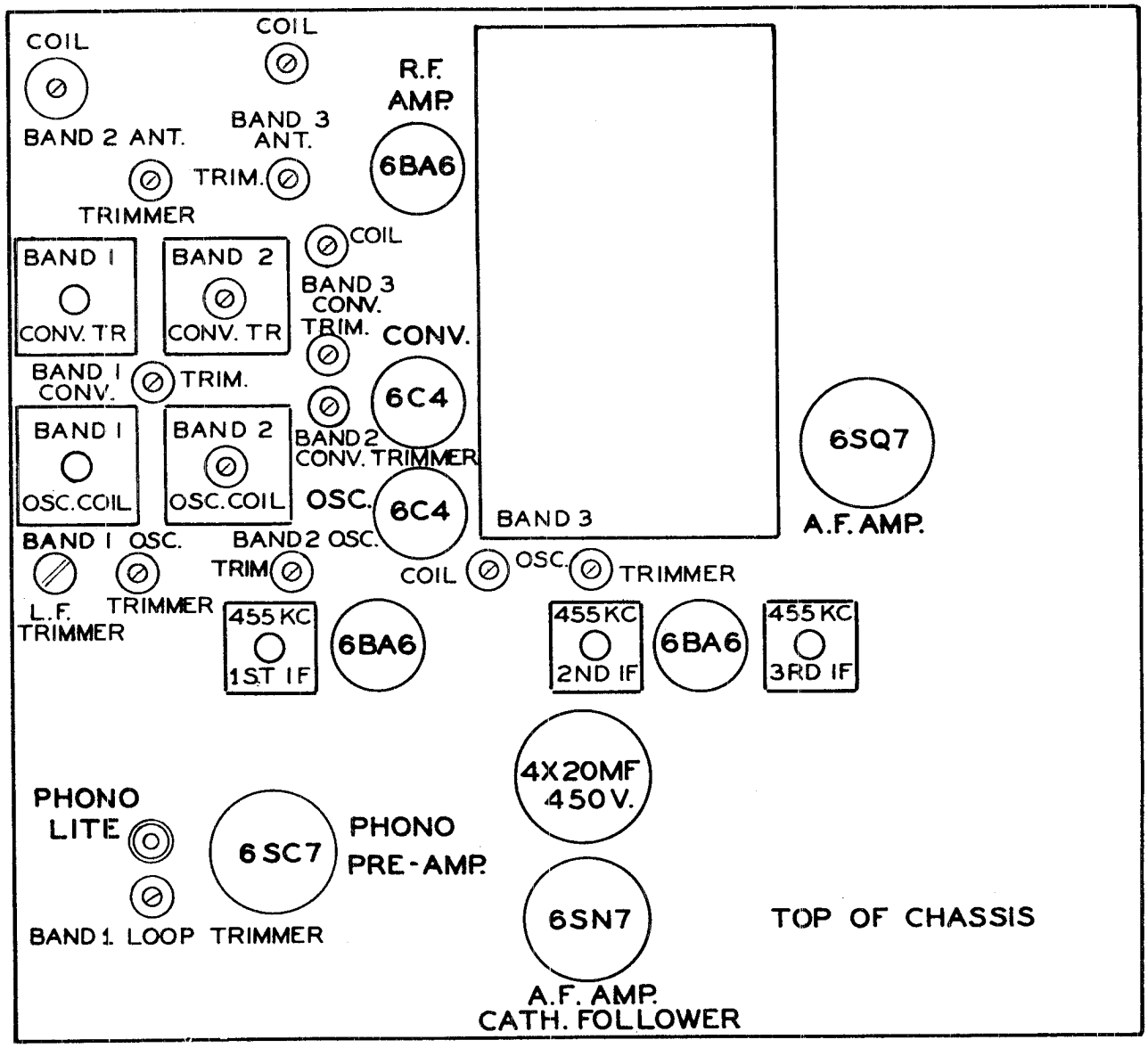


FIG. 1

Model 515 Tuner Assembly

Band 3 R.F. Alignment

The signal generator connection through dummy antenna, AC output voltmeter connections and operating controls setting remain as for Band 2 R.F. alignment.

Set signal generator and receiver dial at 6 mc and adjust in step procedure Band 3 oscillator coil (L5) core, next Band 3 converter transformer (L4) core and Band 3 antenna coil (L3) core for maximum indication on output meter.

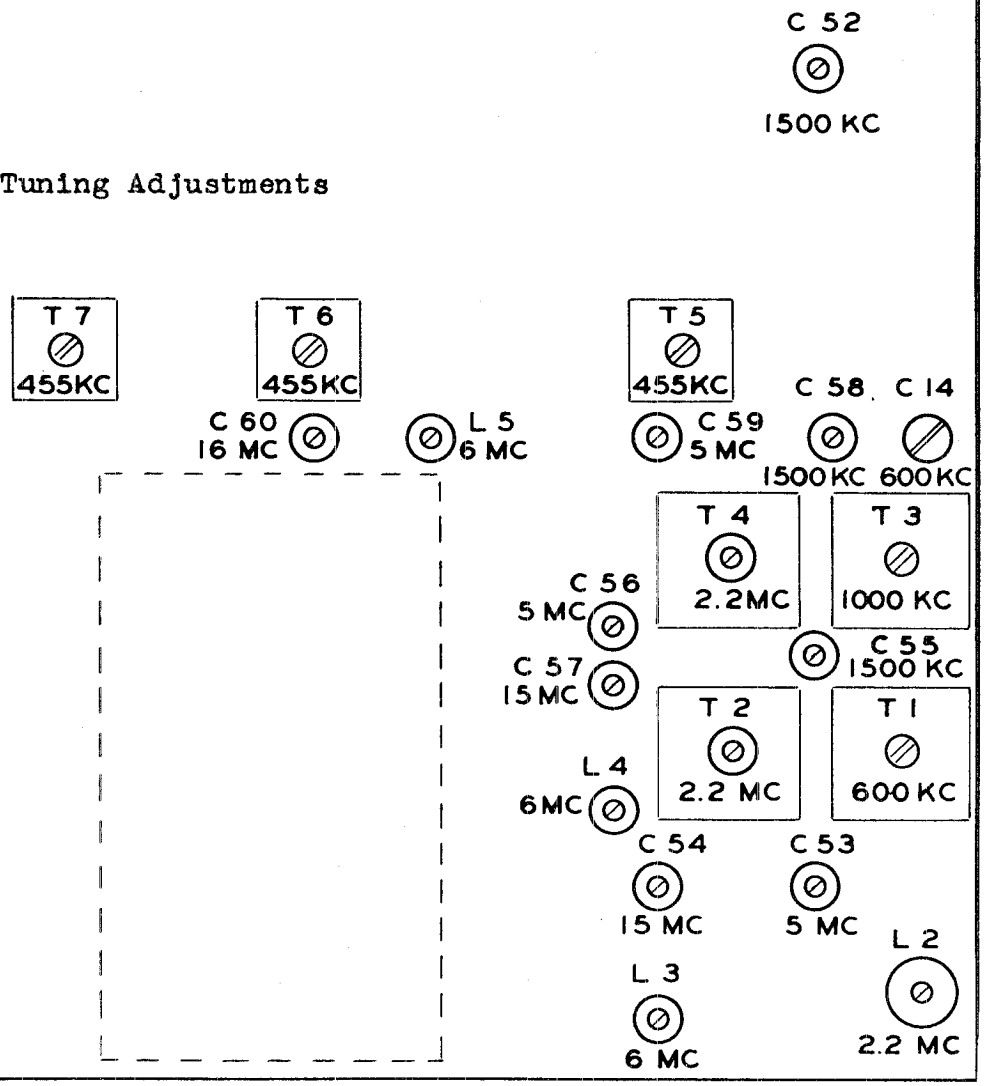
Reset the signal generator and receiver dial at 15 mc and adjust in step procedure Band 3 oscillator trimmer (C60), Band 3 converter trimmer (C57), and Band 3 antenna trimmer (C54).

Repeat above procedure until the 6 mc and 15 mc points require no further adjusting of cores and trimmers.

Normal sensitivity at any frequency on Band 3 is less than 10 uv for 10 db signal to noise ratio with 400 cycles 30% modulation.

FIG. 2

Location Of Tuning Adjustments



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VOLTAGE TABLE

Tube	Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1	6BA6	-.3	0	AC 6.5	0	120	120	1.25	-
V2	6C4	140	0	AC 6.5	0	140	-.2	7	-
V3	6C4	130	0	AC 6.5	0	130	-3.5	0	-
V4	6BA6	-.3	0	AC 6.5	0	120	120	3	-
V5	6BA6	0	0	AC 6.5	0	110	110	2.5	-
V6	6SQ7	0	-.8	0	0	0	90	AC 6.8	0
V7	6SN7	0	110	5	35	235	50	AC 6.8	0
V13	6SC7	0	110	-.5	-.5	90	0	0	AC 6.8
V8	6SN7	66	210	78	66	210	78	0	AC 6.8
V9	6L6G	0	AC 6.8	360	275	0	73	0	15
V10	6L6G	0	AC 6.8	360	275	0	73	0	15
V11	5Y3	0	400	0	AC 390	0	AC 390	0	400
V12	25Z6	0	0	AC 170	200	AC 170	0	0	200

Voltage readings made with Voltohmyst. Line voltage adjusted to 117 V AC. All voltages measured between indicated pin and chassis frame. Unless noted all voltages are DC and positive to chassis.

No signal input.
Voltages taken with the service selector switch in Band 1 position.
Volume control in the counterclockwise position.
Tone controls clockwise.

RESISTANCE TABLE

Tube	Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1	6BA6	1.75 M	0	0	0	inf.	inf.	82	-
V2	6C4	inf.	inf.	0	0	inf.	3.5 M	4.7 K	-
V3	6C4	inf.	inf.	0	0	inf.	33 K	0	-
V4	6BA6	1.4 M	0	0	0	inf.	inf.	220	-
V5	6BA6	0	0	0	0	inf.	inf.	220	-
V6	6SQ7	0	4.7 M	0	0	0	inf.	0	0
V7	6SN7	19 K	inf.	2.2 K	500 K	inf.	12 K	0	0
V13	6SC7	0	inf.	3.3 M	3.3 M	inf.	0	0	0
V8	6SN7	230 K	inf.	11 K	230 K	inf.	11 K	0	0
V9	6L6G	inf.	.2	inf.	inf.	470 K	10 K	0	170
V10	6L6G	inf.	.2	inf.	inf.	470 K	10 K	0	170
V11	5Y3	inf.	inf.	inf.	5	inf.	5	inf.	inf.
V12	25Z6	inf.	inf.	2	inf.	2	inf.	inf.	inf.

Resistance readings taken with Voltohmyst connected between pin indicated and chassis frame. Values given are in ohms except where K indicates times 1000 and M indicates times 1 megohm.

All controls to the counterclockwise or off position.
Range switch in Band 1 position.

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part No.
(C1 (C2 (C3	Main tuning capacitor	Capacitor, variable, 3 gang	15W4895
C4	Grid coupling, RF	Capacitor, mica 240 MMFD 10% 500 V	15A366
C5	Cathode bypass, RF	Capacitor, paper, .05 MFD 400 V, miniature tubular	15L3466
C6	Grid decoupling, RF	Same as C5	
C7	Cathode bypass, RF	Capacitor, ceramic 5000 MMFD hi-kap 500 V	15L3462
C8	Screen bypass, RF	Capacitor, paper .05 MFD 600 V, miniature tubular	15L3467
C9	Screen bypass, RF	Same as C7	
C10	Shunt capacity	Capacitor, mica 10 MMFD 10% 500 V	15E3207
C11	Grid coupling, Conv.	Capacitor, ceramic 100 MMFD 10% 500 V	15L3460
C12	Grid decoupling, Conv.	Same as C5	
C13	Cathode coupling, Conv.	Capacitor, paper 5000 MMFD 20% 600 V	15H2603
C14	Variable padder, Band 1, Osc.	Capacitor, mica trimmer, 30-200 MMFD	15E2675
C15	Fixed padder, Band 1, Osc.	Capacitor, mica 460 MMFD 10% 500 V	15E1935
C16	Shunt capacity	Capacitor, ceramic 30 MMFD 5%	15W4936
C17	Fixed padder, Band 2, Osc.	Capacitor, mica 1000 MMFD 20% 500 V	15A35
C18	Fixed padder, Band 3, Osc.	Capacitor, mica 6200 MMFD 20% 500 V	15A40
C19	Grid coupling, Osc.	Capacitor, ceramic 51 MMFD 5% 500 V	15L3458
C20	Plate decoupling, Osc.	Capacitor, ceramic 1500 MMFD 350 V	15L3459
C21	Feedback coupling, Osc. plate	Same as C13	
C22	Plate decoupling, IF	Same as C8	
C23	Grid decoupling, IF	Same as C5	
C24	Plate decoupling, IF	Same as C8	
C25	Plate decoupling, IF	Same as C8	
C26	RF bypass, Diode	Same as C11	
C27	Bypass, AGC	Capacitor, paper .1 MFD 200 V, miniature tubular	15S4298
C28A C28B	RF filter RF filter	Capacitor, silver ceramic, 2x100 MMFD 20% 500 V, 3 wire leads	15D2923
C29	Audio input coupling	Same as C5	
C30	Grid coupling, Phono Preamplifier	Same as C5	
C31	Grid coupling, Phono Preamplifier	Same as C5	
C32	Equalizing capacity	Capacitor, paper .015 MFD 400 V, miniature tubular	15L3464

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part No.
C33	Coupling, Audio Amp.	Capacitor, paper .1 MFD 600 V, miniature tubular	15L3468
C34	Coupling, Audio Amp.	Capacitor, paper .02 MFD 200 V, miniature tubular	15U4580
C35	Grid coupling, Audio Amp.	Capacitor, paper .01 MFD 200 V, miniature tubular	15L3463
C36	RF filter, Audio Amp.	Same as C11	
C37	Grid coupling, Audio Amp.	Same as C33	
C38	Bypass, Treble control	Same as C35	
C39	Bypass, Treble control	Same as C13	
C40	Bypass, Bass control	Same as C13	
C41	Bypass, Bass control	Same as C34	
C42A	Decoupling	Capacitor, electrolytic,	15L3588
C42B	Filter, low frequency	4x20 MFD, 450 V	
C42C	Filter, low frequency		
C43	Cathode bypass, Audio Amp.	Capacitor, electrolytic, 25 MFD, 25 V, tubular	15B795
C44	Grid coupling, Audio Amp.	Same as C8	
C45	Coupling, cathode follower	Same as C5	
C46	Shunt capacity	Capacitor, mica 25 MMFD 10% 500 V	15E1849
C47	Grid coupling, Audio Amp.	Same as C8	
C48	Grid coupling, Audio Amp.	Same as C8	
C49	Cathode bypass, Power Amp.	Capacitor, electrolytic 25 MFD, 50 V, tubular	15B638
C50A	Filter, low voltage	Capacitor, electrolytic,	15L3438
C50B	Filter, low voltage	2x60 MFD 200 V	
C51A	Filter, high voltage	Same as C42	
C51B	Filter, high voltage		
C51C	Filter, high voltage		
C52	Trimmer, Band 1 Ant.	Capacitor, trimmer, 1-8 MMFD	15W5079
C53	Trimmer, Band 2 Ant.	Same as C52	
C54	Trimmer, Band 3 Ant.	Same as C52	
C55	Trimmer, Band 1 Conv.	Same as C52	
C56	Trimmer, Band 2 Conv.	Same as C52	
C57	Trimmer, Band 3 Conv.	Same as C52	
C58	Trimmer, Band 1 Osc.	Same as C52	
C59	Trimmer, Band 2 Osc.	Same as C52	
C60	Trimmer, Band 3 Osc.	Same as C52	
C61	RF bypass, Audio	Same as C20	
E1	Dial light	Lamp, 6-8 V .150 A #47 brown	49A168
E2	Dial light	Same as E1	
E3	Phono compt. light	Same as E1	
E4	Overload protection	Fuse, 3 amp, 3 AG	37A162

MODEL 515

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part No.
E5	Main tuning knob	Knob, station selector 1 7/8" dia. brass	47V4603
E6	Control knob	Knob, 1 1/8" dia. black bakelite, push-on type	47V4604
E7	Align IF	Aligning tool	94V4707
J1	Loop connector to receiver	Receptacle, 3 contact	67U4716
J2	Phono pickup, external audio sound connector	Receptacle, dual, insulated	67V4657
J3	Phono compartment light connector	Receptacle, single, insulated	67E3226
J4	Power cable connector	Socket, 12 contact	82S4305
J5	Speaker connector	Receptacle, 2 contact	67V4673
J6	Phono motor power connector	Receptacle, 4 contact	67B645
L1	Signal interceptor	Loop	1V4594
L2	Band 2 antenna tuning	Coil	20W4915
L3	Band 3 antenna tuning	Coil	20W4916
L4	Band 3 conv. tuning	Transformer	20W4918
L5	Band 3 osc. tuning	Coil	20W4920
L6	Filter choke, ripple	Choke	17L3312
LS1	Loudspeaker	Speaker, 12" coaxial, PM 8 ohm voice coil	85V4593
P1	Loop connector to receiver	Plug, 3 contact	65U4714
P2	Phono compartment light connector	Plug, single contact	65E3225
P3	Amplifier connector to tuner	Plug, 12 contact	65S4301
R1	Grid load, RF	Resistor, composition, .47 meg, 10% ½ watt	70L3404
R2	Grid decoupling, RF	Resistor, composition, .1 meg, 10% ½ watt	70L3401
R3	Cathode bias, RF	Resistor, composition, 82 ohms 5% ½ watt	70L3391
R4	Plate decoupling, RF	Resistor, composition, 1000 ohms 10% ½ watt	70L3393
R5	Grid load, Conv.	Resistor, composition, 2.2 meg, 20% ½ watt	70L3408

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part No.
R6	Grid decoupling, Conv.	Same as R2	
R7	Cathode bias, Conv.	Resistor, composition, 4700 ohms, 10% ½ watt	70L3395
R8	Plate decoupling, Conv.	Same as R4	
R9	Grid decoupling, IF	Same as R2	
R10	Grid load, Osc.	Resistor, composition, 33,000 ohms, 10% ½ watt	70L3398
R11	Plate load, Osc.	Same as R4	
R12	Cathode bias, IF	Resistor, composition, 220 ohms, 5% ½ watt	70V4783
R13	Plate decoupling, IF	Same as R4	
R14	Cathode bias, IF	Same as R12	
R15	Plate decoupling, IF	Resistor, composition, 3300 ohms, 10% ½ watt	70L3394
R16	Diode load, IF	Resistor, composition, .22 meg 10% ½ watt	70L3403
R17	Diode decoupling, IF	Resistor, composition, 47,000 ohms 10% ½ watt	70L3399
R18	Decoupling, AGC	Resistor, composition, 1 meg 20% ½ watt	70L3406
R19	Decoupling, Audio	Resistor, composition, 22,000 ohms 10% ½ watt	70L3397
R20	Power filter	Resistor, 750 ohms, 10% 5 watt, wirewound	70W4912
R21	Compensation, Phono Pickup	Resistor, composition, 6800 ohms, 10% ½ watt	70L3534
R22	Grid load, Phono Preamplifier	Resistor, composition, 3.3 meg, 20% ½ watt	70L3422
R23	Plate load, Phono Preamplifier	Resistor, composition, 68,000 ohms, 10% ½ watt	70L3515
R24	Plate load, Phono Preamplifier	Same as R10	
R25	Equalizing, Phono Audio Freq.	Same as R16	
R26	Grid load, Phono Preamplifier	Same as R22	
R27	Equalizing, Phono Audio Freq.	Same as R19	
R28	Volume control	Potentiometer, volume, .5 meg, 20%	70V4583
R29	Grid load, Audio Amp.	Resistor, composition, 4.7 meg, 20% ½ watt	70L3530
R30	Plate load, Audio Amp.	Same as R2	
R31	Tone control network	Same as R17	
R32	Treble control	Potentiometer, treble, .5 meg, 20%	70V4584
R33	Bass control	Potentiometer, bass off-on, .5 meg, 20%	70V4585
R34	Bass control network	Same as R19	
R35	Grid load, Audio Amp.	Same as R2	
R36	Cathode follower	Resistor, composition, 56 ohms, 10% ½ watt	70V4628

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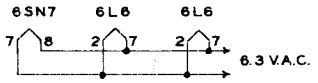
Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part No.
R37	Cathode bias, Audio Amp.	Resistor, composition, 2200 ohms, 10% ½ watt	70L3432
R38	Plate load, Audio Amp.	Same as R17	
R39	Cathode follower decoupling	Resistor, composition, 560 ohms, 10% ½ watt	70L3527
R40	Cathode circuit	Resistor, composition, 10,000 ohms, 10% ½ watt	70L3396
R41	Cathode bias, Cathode Follower	Resistor, composition, 1800 ohms, 10% ½ watt	70V4700
R42	Grid load, Cathode Follower	Same as R1	
R43	Plate decoupling, Audio Amp.	Same as R4	
R44	Grid load, Phase Inverter	Same as R16	
R45	Cathode bias, Phase Inverter	Resistor, composition, 680 ohms, 10% ½ watt	70V4691
R46	Cathode coupling	Resistor, composition, 10,000 ohms, 10% 1 watt	70L3427
R47	Plate load, Phase Inverter	Same as R46	
R48	Grid load, Power Amp.	Same as R1	
R49	Grid load, Power Amp.	Same as R1	
R50	Cathode bias, Power Amp.	Resistor, 167 ohms, 10% 5 watt, wirewound	70W4910
R51	Filter	Resistor, 375 ohms, 10% 5 watt, wirewound	70W4911
R52	Filter	Resistor, composition, 3900 ohms, 10% 2 watt	70V4693
SW1	Band 1, 2, 3, Phono Switching	Switch, range, 4 position	89W4899
T1	Interstage coupling, Band 1 Conv.	Transformer	20V4620
T2	Interstage coupling, Band 2 Conv.	Transformer	20W4917
T3	Oscillator, Band 1	Coil	20V4621A
T4	Oscillator, Band 2	Coil	20W4919
T5	Interstage coupling, IF	Transformer	20V4622A
T6	Interstage coupling, IF	Same as T5	
T7	Interstage coupling, IF	Same as T5	
T8	Power	Transformer	91W4900
T9	Output	Transformer	91V4667

V1	RF Amplifier	Tube - 6BA6	92G2871
V2	Converter	Tube - 6C4	92B597
V3	Oscillator	Same as V2	
V4	IF Amplifier	Same as V1	
V5	IF Amplifier	Same as V1	
V6	2nd detector, 1st Audio Amp.	Tube - 6SQ7	92V4632
V7	2nd Audio Amp.	Tube - 6SN7	92A230
V8	Phase Inverter	Same as V7	
V9	Audio Power Output	Tube - 6L6G	92A233
V10	Audio Power Output	Same as V9	
V11	Low Voltage Rectifier	Tube - 25Z6GT	92E1419
V12	High voltage Rectifier	Tube - 5Y3GT	92B480
* V13	Phono Pickup Preamplifier	Tube - 6SC7	92E4695
X1	Socket for V1	Socket, 7 contact, miniature, bakelite	82B663
X2	Socket for V2	Socket, 7 contact, miniature mica filled bakelite	82V4636
X3	Socket for V3	Same as X2	
X4	Socket for V4	Same as X1	
X5	Socket for V5	Same as X1	
X6	Socket for V6	Socket, 8 contact octal, black bakelite, type MIP8	82S4412
X7	Socket for V7	Same as X6	
X8	Socket for V8	Socket, 8 contact octal, bakelite	82E1322
X9	Socket for V9	Same as X8	
X10	Socket for V10	Same as X8	
X11	Socket for V11	Same as X8	
X12	Socket for V12	Same as X8	
X13	Socket for V13	Same as X6	

* In some models 6SL7 tube is substituted for the 6SC7 tube with changes in socket wiring.

ALL RESISTORS ½ W UNLESS NOTED
ALL CAPACITORS IN MMF UNLESS NOTED



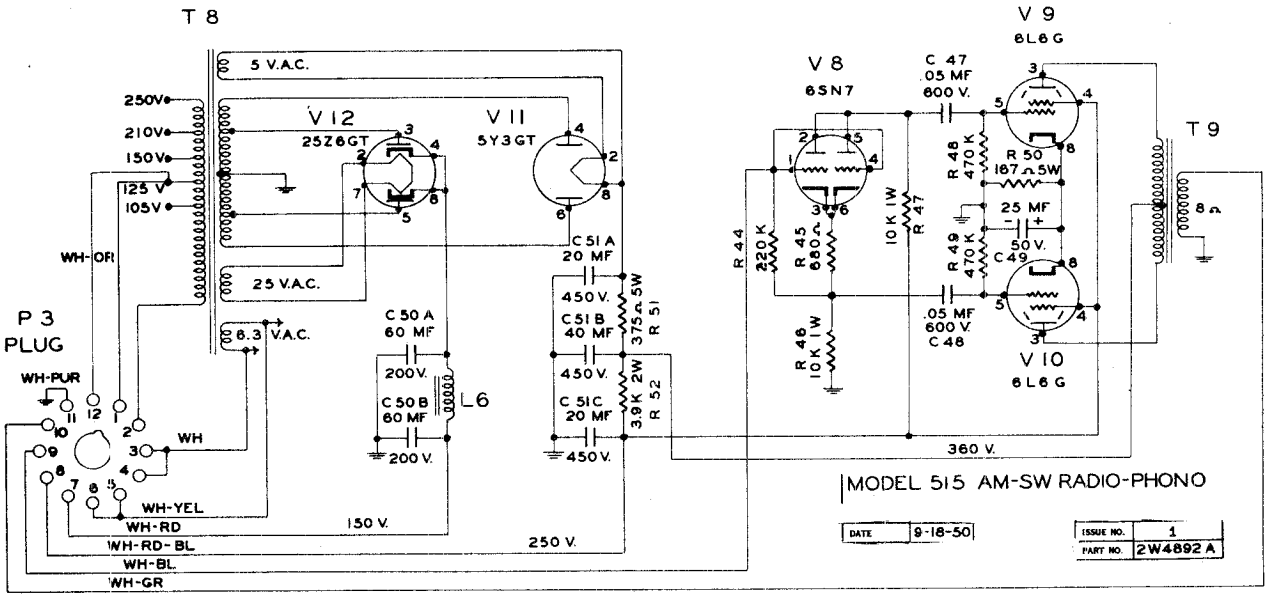


Figure 3 Schematic Diagram Model 515 Amplifier

MODEL 515

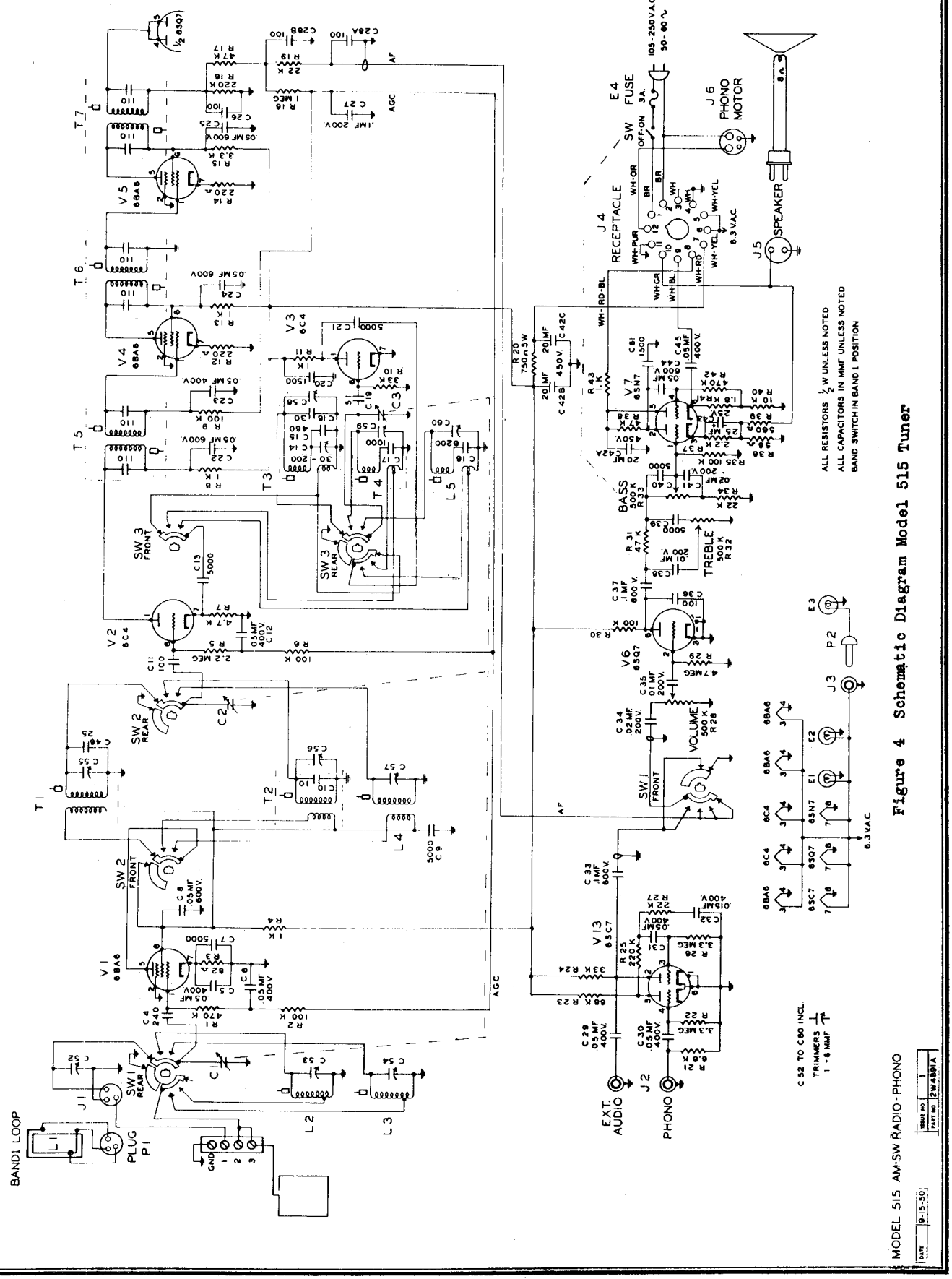


Figure 4 Schematic Diagram Model 515 Tuner

MODELS 15, 16,
Ch. 132.844,
132.844-1

Specifications

Power Supply
105-125 Volts AC-DC 35 Watts

Frequency Range
Broadcast 540-1600 KC

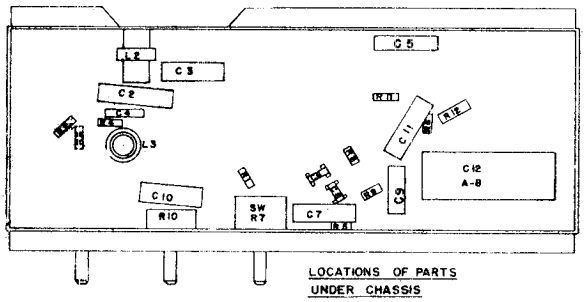
Power Output
Undistorted 1.0 Watt
Maximum 2.0 Watt

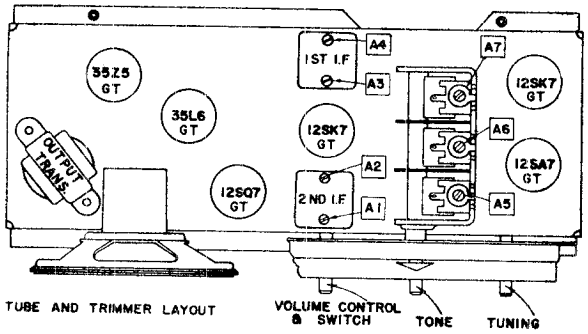
Speaker Voice Coil Impedance 3.2 ohms

ALIGNMENT DATA

With variable condenser closed, set the pointer horizontally to the left. Generator ground lead connected to floating ground.

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connections	Adjust Trimmers (In order shown for max. output)	Trimmer Function
Open	455 Kc	.05 mfd.	Mixer Grid	A1,A2,A3,A4,	I.F.
1400 Kc	1400 Kc	50 mmfd.	Ext.Ant.Conn.	A5,A6,A7	Osc.R.F.,Ant.
600 Kc	600 Kc	50 mmfd.	Ext.Ant.Conn.	Check Point	

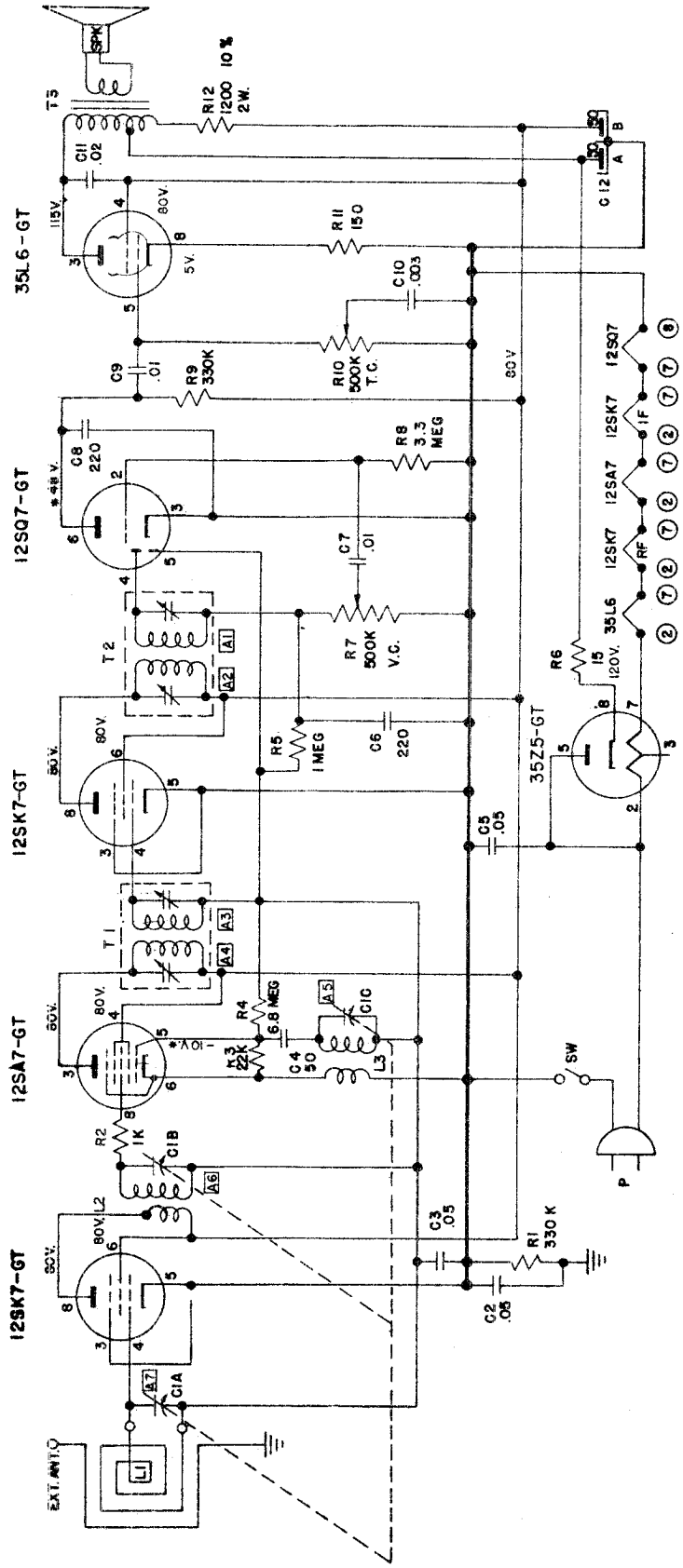




REPAIR PARTS LIST

Schematic Location	Part No.	Description
L1	N23159	Antenna Loop Assembly
	N22953	Bracket, Antenna Loop Mtg.
	N23207	Bracket, Var. Con. Mtg.
	N22964	Bracket, Dial Scale Mtg. (left)
	N22965	Bracket, Dial Scale Mtg. (right)
	N23561	Cabinet Assembly (Brown - Cat. No. 15)
	N23562	Cabinet Assembly (Ivory - Cat. No. 16)
	N22823-2	Cabinet (Brown - Cat.No.15)
	N22823-1	Cabinet (Ivory - Cat.No.16)
	N22369-1	Cloth, Grille (Brown - Cat. No. 15)
	N22369-2	Cloth, Grille (Ivory - Cat. No. 16)
	N22937	Crystal, Dial
	N22939	Emblem "G"
	N19361	Clip, Hairpin
L2	N23163	Coil, R.F.
L3	N23160	Coil, Oscillator
C1A,C1B, C1C	N23155	Condenser, Variable, 3 Gang
C2,C5		Condenser, .05 mfd., 400 Volt
C3		Condenser, .05 mfd., 200 Volt
C4		Condenser, .00005 mfd., 500 Volt Mica
C6,C8		Condenser, .0002 mfd., 350 Volt Ceramic
C7,C9,C11		Condenser, .01 mfd., 400 Volt
C10		Condenser, .003 mfd., 600 Volt
C12A,C12B	N22111	Condenser, Electrolytic, 50-50 mfd. 150 Volt
	N19132	Cord, Dial Drive
	N22940-1	Cover, Rear Cabinet (Brown - Cat. No. 15
	N22940-2	Cover, Rear Cabinet (Ivory - Cat. No. 16
	N22604-5A	Knob, On-Off-Volume (Brown - Cat. No. 15)
	N22604-5B	Knob, Tone (Brown - Cat.No.15)
	N22604-5C	Knob, Tuning (Brown - Cat.No.15)
	N22604-3A	Knob, On-Off-Volume (Ivory - Cat. No. 16)
	N22604-3B	Knob, Tone (Ivory - Cat. No.16)
	N22604-3C	Knob, Tuning (Ivory-Cat.No.16)
	N23144	Leaflet, Instruction
P	Y20139-15	Line Cord with Plug
	N22956	Pointer, Dial
R1,R9		Resistor, 330,000 ohms, ½ watt
R2		Resistor, 1000 ohms, ½ watt
R3		Resistor, 22,000 ohms, ½ watt
R4		Resistor, 6.8 megohms, ½ watt
R5		Resistor, 1 megohm, ½ watt
R6		Resistor, 15 ohm, ½ watt
R7	N22963	Resistor, Volume Control & Switch, 500,000 ohms
R8		Resistor, 3.3 megohm, ½ watt
R10	N23156	Resistor, Tone Control, 500,000 ohms
R11		Resistor, 150 ohm, ½ watt
R12		Resistor, 1200 ohms, 2 watt
	N22954-2	Scale, Dial
	N22957	Shaft, Tuning
	N22760-1	Speaker, 5" P.M.
	N19133	Spring
	N23161	Transformer, 1st I.F.
	N23162	Transformer, 2nd I.F.
	N23164	Transformer, Output

MODELS 15, 16,
Ch. 132.844,
132.844-1



SUBJECT: Parts Changes and addition of -1 to the Chassis Number

Chassis No. 132.884-1 incorporates the following changes to prevent microphonics:

1. Part No. N23160 Oscillator Coil changed to Part No. N23751 Oscillator Coil.

2. Part No. N23155 Variable Condenser changed to Part No. N23743 Variable Condenser.

Variable Condenser N23743 has a wide spaced oscillator section with a lower capacity than N23155, and Oscillator Coil N23743 has a higher inductance than N23160.

Therefore, for proper tracking, N23155 and N23160 should be used together, and N23743 and N23751 should be used together when making service replacements of the Variable Condenser or Oscillator Coil.

MODELS 18, 20,
Ch. 132.877

TECHNICAL INFORMATION

Specifications

Power Supply
105-120 Volts AC 50 Watts
Frequency Range
Broadcast . . . . . 540-1600 Kc
FM . . . . . 88- 108 Mc

Power Output
Undistorted . . . 1.0 Watt
Maximum . . . . . 2.5 Watt

Speaker Voice Coil Impedance 3.2 ohms

AM Tuning range — 540 Kc to 1600 Kc. Intermediate Frequency — 455 Kc. I.F. and R.F. measurements made at 500 milliwatts output — approximately 1.27 volts on a rectifier type voltmeter connected across speaker voice coil.

Approximately input for 500 MW output: I.F. 300 uv; R.F. with standard loop: at 600 Kc, 1200 uc/m; at 1000 Kc, 1050 uv/m; at 1400 Kc, 800 uv/m.

FM Tuning range — 88 megacycles to 108 megacycles. Intermediate Frequency 10.7 megacycles. I.F. and R.F. measurements made at 500 milliwatts output — approximately 1.27 volts on a rectifier type voltmeter connected across speaker voice coil. Approximate input for 500 MW output: I.F. 300 uv; R.F. "Absolute Measurements": 91 megacycles, 125 uv; 105 megacycles, 100 uv.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	Across speaker voice coil.
Output meter reading to indicate 500 MW	1.27 volts.
Generator Modulation	30%, 400 cycles.
Position of volume control	Fully clockwise.
Set dial pointer	Horizontal, variable condenser closed.
Set band switch	To left for AM alignment, to right for FM alignment.

AM ALIGNMENT

Position of Variable	Generator Frequency	Dummy Ant.	Generator Connection (high)	Generator Connection Ground Lead	Adjust Trimmer In Order Shown For Max. Output	Trimmer Function
Open	455 Kc	.05 mfd.	Mixer Grid	Chassis	A1, A2, A3, A4,	I.F.
Open	1650 Kc		*Test Loop	Test Loop	A5	Oscillator
1400 Kc	1400 Kc		*Test Loop	Test Loop	A6	Antenna
**600 Kc	600 Kc		*Test Loop	Test Loop	Check Point	Antenna

* Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop. Or the generator can be connected with the high side lead to the AM antenna screw terminal and the ground lead to the chassis.

** With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section places of variable for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

FM ALIGNMENT

Detector and I.F. alignment using Signal Generator and Oscilloscope.

1. Connect FM Generator, High side, to grid (pin 1) of 6BA6 2nd I.F. tube through .005 mfd. dummy.
2. Set generator frequency to 10.7 Mc. modulated either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc. deviation).
3. Connect vertical input of scope across volume control of receiver (grounded terminal to chassis, ungrounded terminal to high side of control).
4. Set scope switch for internal synchronization and set horizontal oscillator to 2X frequency of modulating voltage of generator. (120 or 800 cycles)
5. Turn variable condenser fully open, and band switch to right (FM).
6. Adjust frequency vernier of horizontal oscillator on scope until the pattern becomes stationary.
7. Adjust ratio detector primary slug No. A7 for maximum vertical sweep of the scope pattern.
8. Adjust ratio detector secondary slug No. A8 to center the cross over point of the pattern. Pattern should look like Fig. 1, with the same amount of curve on both ends, and the cross over point in the center.
9. Connect generator, high side, to center antenna screw terminal on bottom of chassis.
10. Adjust I.F. slugs A9, A10 and A11 for the greatest vertical sweep of the pattern, consistent with linearity. If the I.F. slugs are adjusted for maximum sweep of the pattern, the pattern may become non-linear. Therefore, adjustment should be made for the greatest sweep which can be obtained and still have all four ends of the "X" pattern similar in size and shape.
11. Check the alignment of the I.F. and detector circuits by varying the signal generator frequency above and below the center frequency of 10.7 Mc. If the receiver is perfectly aligned, two smaller "X" patterns of similar size and shape will result, one on either side of the center frequency. See Figure 2.

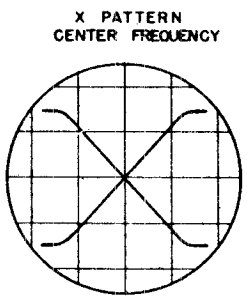


FIG 1

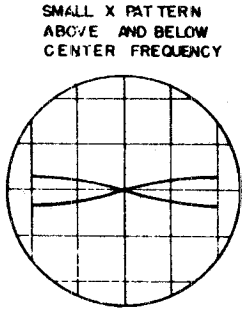
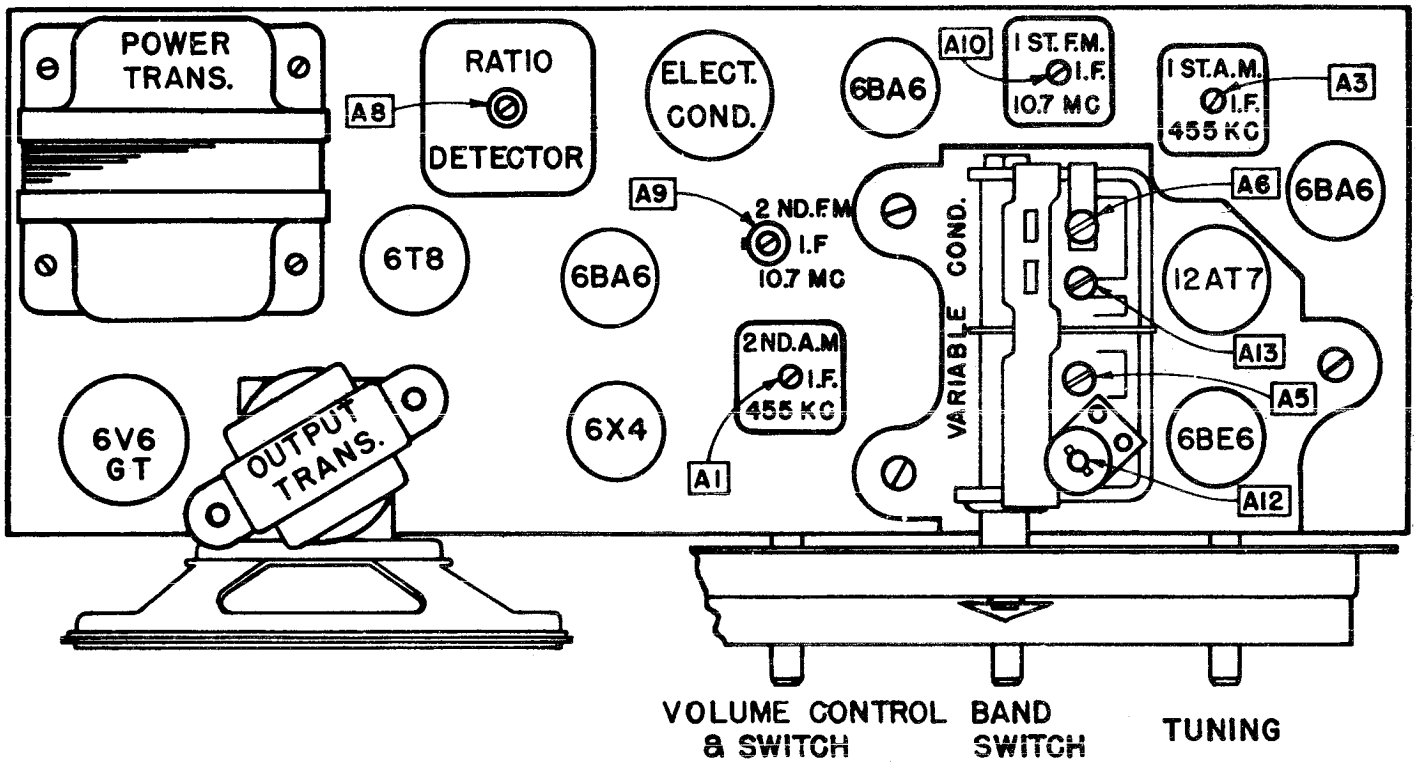
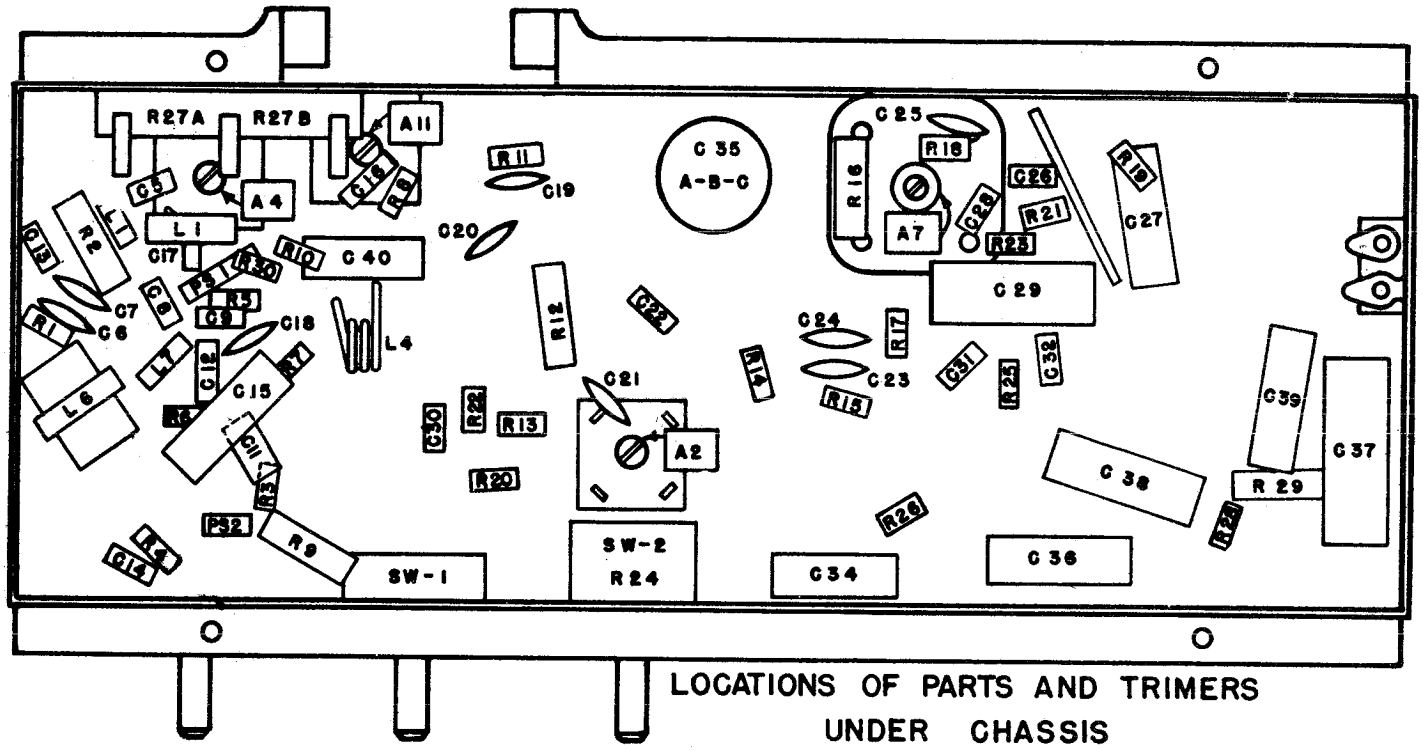


FIG 2

Position of Variable	Generator Frequency	Dummy Ant.	RF Generator Connection High Side	Generator Connection Ground Lead	Adjust Trimmers In Order Shown	Trimmer Function
Fully Open	108.5 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	A12	Oscillator
Fully Closed	87.5 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	Check Point	Oscillator
105 Mc.	105 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	A13	R.F.
91 Mc.	91 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	Check Point	R.F.

For R.F. alignment use FM generator signal modulated with 400 cycles 45 Kc. sweep (22.5 Kc.) deviation).
* The 300 ohm dummy should be made up to two 150 ohm resistors, one placed in each lead at the receiver antenna terminals





LOCATIONS OF PARTS AND TRIMERS
UNDER CHASSIS

REPAIR PARTS LIST

Schematic Location	Part No.	Description
L3	N22536	Antenna Loop Assly.
	N23561	Cabinet Assly. (Brown- Cat. No. 18)
	N23451	Cabinet Assly. (Ivory - Cat. No. 20)
	N22823-2	Cabinet (Brown - Cat. No. 18)
	N22823-1	Cabinet (Ivory - Cat. No. 20)
	N22369-1	Cloth, Grille (Brown - Cat. No. 18)
	N22369-2	Cloth, Grille (Ivory - Cat. No. 20)
	N22937	Crystal, Dial
	N22939	Emblem "G"
L1	N22618	Choke, High Frequency, 1.5 uh
L2	N21145	Choke, High Frequency, 715 uh
L7	N22597-1	Choke, High Frequency, 3 uh
L8	N21673	Choke, R.F., Iron core, 14 uh
L4	N22593	Coil, R.F., FM
L5	N22594	Coil, Oscillator, FM
L6	N22537	Coil, Oscillator, AM
C1,C2,C3,C4	N22962	Condenser, Variable
C4A	N22724	Condenser, Cer. Temp. Cor. 5-25 uuf
C5,C14, C6,C18,C19, C21,C23,C25 C27,C28,C24 C8,C26,C29, C30,C31 C9,C15 C17 C1		Condenser, Ceramic, 47 uuf, 350 v.
		Condenser, Disc, 5K uuf, 350 v.
		Condenser, Disc, 10 K uuf, 350 v.
		Condenser, Ceramic, 100 uuf, 350 v.
		Condenser, Ceramic, 1K uuf, 350 v.
C1		Condenser, Ceramic, 1.5 uuf, 350 v. Girrick
C11		Condenser, Ceramic, 50 uuf, 500 V.N750
C12,C34		Condenser, P.T., .01 uf, 400 v.
C22		Condenser, Ceramic, 15 uuf, 350 v.
C27		Condenser, P.T., .003 uf, 600 v.
C2	N22659	Condenser, Electrolytic, 4 uf, 25 v.
C32		Condenser, Ceramic, 220 uuf, 350 v.
C35A,C35B,C35C	N22806	Condenser, Electrolytic, 40-20-20 uf, 350 v.
C36,C38		Condenser, P.T., .02 uf, 400
C39		Condenser, Molded, .01 uf, 400 v.
C37	N22602	Condenser, Electrolytic, 10 uf, 25 v.
C40		Condenser, P.T., .05 uf, 200 v.
R24,R3-2	N22963	Control, Volume & Switch, 500 K ohms
	N19132	Cord, Dial Drive
P	N20138-4	Cord, Power with Plug
	N22940-1	Cover, Cabinet Rear (Brown - Cat.No.18)
	N22940-2	Cover, Cabinet Rear (Ivory - Cat.No.20)
	N22604-5A	Knob, On-Off-Volume (Brown - Cat.No.18)
	N22604-5B	Knob, AM-FM (Brown - Cat.No.18)
	N22604-5C	Knob, Tuning (Brown - Cat. No.18)
	N22604-3A	Knob, On-Off-Volume - (Ivory - Cat.No.20)
	N22604-3B	Knob, AM-FM (Ivory - Cat. No. 20)
	N22604-3C	Knob, Tuning (Ivory - Cat. No. 20)
	N22943	Leaflet, Instruction
	N22936	Pointer, Dial
R1,R11,R15		Resistor, 68 ohms, ½ watt
R2		Resistor, 27K ohms, 1 watt
R3		Resistor, 47 ohms, ½ watt
R4,R6		Resistor, 22K ohms, ½ watt
R5		Resistor, 2200 ohms, ½ watt
R7,R8,R13, R17,R30		Resistor, 1K ohms, ½ watt
R9		Resistor, 8.2K ohms, 1 watt
R10,R20		Resistor, 1 megohm, ½ watt
R12		Resistor, 10K ohms, 1 watt
R16,R22		Resistor, 100K ohms, ½ watt
R16		Resistor, 3.3K ohms, 1 watt
R18		Resistor, 180 ohms, ½ watt
R19		Resistor, 39K ohms, ½ watt
R21		Resistor, 220K ohms, ½ watt
R23		Resistor, 15K ohms, ½ watt
R25		Resistor, 10 megohms, ½ watt
R26		Resistor, 330K ohms, ½ watt
R27A,R27B	N22624	Resistor, 2 x 500 ohms, 5 watts
R28		Resistor, 470K ohms, ½ watt
R29		Resistor, 270 ohms, 1 watt
	N22951-1	Scale, Dial
	N22957	Shaft, Tuning
SPK	N22760	Speaker, 5" P.M.
	N19133	Spring, Dial Cord
PS.-2	N22334-1	Suppressor Assly. Parasitic - AM
PS.-1	N22335-1	Suppressor Assly. Parasitic - FM
Sw-1	N22661	Switch, Band, FM-AM
T2,T4	N22352-1	Transformer, I.F., AM, 455 Kc
T1	N22590	Transformer, 1st I.F., FM, 10.7 Mc.
T3	N22967-1	Transformer, 2nd I.F., FM, 10.7 Mc.
T6	N22995-1	Transformer, Output
T7	N22959	Transformer, Power
T5	N22592	Transformer, Ratio Detector

The following condenser changes were made after some sets were produced and a quantity of labels and instruction sheets were printed:

C36 changed from .005 uf 600 v. to .02 uf, 400 v.
C38 changed from .01 uf 400 v. to .02 uf, 400 v.
C37 changed from 20 uf to 40 uf. Part No. N22601 changed to N22806.

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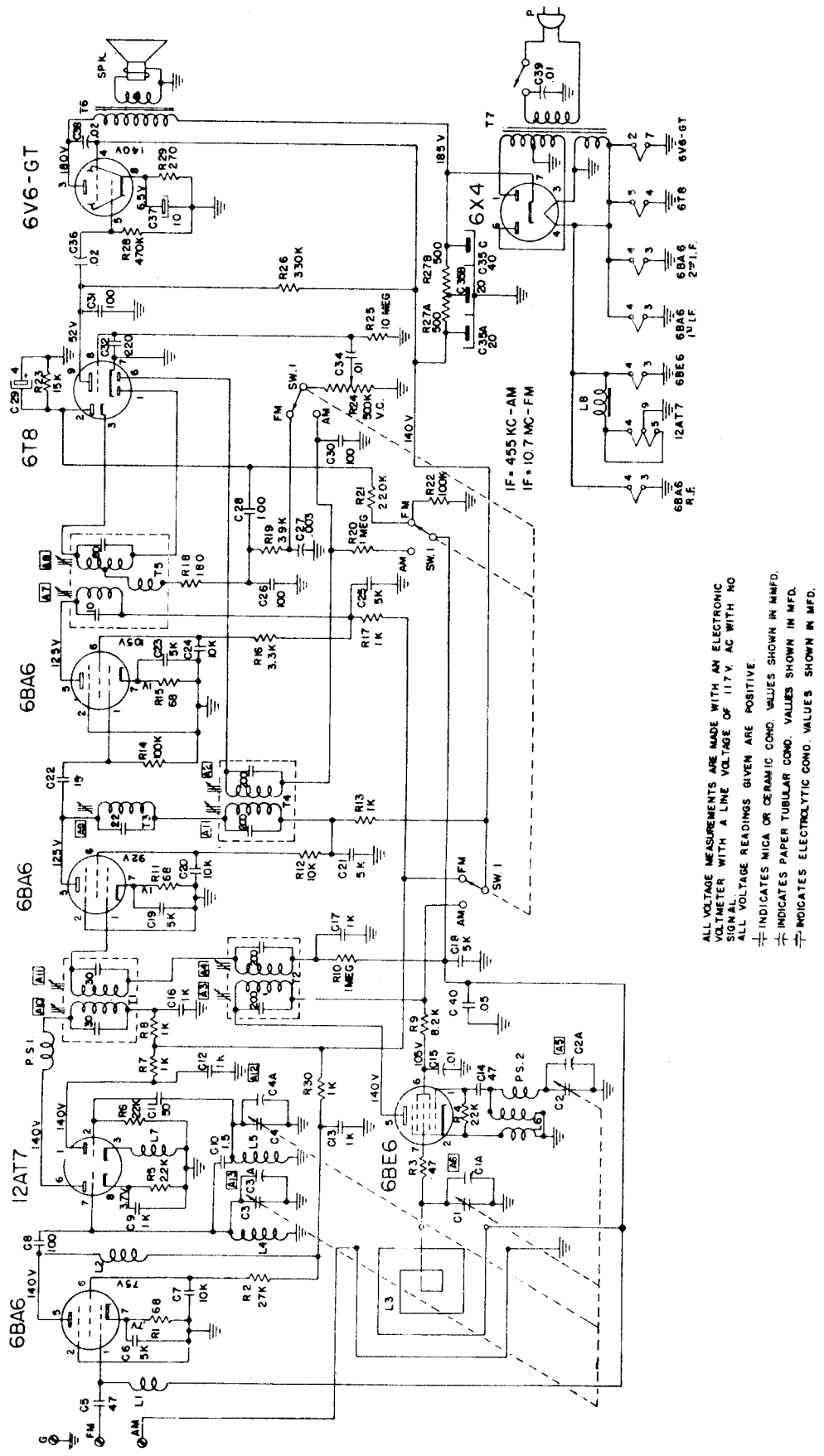
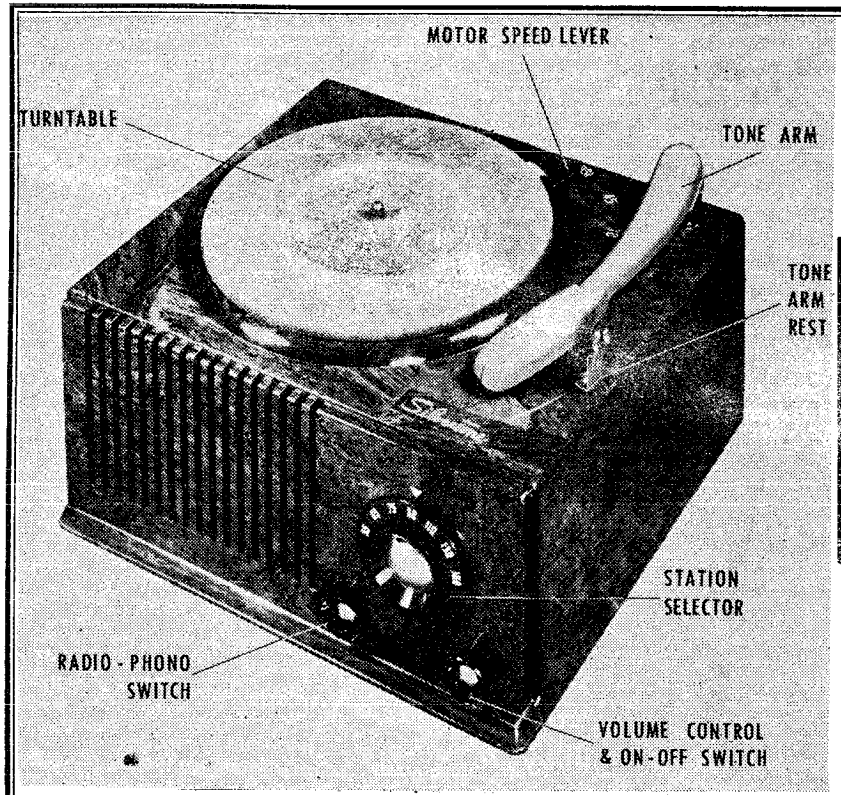
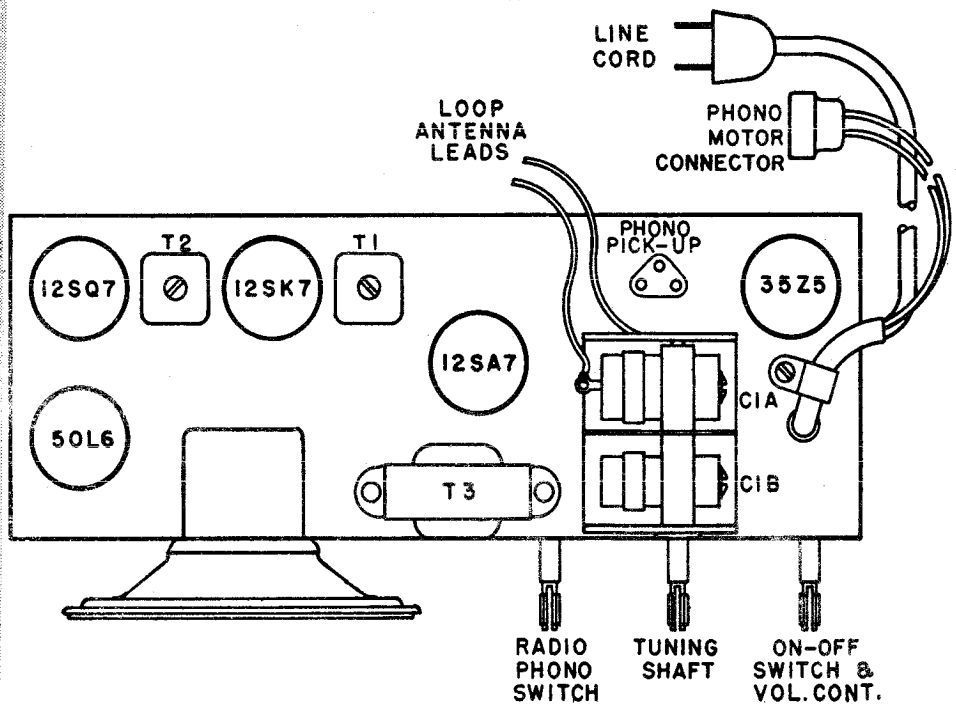
Ch. 132.877







ALIGNMENT PROCEDURE

Preliminary:

Output meter reading to indicate 0.05 watt across voice coil.....0.4 volt

Generator ground lead connection.....common ground

Generator modulation.....30% 400 cycles

Position of Volume Control.....Fully on

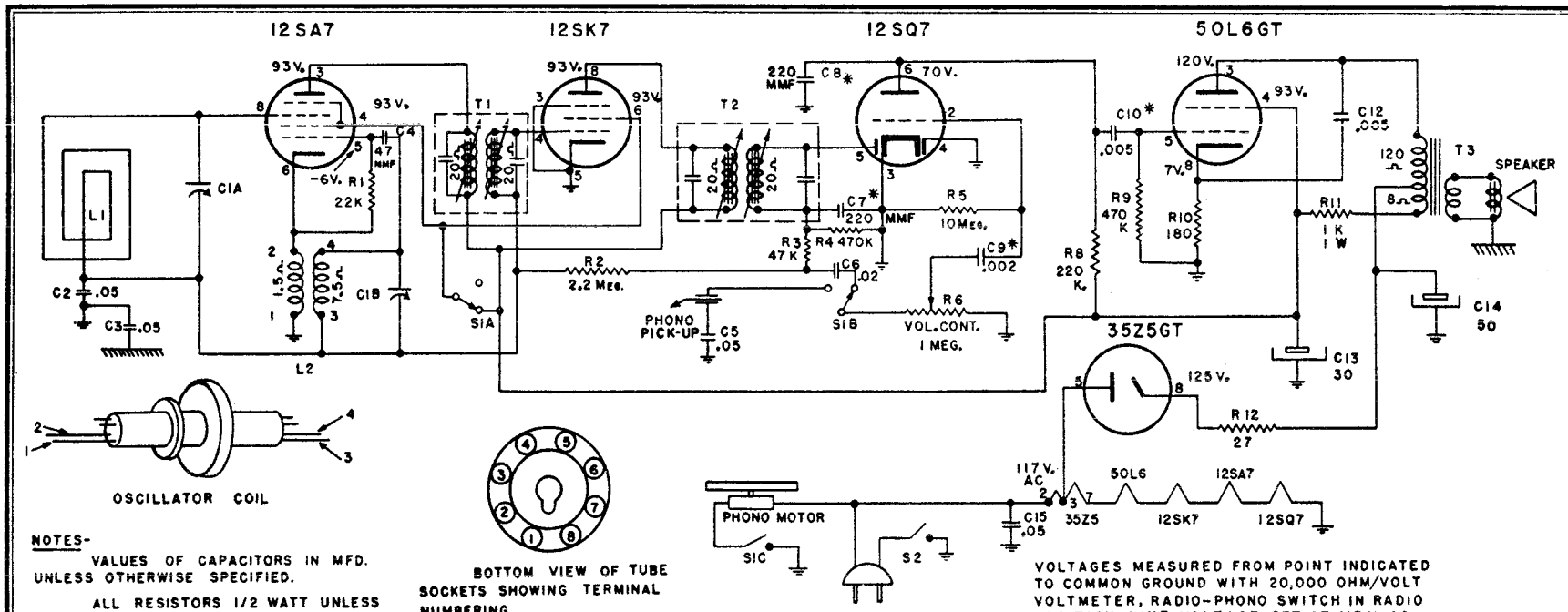
IMPORTANT ALIGNMENT NOTES:

The alignment must be done in the order given.

The entire alignment procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output of the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENT	TRIMMER FUNCTION
Open	455 KC	.1 mfd.	Pin 8 12SA7	T1 and T2 top & bottom	I.F.
Open	1630 KC	.1 mfd.	Pin 8 12SA7	C1B	Oscillator
1400 KC	1400 KC	HAZELTINE LOOP		C1A	Antenna



OSCILLATOR COIL

BOTTOM VIEW OF TUBE SOCKETS SHOWING TERMINAL NUMBERING.

NOTES-

VALUES OF CAPACITORS IN MFD. UNLESS OTHERWISE SPECIFIED.

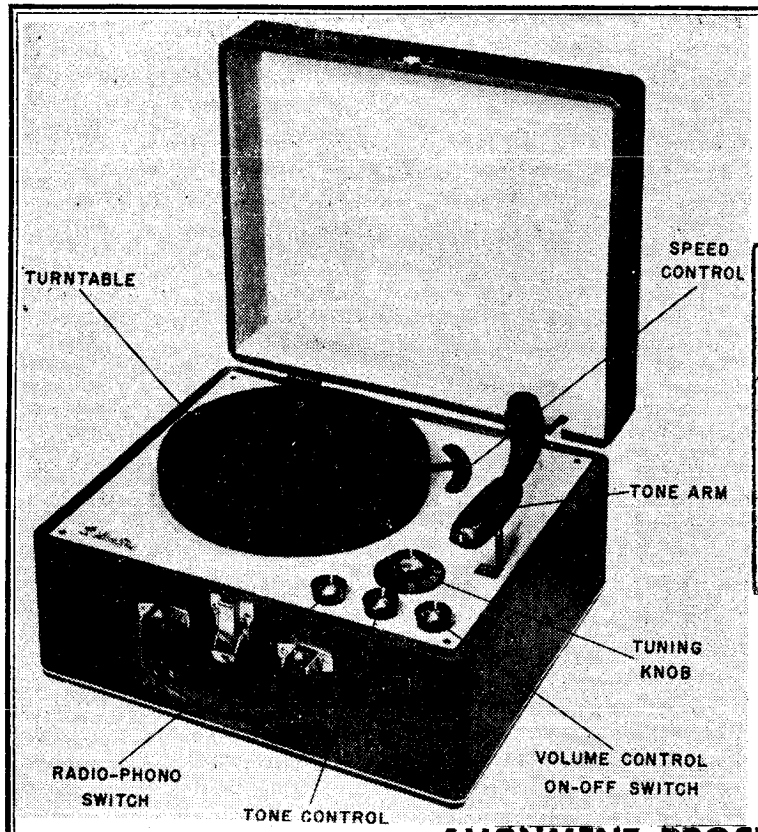
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.

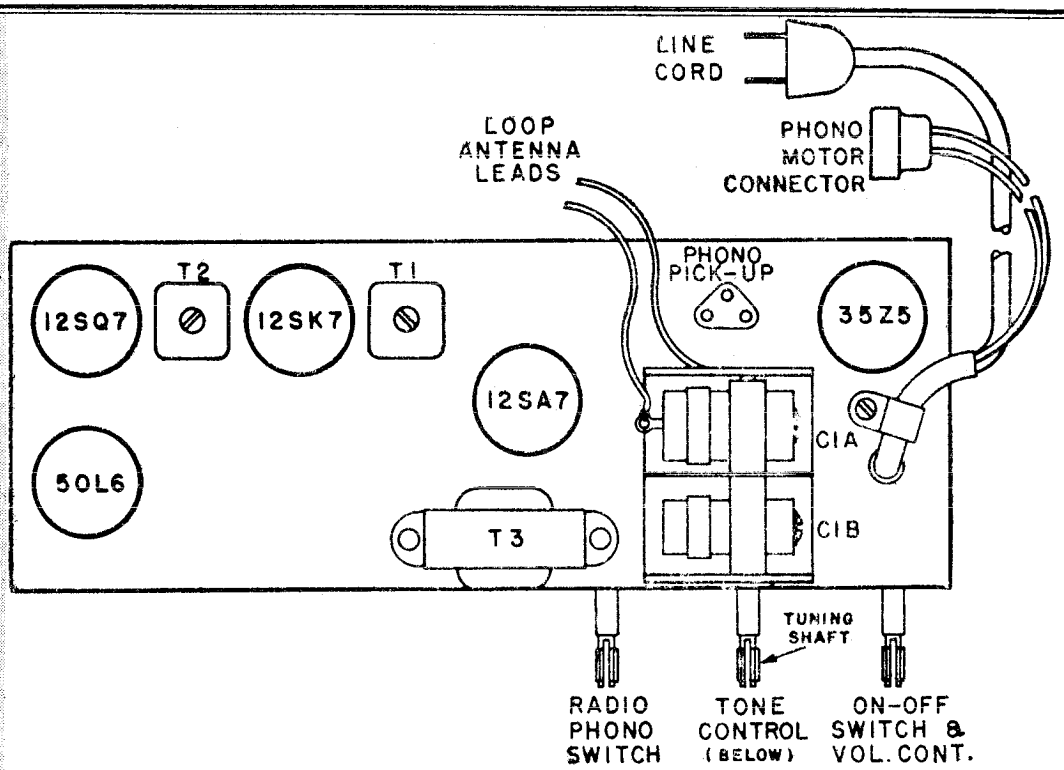
* THESE CAPACITORS ARE IN CERAMIC UNIT PART NO. T17-104.

VOLTAGES MEASURED FROM POINT INDICATED TO COMMON GROUND WITH 20,000 OHM/VOLT VOLTMETER, RADIO-PHONO SWITCH IN RADIO POSITION, LINE VOLTAGE SET AT 117 V. AC.

PARTS LIST FOR CHASSIS

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	T83-699	Adapter, 45 RPM
	T44-15	Baffle, cardboard
	T11-456	Bracket, tone arm rest
	T62-17	Bumper, foot
	T42-485	Cabinet
C1A, C1B	T19-213	Capacitor, variable (2 gang)
C2	T16-197	Capacitor, .05 mfd. 200 v.
C3, C5, C15	T16-189	Capacitor, .05 mfd. 400 v.
C4	T15-229	Capacitor, 47 mmfd. mica
C6	T16-150	Capacitor, .02 mfd. 400 v.
C7, C8, C9, C10	T17-104	Capacitor, ceramic unit
C12	T16-190	Capacitor, .005 mfd. 600 v.
C13, C14	T18-304	Capacitor, electrolytic, 50-30 mfd. 150 v.
	T83-702	Cartridge
	T11-187	Clamp, line cord
	T83-421	Clip, IF transformer mounting
L2	T10-572	Coil, oscillator
R6, S2	T24-195	Control, VOLUME and ON-OFF
	T23-151	Cord, power line
	T21-169	Cover, plate, chassis
	T98-18	Grille cloth
	T47-108	Grommet (gang mounting)
	T52-324	Knob, TUNING
	T52-323	Knob, VOLUME and ON-OFF
	T52-328	Knob, RADIO-PHONO
	T88-186	Label, tube position
	T88-187	Label, schematic
	T88-217	Label, parts list
L1	T82-71	Loop, antenna
	T59-25	Motor, phono, 3 speed
	T83-703	Needle
	T45-124	Plug, phono
	T22-143	Plug, phono motor
	T39-289	Pulley, 3 speed, stepped
R1	T60-659	Resistor, 22K ohm, 1/2 w.
R2	T60-726	Resistor, 2.2 megohm, 1/2 w.
R3	T60-730	Resistor, 47K ohm, 1/2 w.
R4, R9	T60-731	Resistor, 470K ohm, 1/2 w.
R5	T60-728	Resistor, 10 megohm, 1/2 w.
R8	T60-667	Resistor, 220K ohm, 1/2 w.
R10	T60-774	Resistor, 180 ohm, 1/2 w. 10%
R11	T60-732	Resistor, 1000 ohm, 1 w. 10%
R12	T60-690	Resistor, 27 ohm, 1/2 w. 10%
	T22-142	Socket, phono motor
	T68-11	Socket, octal, tube
	T68-41	Socket, phono
	T77-151	Spacer, (gang mounting)
	T79-393	Speaker, 4" P.M.
	T70-175	Spring, hair pin
S1A, S1B, S1C	T69-189	Switch, RADIO-PHONO
	T83-692	Tone arm (with cartridge)
T1	T10-508	Transformer, 1st I.F.
T2	T10-479	Transformer, 2nd I.F.
T3	T80-268	Transformer, output
	T83-691	Turntable, 8" dia.
	T86-146	Washer, "C", turntable spindle
	T39-288	Wheel idler





ALIGNMENT PROCEDURE

Preliminary:

Output meter reading to indicate 0.05 watt across voice coil . . 0.4 volt

Generator ground lead connection . . . . . common ground

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully on

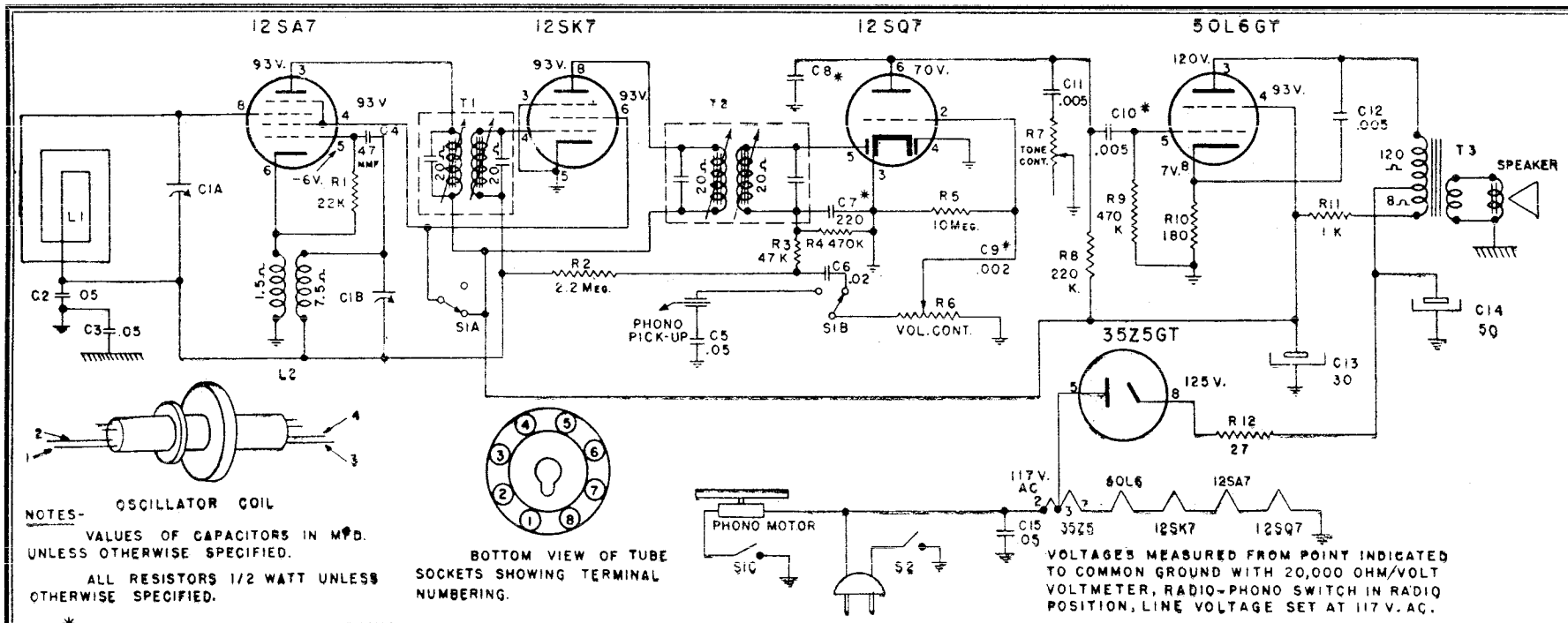
IMPORTANT ALIGNMENT NOTES:

The alignment must be done in the order given.

The entire alignment procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output of the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENT	TRIMMER FUNCTION
Open	455 KC	.1 mfd.	Pin 8 12SA7	T1 and T2 top & bottom	I.F.
Open	1630 KC	.1 mfd.	Pin 8 12SA7	C1B	Oscillator
1400 KC	1400 KC	HAZELTINE LOOP		C1A	Antenna



OSCILLATOR COIL

BOTTOM VIEW OF TUBE SOCKETS SHOWING TERMINAL NUMBERING.

NOTES- VALUES OF CAPACITORS IN MFD. UNLESS OTHERWISE SPECIFIED.

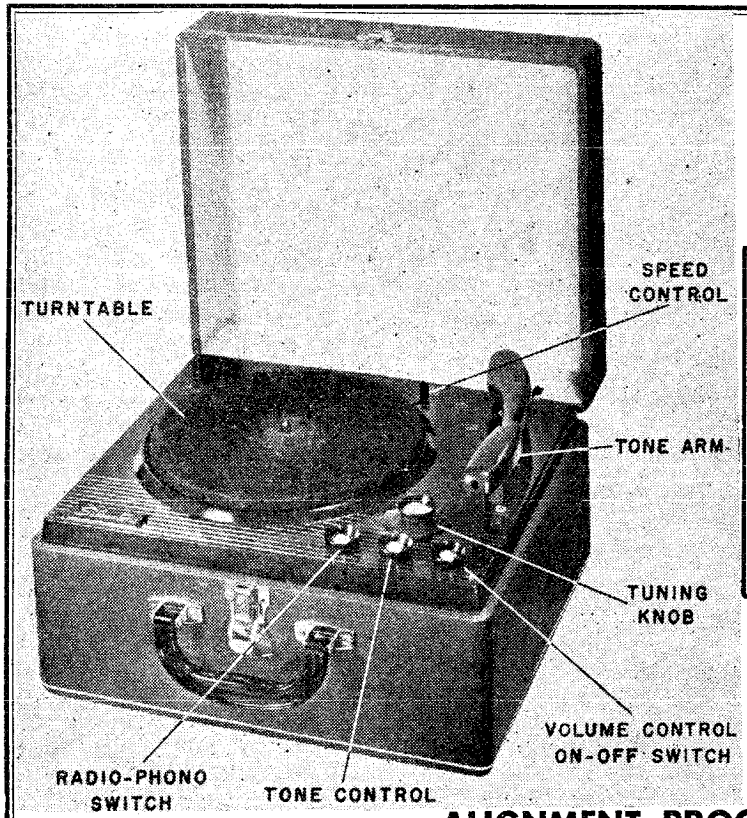
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.

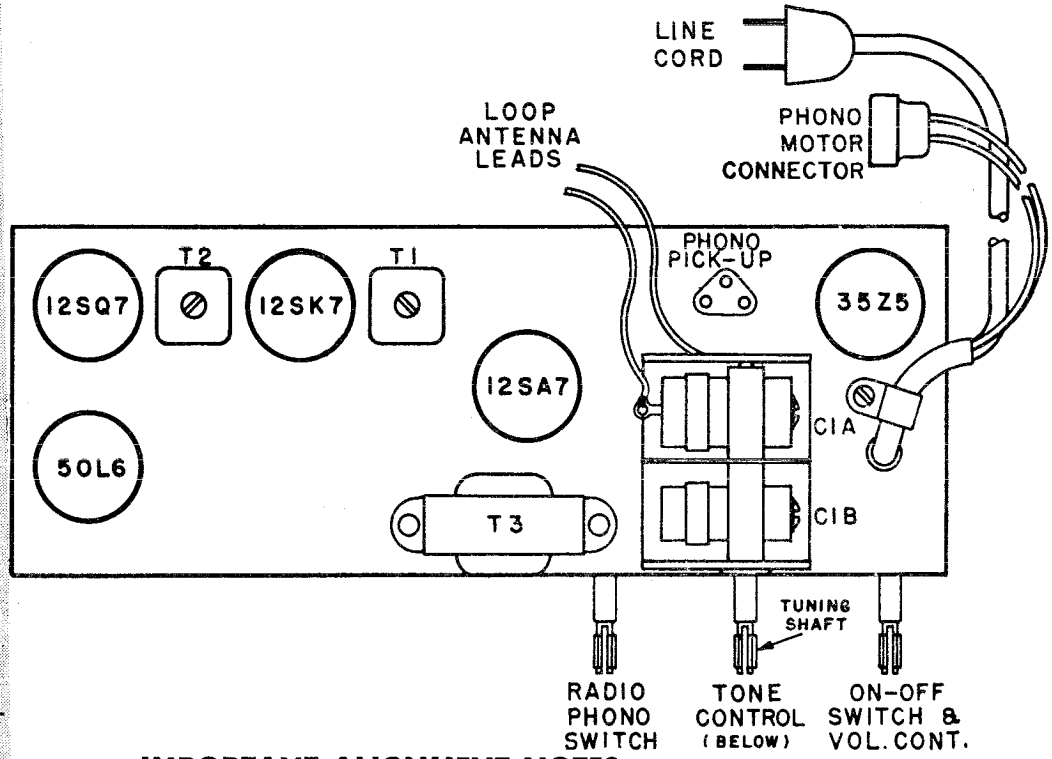
VOLTAGES MEASURED FROM POINT INDICATED TO COMMON GROUND WITH 20,000 OHM/VOLT VOLTMETER, RADIO-PHONO SWITCH IN RADIO POSITION, LINE VOLTAGE SET AT 117 V. AC.

* THESE CAPACITORS ARE IN CERAMIC UNIT PART NO. T17-104

PARTS LIST FOR CHASSIS

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	T83-699	Adapter, 45 RPM
	T11-464	Bracket, tone arm rest
	T42-488	Cabinet
C1A, C1B	T19-214	Capacitor, variable (2 gang)
C2	T16-197	Capacitor, .05 mfd. 200 v.
C3, C5, C15	T16-189	Capacitor, .05 mfd. 400 v.
C4	T15-229	Capacitor, 47 mmfd. mica
C6	T16-150	Capacitor, .02 mfd. 400 v.
C7, C8 C9, C10	T17-104	Capacitor, ceramic unit
C11, C12	T16-190	Capacitor, .005 mfd. 600 v.
C13, C14	T18-304	Capacitor, electrolytic, 50-30 mfd. 150 v.
	T83-702	Cartridge
	T11-187	Clamp, line cord
	T83-421	Clip, IF transformer mounting
L2	T10-572	Coil, oscillator
R6, S2	T24-196	Control, VOLUME and ON-OFF
R7	T26-128	Control, TONE
	T23-151	Cord, power line
	T21-168	Cover, plate, chassis
	T36-128	Grille, flocked screen
	T47-108	Grommet (gang mounting)
	T52-322	Knob, TUNING
	T52-323	Knob, VOLUME and ON-OFF
	T52-327	Knob, TONE
	T52-328	Knob, RADIO-PHONO
	T88-188	Label, tube position
	T88-189	Label, schematic
L1	T82-70	Loop, antenna
	T83-696	Motor-board, masonite
	59-27	Motor, phono, 3 speed
	T83-703	Needle
	T22-143	Plug, phono motor
	T39-289	Pulley, 3 speed stepped
R1	T60-659	Resistor, 22K ohm, 1/2 w.
R2	T60-726	Resistor, 2.2 megohm, 1/2 w.
R3	T60-730	Resistor, 47K ohm, 1/2 w.
R4, R9	T60-731	Resistor, 470K ohm, 1/2 w.
R5	T60-728	Resistor, 10 megohm, 1/2 w.
R8	T60-667	Resistor, 220K ohm, 1/2 w.
R10	T60-774	Resistor, 180 ohm, 1/2 w. 10%
R11	T60-732	Resistor, 1000 ohm, 1 w. 10%
R12	T60-690	Resistor, 27 ohm, 1/2 w. 10%
	T22-142	Socket, phono motor
	T68-11	Socket, octal, tube
	T68-41	Socket, phono
	T77-151	Spacer (gang mounting)
	T79-392	Speaker, 4" x 6", P.M.
	T70-175	Spring, hair pin
S1A, S1B, S1C	T69-190	Switch, RADIO-PHONO
	T83-692	Tone arm, with cartridge
	T83-701	Tone arm (less cartridge)
T1	T10-508	Transformer, 1st I.F.
T2	T10-479	Transformer, 2nd I.F.
T3	T80-268	Transformer, output
	T83-691	Turntable, 8" dia.
	T86-146	Washer, "C," turntable spindle
	T39-288	Wheel, idler





ALIGNMENT PROCEDURE

Preliminary:

Output meter reading to indicate 0.05 watt across voice coil..0.4 volt

Generator ground lead connection.....common ground

Generator modulation.....30%, 400 cycles

Position of Volume Control.....Fully on

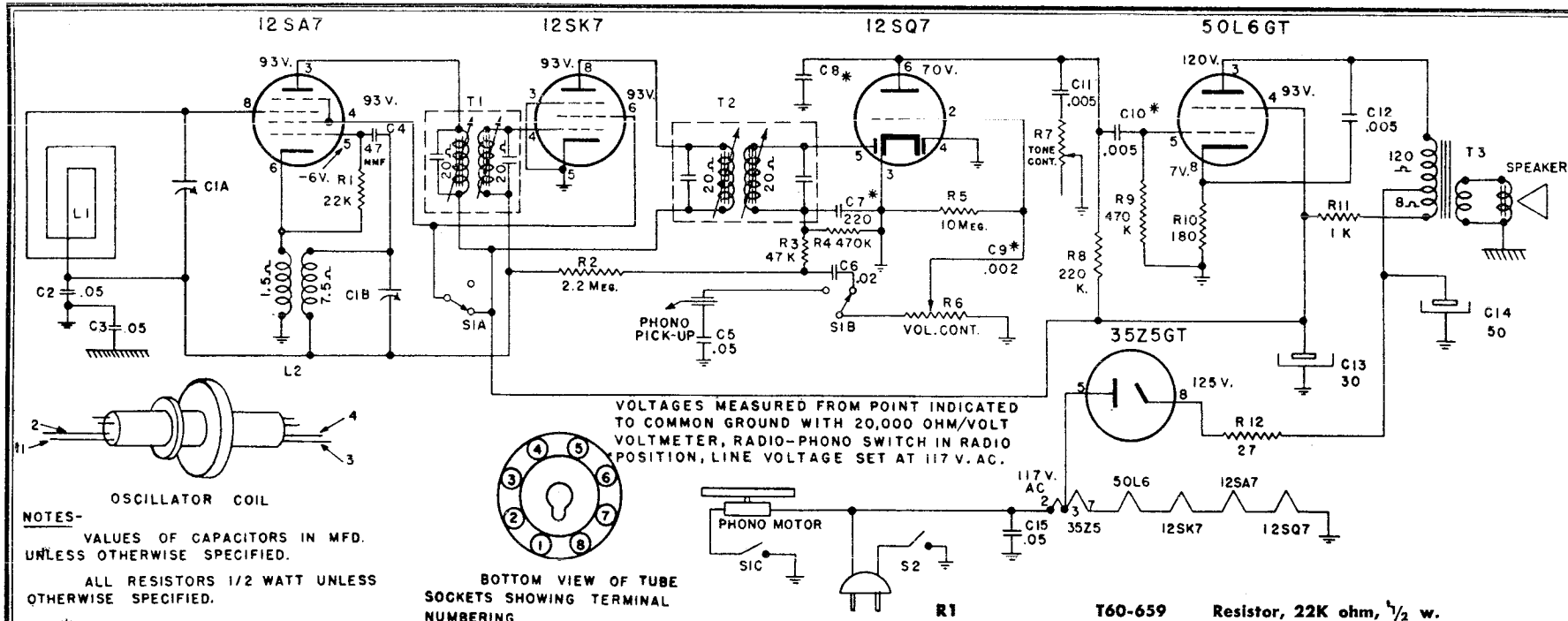
IMPORTANT ALIGNMENT NOTES:

The alignment must be done in the order given.

The entire alignment procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output of the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENT	TRIMMER FUNCTION
Open	455 KC	.1 mfd.	Pin 8 12SA7	T1 and T2 top & bottom	I.F.
Open	1630 KC	.1 mfd.	Pin 8 12SA7	C1B	Oscillator
1400 KC	1400 KC	HAZELTINE LOOP		C1A	Antenna



OSCILLATOR COIL

VOLTAGES MEASURED FROM POINT INDICATED TO COMMON GROUND WITH 20,000 OHM/VOLT VOLTMETER, RADIO-PHONO SWITCH IN RADIO POSITION, LINE VOLTAGE SET AT 117 V. AC.

BOTTOM VIEW OF TUBE SOCKETS SHOWING TERMINAL NUMBERING.

NOTES-

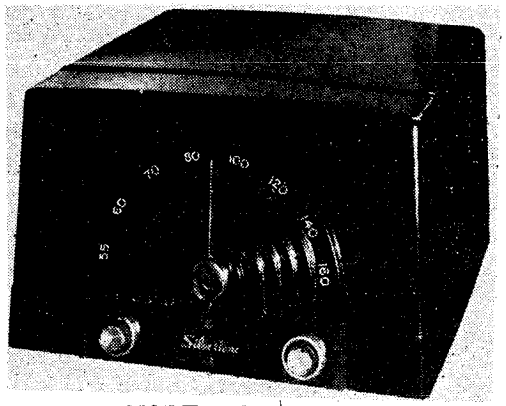
VALUES OF CAPACITORS IN MFD. UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.

* THESE CAPACITORS ARE IN CERAMIC UNIT PART NO. T17-104

PARTS LIST FOR CHASSIS

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	T83-699	Adapter, 45 RPM
	T11-456	Bracket, tone arm rest
	T42-488	Cabinet
C1A, C1B	T19-213	Capacitor, variable (2 gang)
C2	T16-197	Capacitor, .05 mfd. 200 v.
C3, C5, C15	T16-189	Capacitor, .05 mfd. 400 v.
C4	T15-229	Capacitor, 47 mmfd. mica
C6	T16-150	Capacitor, .02 mfd. 400 v.
C7, C8, C9, C10	T17-104	Capacitor, ceramic unit
C11, C12	T16-190	Capacitor, .005 mfd. 600 v.
C13, C14	T18-304	Capacitor, electrolytic, 50-30 mfd. 150 v.
	T83-702	Cartridge
	T11-187	Clamp, line cord
	T83-421	Clip, IF transformer mounting
L2	T10-572	Coil, oscillator
R6, S2	T24-195	Control, VOLUME and ON-OFF
R7	T26-127	Control, TONE
	T23-151	Cord, power line
	T21-168	Cover, plate, chassis
	T36-128	Grille, flocked screen
	T47-108	Grommet (gang mounting)
	T52-322	Knob, TUNING
	T52-323	Knob, VOLUME and ON-OFF
	T52-327	Knob, TONE
	T52-328	Knob, RADIO-PHONO
	T88-172	Label, tube position
	T88-173	Label, schematic
L1	T82-70	Loop, antenna
	T83-688	Motor-board, plastic
	59-25	Motor, phono, 3 speed
	T83-703	Needle
	T45-124	Plug, phono
	T22-143	Plug, phono motor
	T39-289	Pulley, 3 speed stepped
R1	T60-659	Resistor, 22K ohm, 1/2 w.
R2	T60-726	Resistor, 2.2 megohm, 1/2 w.
R3	T60-730	Resistor, 47K ohm, 1/2 w.
R4, R9	T60-731	Resistor, 470K ohm, 1/2 w.
R5	T60-728	Resistor, 10 megohm, 1/2 w.
R8	T60-667	Resistor, 220K ohm, 1/2 w.
R10	T60-774	Resistor, 180 ohm, 1/2 w. 10%
R11	T60-732	Resistor, 1000 ohm, 1 w. 10%
R12	T60-690	Resistor, 27 ohm, 1/2 w. 10%
	T83-709	Retainer, centering discs, 45 RPM
	T22-142	Socket, phono motor
	T68-11	Socket, octal, tube
	T68-41	Socket, phono
	T77-151	Spacer (gang mounting)
	T79-392	Speaker, 4" x 6", P.M.
	T70-175	Spring, hair pin
S1A, S1B, S1C	T69-189	Switch, RADIO-PHONO
	T83-692	Tone crm, with cartridge
	T83-701	Tone arm (less cartridge)
T1	T10-508	Transformer, 1st I.F.
T2	T10-479	Transformer, 2nd I.F.
T3	T80-268	Transformer, output
	T83-691	Turntable, 8" dia.
	T86-146	Washer, 'C,' turntable spindle
	T39-288	Wheel, idler



MODEL 1040

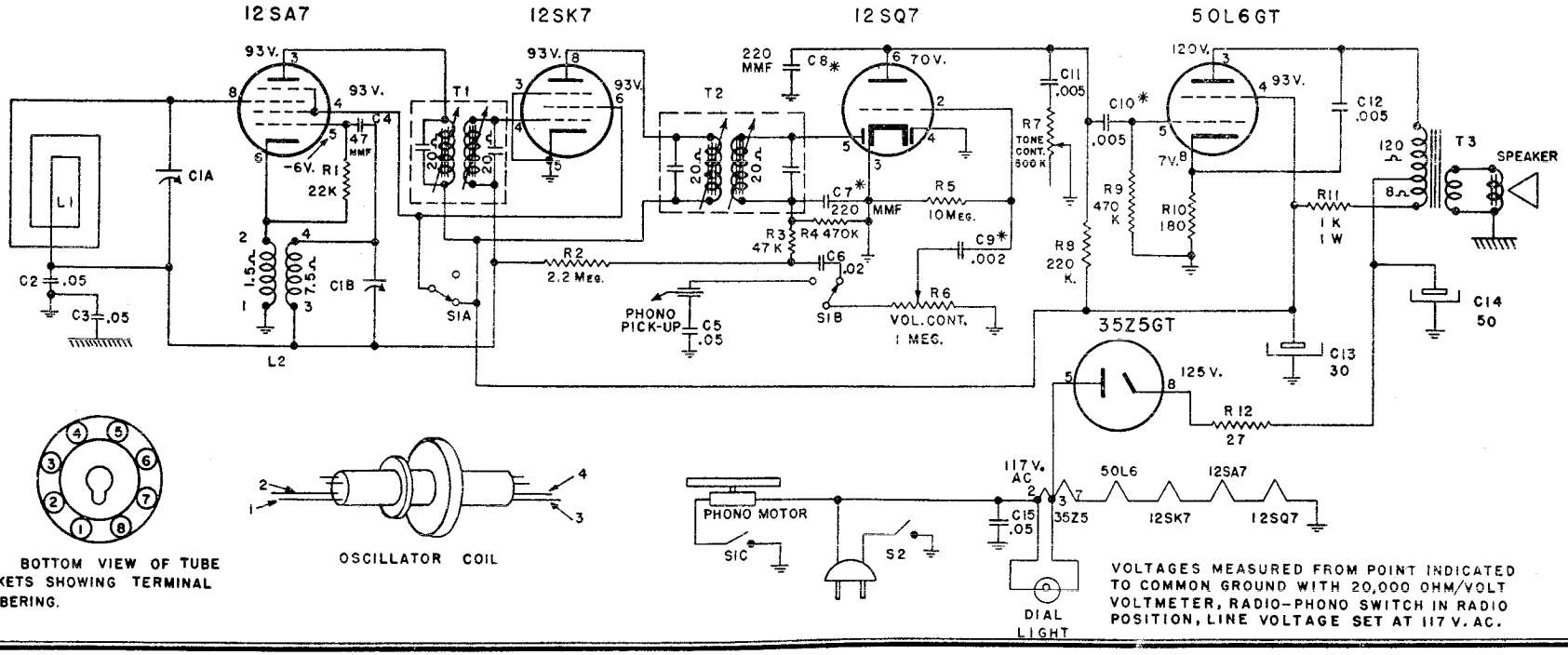
MODEL 1045

NOTES-

VALUES OF CAPACITORS IN MFD UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.

* THESE CAPACITORS ARE IN CERAMIC UNIT PART NO. T17-104.



BOTTOM VIEW OF TUBE SOCKETS SHOWING TERMINAL NUMBERING.

OSCILLATOR COIL

VOLTAGES MEASURED FROM POINT INDICATED TO COMMON GROUND WITH 20,000 OHM/VOLT VOLTMETER, RADIO-PHONO SWITCH IN RADIO POSITION, LINE VOLTAGE SET AT 117 V. AC.

MODELS 1040, 1045,
Ch. 528.194

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter reading to indicate 0.05 Watt across Voice Coil.....0.4 Volt
Generator ground lead connection.....Floating Ground
Generator Modulation.....30%, 400 cycles
Position of Volume Control.....Fully on

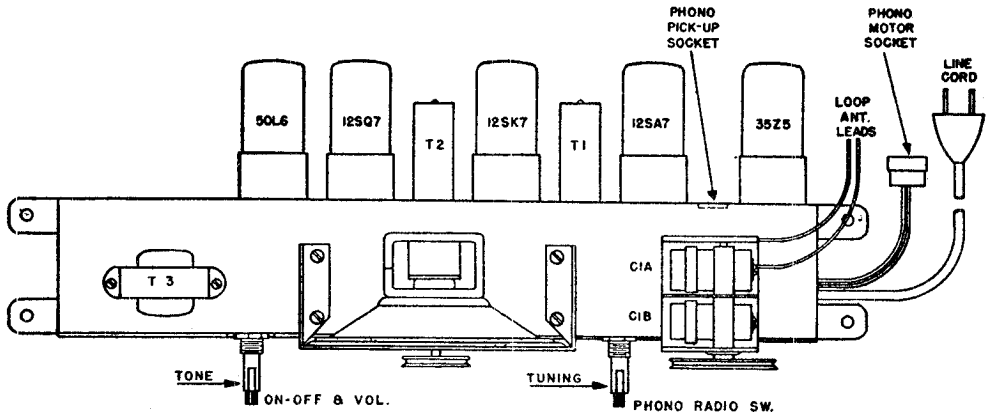
IMPORTANT ALIGNMENT NOTES:

The Alignment must be done in the order given.

The entire Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENT	TRIMMER FUNCTION
open	455 KC	.1 mfd.	pin 8 12SA7	T1 and T2 top and bottom	I.F.
open	1630 KC	.1 mfd.	pin 8 12SA7	C1B	Oscillator
1400 KC	1400 KC	HAZELTINE TEST LOOP		C1A	Antenna



LOCATION OF PARTS OF TOP OF CHASSIS

MODELS 1040, 1045,
Ch. 528.194

MODEL 1040

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	T62-17	Bumper, foot
	T72-56	Bushing, pulley
	T42-486	Cabinet, less cover
C1A, C1B	T19-212	Capacitor, variable (2 gang)
C2	T16-197	Capacitor, .05 mfd. 200 v.
C3, C5, C15	T16-189	Capacitor, .05 mfd. 400 v.
C4	T15-229	Capacitor, 47 mmfd. mica
C6	T16-150	Capacitor, .02 mfd. 400 v.
C7, C8, C9, C10	T17-104	Capacitor, ceramic unit
C11, C12	T16-190	Capacitor, .005 mfd. 600 v.
C13, C14	T18-304	Capacitor, electrolytic, 50-30 mfd. 150 v.
	T11-187	Clamp, line cord, chassis
	T11-232	Clamp, line cord, cabinet
	T83-421	Clip, I.F. transformer mounting
L2	T10-572	Coil, oscillator
R6, R7, S2	T24-194	Control, dual, ON-OFF-VOLUME and TONE
	T51-109	Cord, dial drive, approx. 30"
	T23-151	Cord, power line
	T21-167	Cover, plate, chassis
	T42-487	Cover, cabinet
	T47-108	Grommet (gang mounting)
	T83-690	Hinge, cabinet cover
	T48-54	Jewel, pilot light
	T52-321	Knob, ON-OFF-VOLUME and PHONO-RADIO
	T52-320	Knob, TUNING and TONE
	T88-170	Label, tube position
	T88-171	Label, schematic
	T89-7	Lamp, pilot
	T82-69	Loop, antenna
	T58-83	Pointer, dial
	T39-287	Pulley, pointer drive
R1	T60-659	Resistor, 22K ohm, ½ w.
R2	T60-726	Resistor, 2.2 megohm, ½ w.
R3	T60-730	Resistor, 47K ohm, ½ w.
R4, R9	T60-731	Resistor, 470K ohm, ½ w.
R5	T60-728	Resistor, 10 megohm, ½ w.
R8	T60-667	Resistor, 220K ohm, ½ w.
R10	T60-774	Resistor, 180 ohm, ½ w. 10%.
R11	T60-732	Resistor, 1000 ohm, 1 w. 10%.
R12	T60-690	Resistor, 27 ohm, ½ w. 10%
	T75-85	Shaft, pulley
	T71-39	Shield, pilot lamp
	T87-33	Socket, pilot lamp
	T68-11	Socket, octal, tube
	T68-41	Socket, phono
	T22-142	Socket, phono motor
	T77-151	Spacer (gang mounting)
	T79-391	Speaker, 5" P.M.
	T70-135	Spring (dial cord)
	T84-513	Support, lid
S1A, S1B, S1C	T69-188	Switch, RADIO-PHONO
T2	T10-479	Transformer, 2nd I.F.
T1	T10-508	Transformer, 1st I.F.
T3	T80-268	Transformer, output

MODEL 1045

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	T44-16	Baffle, wood
	T44-18	Baffle, cardboard
	T72-56	Bushing, pulley
	T42-506	Cabinet
C1A, C1B	T19-212	Capacitor, variable (2 gang)
C2	T16-197	Capacitor, .05 mfd. 200 v.
C3, C5, C15	T16-189	Capacitor, .05 mfd. 400 v.
C4	T15-229	Capacitor, 47 mmfd. mica
C6	T16-150	Capacitor, .02 mfd. 400 v.
C7, C8, C9, C10	T17-104	Capacitor, ceramic unit
C11, C12	T16-190	Capacitor, .005 mfd. 600 v.
C13, C14	T18-304	Capacitor, electrolytic, 50-30 mfd. 150 v.
	T83-700	45 RPM Record Inserts (package of 12)
	T11-187	Clamp, line cord, chassis
	T83-710	Cleat, wood (triangular piece, supports baffle
	T83-421	Clip, I.F. transformer mounting
L2	T10-572	Coil, oscillator
R6, R7, S2	T24-194	Control, dual, ON-OFF-VOLUME and TONE
	T51-109	Cord, dial drive, approx. 30"
	T23-151	Cord, power line
	T21-167	Cover, plate, chassis
	T98-20	Grille cloth
	T47-108	Grommet (gang mounting)
	T48-54	Jewel, pilot light
	T52-342	Knob, ON-OFF-VOLUME and PHONO-RADIO
	T52-341	Knob, TUNING and TONE
	T88-218	Label, tube position
	T88-219	Label, schematic
	T89-7	Lamp, pilot
	T82-72	Loop, antenna
	T67-564	Plate, dial scale
	T58-83	Pointer, dial
	T39-287	Pulley, pointer drive
R1	T60-659	Resistor, 22K ohm, ½ w.
R2	T60-726	Resistor, 2.2 megohm, ½ w.
R3	T60-730	Resistor, 47K ohm, ½ w.
R4, R9	T60-731	Resistor, 470K ohm, ½ w.
R5	T60-728	Resistor, 10 megohm, ½ w.
R8	T60-667	Resistor, 220K ohm, ½ w.
R10	T60-774	Resistor, 180 ohm, ½ w. 10%.
R11	T60-732	Resistor, 1000 ohm, 1 w. 10%.
R12	T60-690	Resistor, 27 ohm, ½ w. 10%
	T97-171	Screw, wood—#8 x ¾"—chassis mounting
	T97-172	Screw, wood—#6 x ¾"—cleat mounting
	T74-228	Screw, 6-32 x ½"—dial plate mounting
	T75-85	Shaft, pulley
	T71-39	Shield, pilot lamp
	T87-33	Socket, pilot lamp
	T68-11	Socket, octal, tube
	T68-41	Socket, phono
	T22-142	Socket, phono motor
	T77-151	Spacer (gang mounting)
	T79-391	Speaker, 5" P.M.
	T70-135	Spring (dial cord)
S1A, S1B, S1C	T69-188	Switch, RADIO-PHONO
T2	T10-479	Transformer, 2nd I.F.
T1	T10-508	Transformer, 1st I.F.
T3	T80-268	Transformer, output
	T86-125	Washer, flat—7/16" O.D.—dial plate screws
	T86-120	Washer, flat—¾" O.D.—shipping bolts
	T86-151	Washer, "C"—shipping bolts
	T56-161	Wing-nut—¼"-28—shipping bolts

MODELS 6286, Ch. 528.6286;
6287, Ch. 528.6287

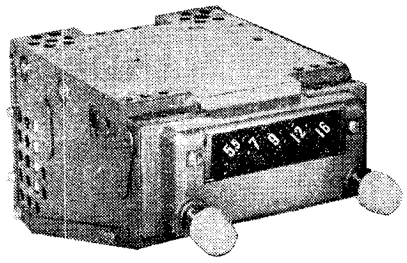
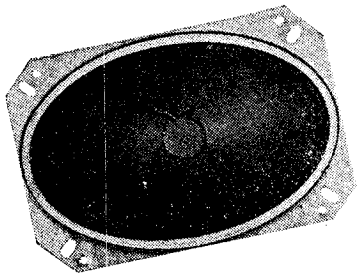


Fig. 1. Radio and Speaker



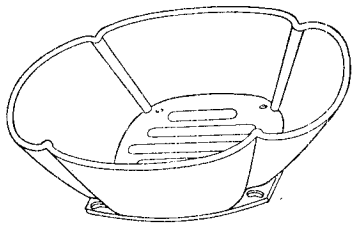


Fig. 2 Universal baffle. Catalog No. 6275T

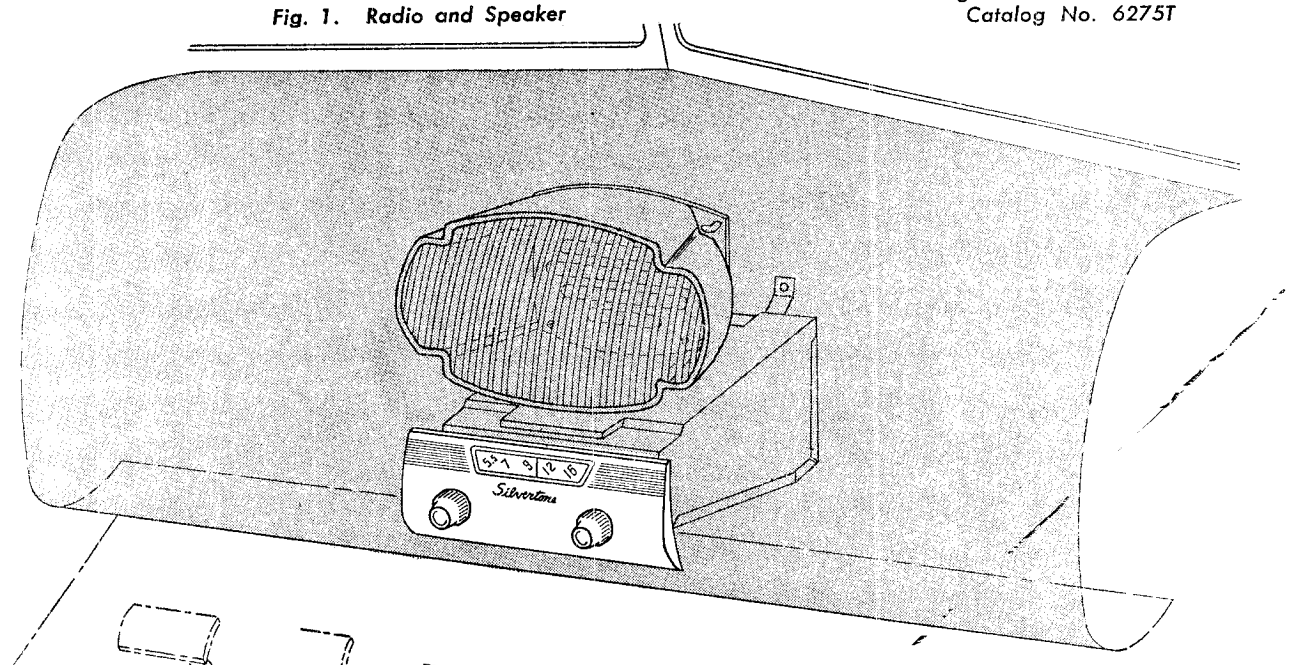


Fig. 3. Custom Style Mounting

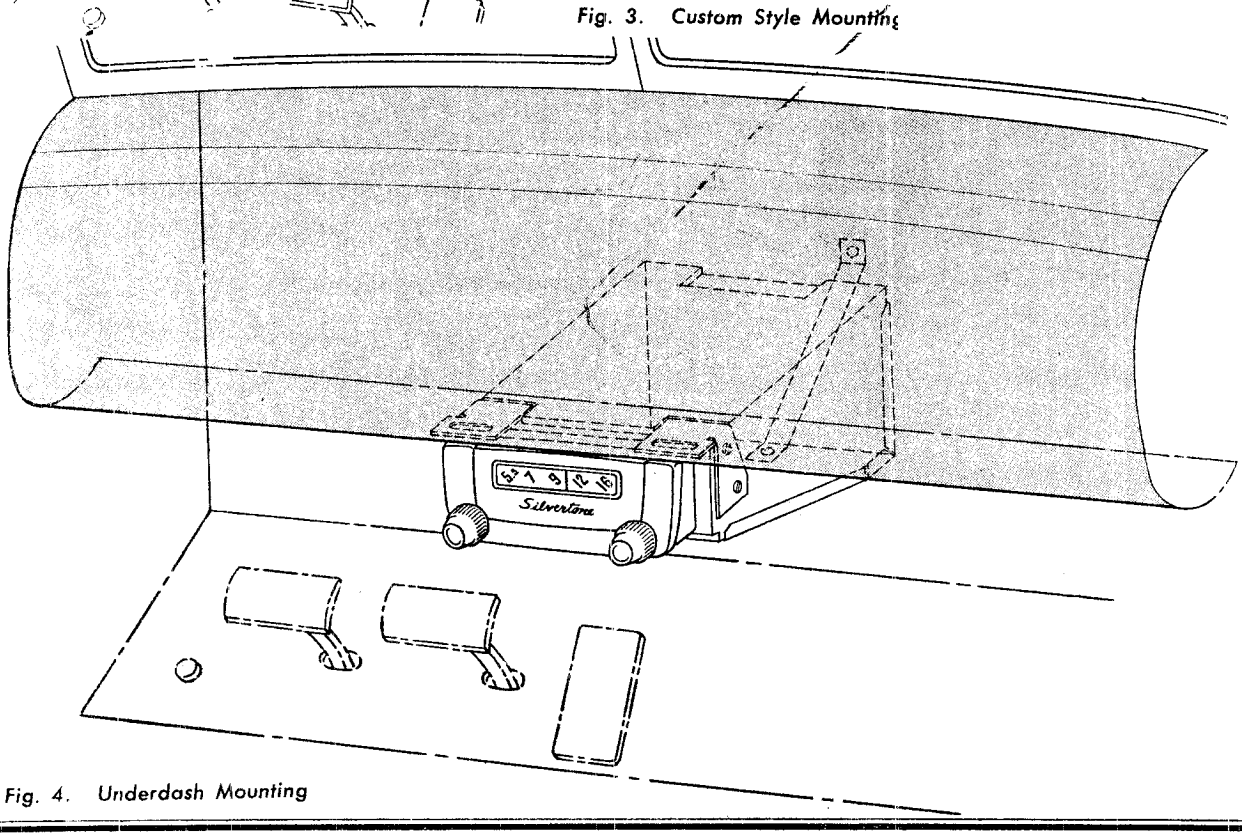


Fig. 4. Underdash Mounting

MODELS 6286, Ch. 528.6286;
6287, Ch. 528.6287

INSTALLATION

The speaker is mounted inside the radio case when it is shipped from the factory. The radio may be installed in your car with the speaker inside the case and it will render very satisfactory service. However, if you wish to take advantage of the finer acoustical improvement that results when the speaker is mounted on the instrument panel it is simple to do so. Simply take off the top cover of the radio case and remove the speaker, then replace the top cover. The speaker may then be mounted on the instrument panel by means of an adapter plate and baffle kit (see Fig. 2) which is available at the Sears Retail or Mail Order Store where you bought the radio. The special speaker baffle adapter plate and kit is sold as a separate item so that the purchaser of the radio is not put to unnecessary expense if he does not wish to mount the speaker on the instrument panel.

SPECIFIC INSTRUCTIONS PERTAINING TO THE MOUNTING OF THE SPEAKER AND RADIO IN THE CAR FOR WHICH YOU ORDERED YOUR RADIO ARE CONTAINED IN THE LEAFLET PACKED IN THE ESCUTCHEON KIT.

CONNECTING THE RADIO

When the radio is mounted in the car, the antenna cable should be connected to the radio by inserting the plug into the antenna receptacle on the side of the case. See Fig. 5. Then connect the "A" lead to the ignition switch. (If the "A" lead is connected to the switched or "cold" side of the ignition switch, the radio can be turned on only when the ignition switch is on. There is no danger then that the radio will be left on inadvertently while the car is parked and the battery unnecessarily drained.) The fuse should then be inserted into the fuse holder in the "A" lead. See Fig. 5.

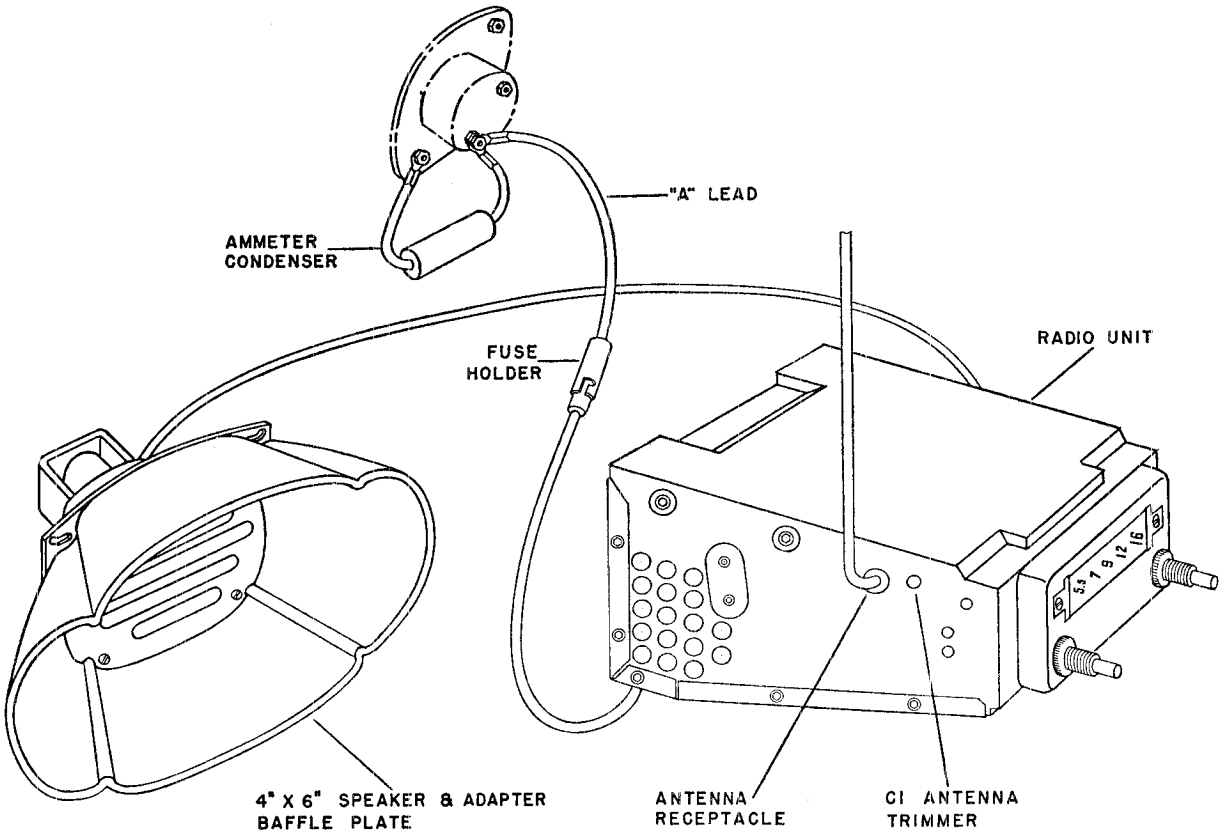


Fig. 5. Connecting the Radio

MODELS 6286, Ch. 528.6286;
6287, Ch. 528.6287

OPERATION

THE ON-OFF SWITCH AND VOLUME CONTROL

This is the righthand knob. When it is turned all the way to the left the receiver is switched off and there is no drain from the car's battery. Rotating the knob part of a turn toward the right switches the receiver on and illuminates the dial. Further rotation of the knob increases the volume. After a station has been tuned in properly the volume control knob should be adjusted to give the desired volume.

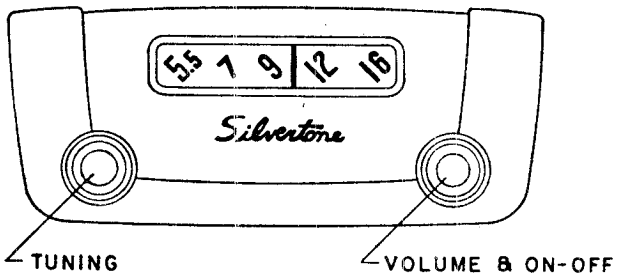


Fig. 6. Radio Front View

The Automatic Volume Control circuit, built into this receiver, will tend to maintain the volume once it has been adjusted by means of the Volume Control knob. However, because of the very great differences in receiving conditions encountered when driving a car, the volume may change beyond the limits for which automatic compensation is possible. As the sensitivity of the receiver automatically changes to compensate for changes in station strength, the background noise may also vary. When the station is strong, there will be little or no background noise but as the station becomes weaker, the background noise will increase. Reception may also be noisy when driving in "electrically noisy" districts. This will be particularly true when driving near trolley lines, high tension power lines, and power stations, etc.

TUNING IN STATIONS

Use the left knob to tune in stations. The dial is numbered in kilocycles minus the final two zeroes. Always tune carefully for the clearest sound and minimum background noise. This can be best accomplished by tuning in a station with the Volume Control turned down. The volume can be adjusted to the proper level when the station has been tuned in. Do not detune the station to reduce volume; use the Volume Control knob.

MATCHING THE ANTENNA

An adjusting screw for matching the receiver to the particular antenna used is accessible through a hole in the case. (See Fig. 5). Set the dial pointer between 1300 KC and 1400 KC, where no station is heard with the Volume Control fully on. Use a small screwdriver to turn the adjusting screw to the point giving the most hiss or noise. The set is now ready for operation.

S84—509 SUPPRESSION KIT AND MISCELLANEOUS PARTS

1 S84-233—"A" lead assembly
1 A43-10—Fuse
1 A81-13—Sleeve (for fuse)
2 A16-183—.5 MFD condensers
1 A96-4—Distributor Suppressor
20" wire braid

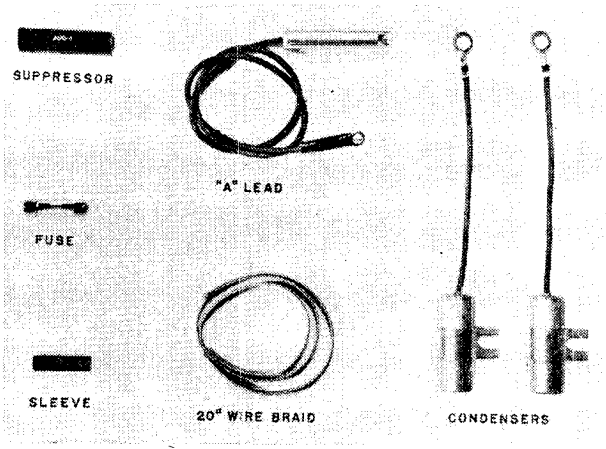


Fig. 7. Suppression Kit and Miscellaneous Parts

MODELS 6286, Ch. 528.6286;
6287, Ch. 528.6287

ELIMINATING MOTOR NOISE

Every precaution was taken in the design of this radio to eliminate motor noise interference. However, in the remote instance that it may be found desirable to take further steps, the following notes are added for your guidance. It may not be necessary to use all of the following suggestions to correct a noise condition in any one car. We recommend using these helpful hints in the manner of a process of elimination, using only those methods that correct your condition.

IMPORTANT: Special care should be taken when mounting the radio to make sure all paint, grease, rust, etc., is removed from all mounting points. A good electrical contact at these points will aid materially in eliminating motor noise.

GENERATOR CONDENSER

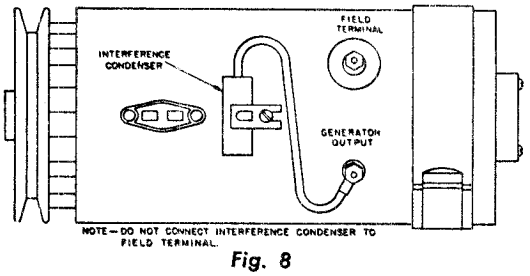


Fig. 8

The generator condenser must be connected to the battery terminal of the generator in all cases. If your car is equipped with a generator using an automatic regulator, make sure the condenser IS NOT fastened to the field winding terminal. If in doubt, your local car dealer can advise you as to where the car manufacturer recommends connecting it.

DISTRIBUTOR SUPPRESSOR

Remove from distributor cap the high tension lead from coil to distributor. Cut the lead two inches from the end, and screw the distributor resistor on to the coil lead, then screw the short length into the resistor and plug the cable into the distributor cap.

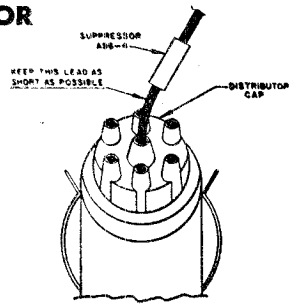


Fig. 9

AMMETER CONDENSER

A .5 MFD bypass condenser is furnished for attaching to the ammeter. This should be connected to either side of the ammeter with the ground lug fastened to a good ground nearby. In most cases the use of this condenser, the distributor suppressor, and the generator condenser, will eliminate all objectionable ignition interference.

VOLTAGE REGULATOR

It is normal to connect a .5 mfd condenser from the battery terminal on the voltage regulator to ground; however, in a number of cars the voltage regulator is mounted on rubber grommets. In such instances, the condenser should be grounded directly to the case of the regulator, rather than to some other ground point. Do not use a larger condenser than .5 mfd or else it will affect the timing of the regulator rendering it less useful.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays, or gauges, may cause interference while in oepration. Proper procedure in such cases is to try another by-pass condenser from ground to the suspected accessory until the source of the interference is found. The condenser then should be permanently mounted in this location.

HIGH AND LOW TENSION LEADS

Considerable ignition interference is experienced from leads in cables that run along the inside of the fire wall near the auto radio. For example, the battery lead to the low voltage side of the ignition coil on a 1950 Model Oldsmobile '88' runs through the fire wall and along the inside past the auto radio to a point beyond the steering column. This lead has heavy radiation. It can be disconnected at the ignition coil and pulled through the fire wall and pushed back through the fire wall at a point to the left of the steering column and run along the outside to its original point of connection on the ignition coil. Such types of leads should be watched for in all installations. They should be rerouted, if possible, or shielded with braid material. It is advisable in extreme cases to bond all leads by wrapping braid around them, and grounding the braid at the closest point. In wrapping a braid around a lead, do not remove the insulation from the leads as this is a radiation type of shield. Keep all ground leads as short as possible, or they will pick up interference.

IGNITION COILS

In cars where the ignition coil is located on the back side of the instrument panel it is often necessary to use an additional condenser. It must be installed from the battery side of the ignition coil to the closest ground on the instrument panel.

Short leads are very important. Where coils are mounted either on the instrument panel or in the driver's compartment, it may be necessary to shield the high tension lead from the coil to the distributor.

WHEEL STATIC

Wheel Static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

Bonding of Ungrounded Engine and Body Parts

The best rule is to keep the ignition interference underneath the hood as much as possible. This is best accomplished by using filters and suppressors on all points that would produce radiation as well as effectively bonding the hood, motor block, and any engine and body parts that are isolated from each other. It would be advisable to check all bolt-on fenders on which antennas are mounted, in that these fenders frequently are not sufficiently well grounded to the rest of the car. Use bonding braid wherever necessary to ground such fenders. Use wide bonding braid and keep all such braid as short as possible. Bonding all cables and tubes that go through the fire wall is necessary in some cases.

MODELS 6286, Ch. 528.6286;
6287, Ch. 528.6287

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 volts DC
Current	5.1 amp. average
Frequency Range	535 to 1605 KC
I. F. Frequency	455 KC
Speaker	4" x 6" P.M.
Power Output	1.25 watts, undistorted 2 watts, maximum
Sensitivity	5 microvolt average for 1 watt output
Selectivity	44KC broad at 1000 times signal at 1000KC

The set contains the following:

1—6BA6—R.F. Amplifier.

1—6BE6—Converter.

1—6BA6 or 6AU6—I.F. Amplifier.

1—6AT6 or 6AV6—Detector—1st audio—AVC.

1—6AQ5—Power Output.

1—6X5—Rectifier.

SERVICE NOTES

Voltages taken at the various points of the circuit to chassis are measured with the volume control in maximum position, all tubes and the rectifier in their sockets and no signal applied. The voltages are shown on the schematic diagram (Fig. 12) and were measured with a Vacuum Tube Voltmeter. An input voltage of 6.6 volts D.C. should always be used when checking voltages.

ALIGNING INSTRUCTIONS

Never attempt any adjustments on this receiver unless it becomes necessary to replace the coils or transformer, or if the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, the rectifier, condensers, resistors, etc., are nomal before proceeding with realignment.

If realignment is necessary follow the instructions given under the heading "ALIGNMENT PROCEDURE." After realignment has been completed repeat the procedure as a final check.

INSTRUCTIONS FOR REMOVING THE CHASSIS FROM THE CASE

Remove the two control knobs by pulling them straight from their shafts. Remove the cover. It is held in place by nine (9) screws; four (4) on each side and one at the back. Remove the four (4) screws, two (2) on each side which hold the chassis in place. Now to remove the chassis, hold the case with one hand, grasp the chassis by the power transformer, lift up and pull back and the chassis will slide out.

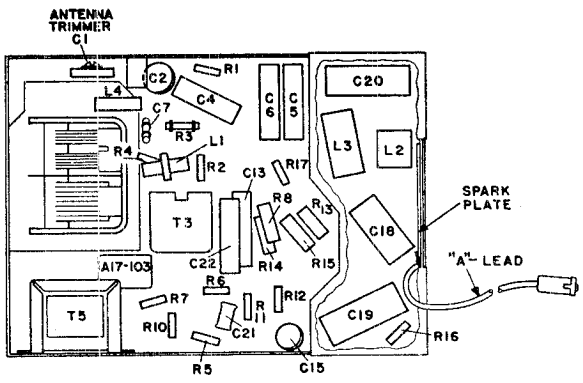


Fig. 10 Chassis—Bottom View

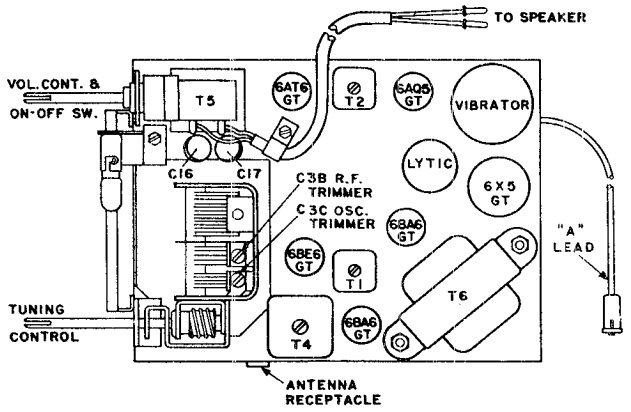


Fig. 11. Chassis—Top View

MODELS 6286, Ch. 528.6286;
6287, Ch, 528.6287

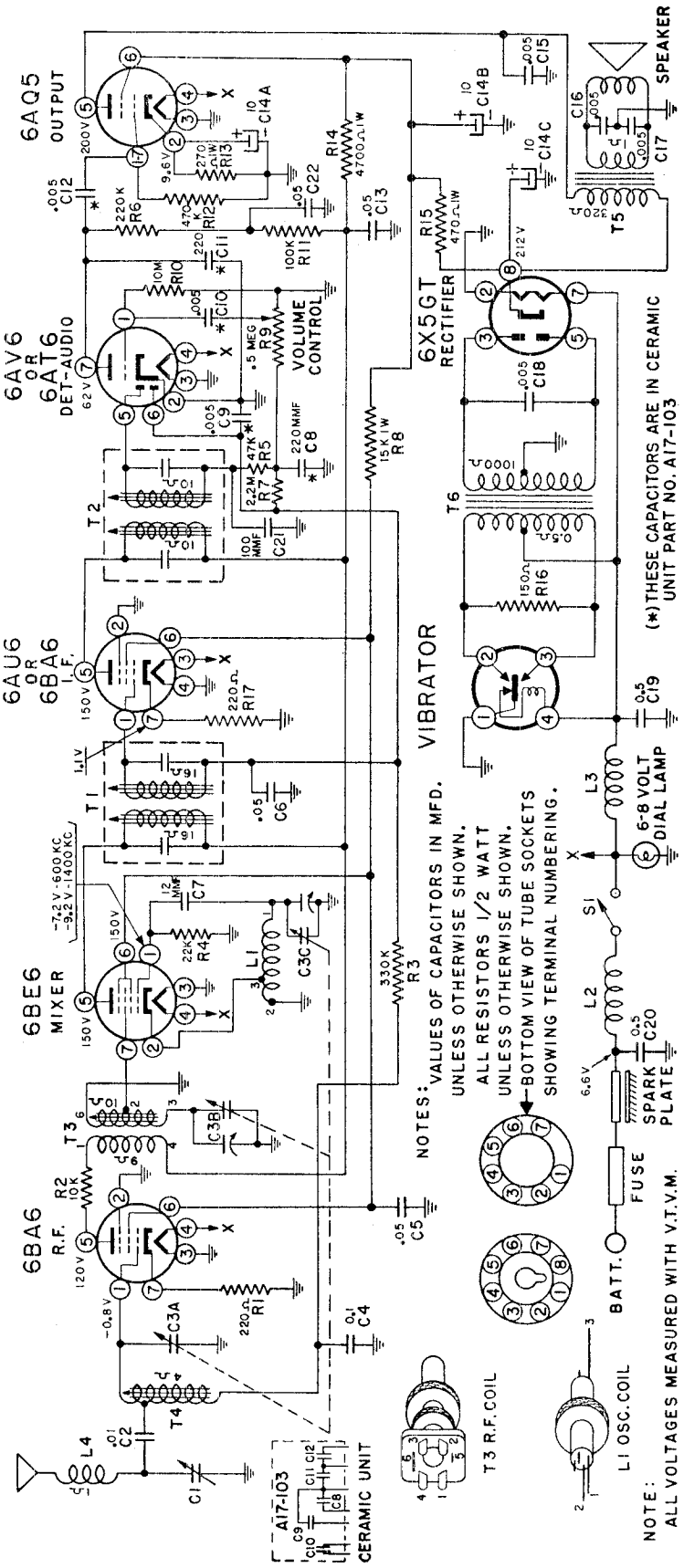


Fig. 12. Schematic Diagram—Control Unit

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.

No signal applied to antenna.

Power input—6.6 volts.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil.

Connect ground lead of signal generator to chassis.

Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.

Non-metallic screwdriver.

Output meter. (1.8 volt for 1 watt output.)

Dummy antennas—.1 MFD., 75 MMFD., 30 MMFD.

For alignment points refer to Figures 10 and 11.

Gang Position	*Generator Frequency*	*Dummy Antenna*	*Generator Connections*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1—Fully Open	455KC	.1 MFD	6BE6 GRID (Pin 7)	T2 Top & bottom	Maximum	Output I.F.
2—Fully Open	455KC	.1 MFD	6BE6 GRID (Pin 7)	T1 Top & bottom	Maximum	Input I.F.
3—Fully Open	1605KC	*	Antenna Input	C3C (Trimmer)	Maximum	Oscillator
4—Tune in Signal from Generator	1400KC	*	Antenna Input	C3B (Trimmer)	Maximum	R.F.
5—Tune in Signal from Generator	1400KC	*	Antenna Input	C1	Maximum	Antenna
6—Tune in Signal from Generator	600KC	*	Antenna Input	T4	Maximum	R.F.
7—Tune in Signal from Generator	600KC	*	Antenna Input	T3	Maximum	Antenna

Repeat steps 5 through 7 until adjustment is correct at both 600KC and 1400 KC.

*30 MMFD across input terminals and 75 MMFD in series with "hot" side of generator leads.

PARTS LIST

Schematic Location	Part Number	Description
	84-233	"A" lead assembly
	11-373	Clamp—"A" lead
	11-380	Clamp—Speaker leads
	83-421	Clip—I.F. Transformer mounting
L1	10-569	Coil—Oscillator
L2	33-229	Coil—"A" line choke
L3	33-234	Coil—Vibrator hash choke
L4	10-527	Coil—Antenna noise choke
C1	20-150	Capacitor, antenna trimmer
C2	15-211	Capacitor, ceramic—.01—600 V.
C3A, C3B, C3C	19-211	Capacitor, variable (3 gang)
C4	16-203	Capacitor, .1 mfd.—200 V. 85°C
C5, C6, C13	16-189	Capacitor, .05 mfd.—400 V. 85°C
C7	15-205	Capacitor, ceramic—12 mmfd.
C8, C9, C10, C11, C12	17-103	Capacitor, ceramic unit
C14A, C14B, C14C	18-303	Capacitor, electrolytic-10-10 mfd. 250 V. 10 mfd. 25 V.
C15, C16, C17	16-177	Capacitor, ceramic—.005 mfd.
C18	16-185	Capacitor, .005 mfd.—1600 V. oil filled
C19	16-215	Capacitor, .5 mfd.—100 V. 85°C
C20	16-214	Capacitor, .5 mfd.—100 V. 100°C
C21	15-196	Capacitor, ceramic—100 mmfd.
C22	16-197	Capacitor, .05 mfd.—200 V. 85°C
R9, S1	24-192	Control—volume, 500 K Chassis 528.6286
R9, S1	24-193	Control—volume, 500K chassis 528.6287
	67-559	Dial scale
	43-10	Fuse—15 amp.—3AG
	47-112	Grommet—Variable condenser mounting
	52-326	Knob, volume and tuning
	89-7	Lamp—pilot—No. 47 Bayonet
	56-146	Nut-knurled—control shafts
	31-180	Plate—dial backing, chassis 528.6286
	31-182	Plate—dial backing, chassis 528.6287
	45-129	Plug—speaker leads
	22-153	Plugbutton—antenna trimmer hole
	58-84	Pointer
	87-38	Receptacle—antenna
R1, R17	60-753	Resistor, 220 ohm, ½ W. 10%
R2	60-760	Resistor, 10K ohm, ½ W. 10%
R3	60-661	Resistor, 330K ohm, ½ W.
R4	60-744	Resistor, 22K ohm, ½ W. 10%
R5	60-730	Resistor, 47K ohm, ½ W.
R6	60-667	Resistor, 220K ohm, ½ W.
R7	60-726	Resistor, 2.2 megohm, ½ W.
R8	60-716	Resistor, 15K ohm, 1 W. 10%
R10	60-728	Resistor, 10 megohm, ½ W.
R11	60-727	Resistor, 100K ohm, ½ W.
R12	60-731	Resistor, 470K ohm, ½ W.
R13	60-754	Resistor, 270 ohm, 1 W. 10%
R14	60-765	Resistor, 4700 ohm, 1 W. 10%
R15	60-694	Resistor, 470 ohm 1 W. 10%
R16	60-767	Resistor, 150 ohm, ½ W. 10%
	83-646	Retainer, dial scale——left
	83-647	Retainer, dial scale—right
	83-516	Retainer, vibrator
	75-84	Shaft—tuning, chassis 528.6286
	75-86	Shaft—tuning, chassis 528.6287
	70-172	Sleeve—rubber—tuning shaft
	81-13	Sleeve—fuse
	68-39	Socket—miniature—wafer
	68-11	Socket—octal—wafer
	68-33	Socket—vibrator
	87-46	Socket & bracket—pilot lamp, chassis 528.6286
	87-37	Socket—pilot lamp, chassis 528.6287
	77-135	Spacer—variable condenser mounting
	79-390	Speaker—4" x 6" P.M.
	70-173	Spring—dial cord, chassis 528.6286
	70-174	Spring—dial cord, chassis 528.6287
	88-163	Sticker—schematic
	88-175	Sticker—tube location, chassis 528.6287
	88-164	Sticker—tube location, chassis 528.6286
	88-179	Sticker—parts list, chassis 528.6287
	88-166	Sticker—parts list, chassis 528.6286
	31-185	Strap—rear mounting
	51-109	String—pointer drive—12"
	84-509	Suppression Kit
	96-4	Suppressor resistor—10K ohm
T1	10-521	Transformer—1st I.F.
T2	10-529	Transformer—2nd I.F.
T3	10-570	Transformer—R.F.
T4	10-568	Transformer—antenna
T5	80-267	Transformer—output
T6	80-266	Transformer—power
	34-105	Vibrator

IMPORTANT: All tubular condensers must be high temperature (85°C.) wax type.

MODELS 6286, Ch. 528.6286; 6287, Ch. 528.6287

MODELS 1U338-I, 1U338-R,
1U338-W, 338-I, 338-R,
338-W

OPERATION AND SERVICE INSTRUCTIONS

FOR

MODELS 338-W, 338-I, 338-R, 1U338-W, 1U338-I, 1U338-R,

AC-DC SUPERHETERODYNE RECEIVER

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON EITHER:
110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT (AC)
OR
110-120 VOLTS DIRECT CURRENT (DC)

SPECIAL INSTRUCTIONS FOR "DIRECT CURRENT" OPERATION:

If the current supply is DIRECT CURRENT, and the radio does not play after it has been turned on for approximately one minute, simply reverse radio power cord plug in electric power receptacle.

LOOP AERIAL

THE LOOP AERIAL SUPPLIED with the radio should provide ample reception in average locations.

Loop aerials are directional—the volume of a weak station may be improved, or undesired electrical noise may be reduced, by lifting and turning the radio to a different position. A trial will reveal position of best reception with least interference.

FUNCTION OF CONTROLS ON RADIO

THE LEFT HAND KNOB controls the volume control and off-and-on switch.

THE RIGHT HAND KNOB is the station selector.

OPERATING INSTRUCTIONS

PLACE VOLUME CONTROL KNOB IN one-half to maximum volume position.

TURN TUNING CONTROL KNOB until the desired station is heard with greatest volume and clearest tone.

3E341-2—338

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:

(A) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.

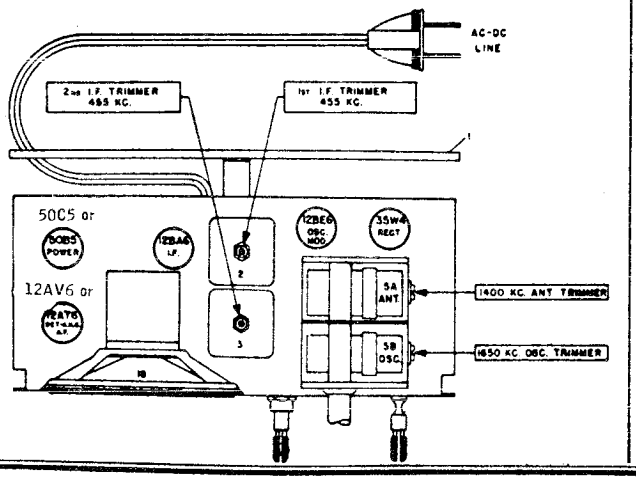
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

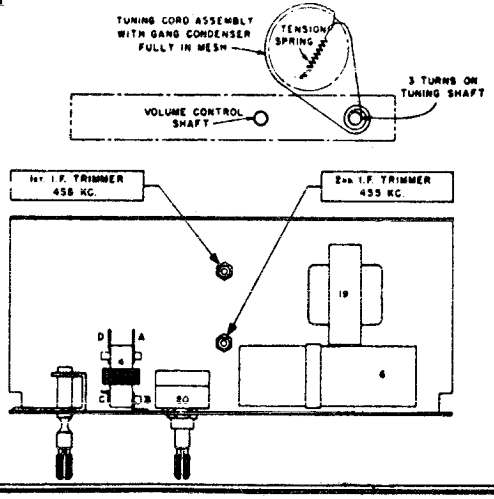
(C) WHEN ADJUSTING THE 1650 KC OSCILLATOR TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the loop. Attach a 1 megohm resistor across these connections and feed output of test oscillator across the 1 megohm resistor.

(D) THE 1400 KC LOOP ANTENNA TRIMMER should be adjusted only after all other adjustments have been made. PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET — APPROXIMATELY 5/8" SPACE BETWEEN LOOP AND CHASSIS.

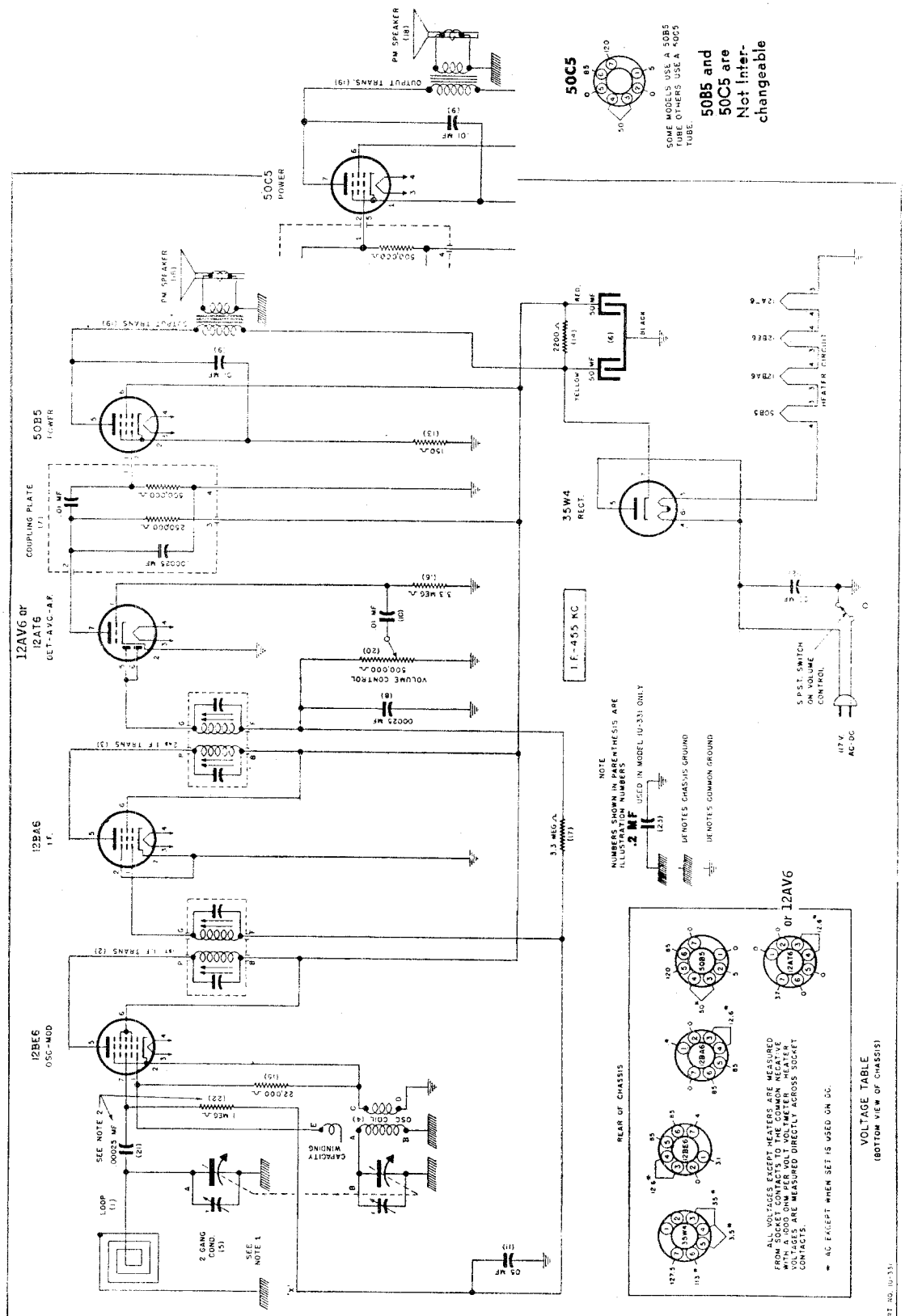
When aligning the 1400 KC Antenna Trimmer, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2" or 3" form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.

Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received.	455 K. C.	.02 MFD. condenser	High side to rear stator plates of tuning condenser. Low side to common negative on 1U338 or to frame of condenser on 338, through a .02 Mfd. blocking condenser.	Adjust each of the second I.F. transformer trimmers for maximum output then adjust each of the first I.F. trimmers for maximum output.
2	Exactly 1650 K. C.	Exactly 1650 K. C.	See paragraph (C) above	See paragraph (C) above	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	See paragraph (D) above	Adjust 1400 K. C. antenna trimmer for maximum output.





MODELS 1U338-I, 1U338-R, 1U338-W, 338-I, 338-R, 338-W



NOTE 1: Connected as shown in Model 1U338 only. Loop return connected to A.V.C. at point X in Model 338.

NOTE 2: Items with illustration numbers (21) and (22) used in 1U338 only. Loop and gang connected directly to pin #7 on 12BE6 in Model 338.

TO SERVICE TUBES, it is necessary to remove the cabinet back by gently pulling out the two trimount studs, used to hold the back to the cabinet, and detaching the two leads from the loop.

Before remounting the back on the cabinet, be sure to properly reconnect these leads. The green-white wire must be attached to the terminal which has the word "GREEN" printed close to it.

TO REMOVE CHASSIS FROM CABINET:

(A) Remove cabinet back.

(B) Unscrew the two screws holding the chassis to the rear of the cabinet.

(C) Remove pointer by gently pulling it away from cabinet.

(D) Pull knobs off of control shafts.

(E) Unscrew and remove slotted nut on volume control shaft—accessible when knob is removed.

(F) Slide Chassis out of cabinet.

TO REINSTALL, reverse the above procedure. DO NOT tighten nut too much—otherwise, cabinet may crack.

PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	64E33	Antenna	Loop and cabinet back
2	20E402	Coil	1st I. F. Transformer
3	20E402	Coil	2nd I. F. Transformer
4	20E333 OR	Coil	Oscillator
4	20E346	Coil	Oscillator (used in 1U338 only)
5	24E45	Condenser	Two Gang, Tuning
6	25E24	Condenser	Dry Electrolytic, 50-50 Mfd. 150 Volt
7	23E2041-2	Condenser	Ceramic, Coupling Plate
8	23E42 OR	Condenser	Mica, .00025 Mfd. 500 V.
8	23E2027	Condenser	Ceramic, .00025 Mfd. 500 V.
9	23E411	Condenser	Tubular, .01 Mfd. 400 V.
10	23E211	Condenser	Tubular, .01 Mfd. 200 V.
11	23E216	Condenser	Tubular, .05 Mfd. 200 V.
12	23E416	Condenser	Tubular, .05 Mfd. 400 V.
13	27E151	Resistor	Carbon, 150 Ohm, 1/3 W.
14	27E222-3	Resistor	Carbon, 2200 Ohm, 1 W.
15	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 W.
16	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
17	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
18	1E32	Speaker	3½" P.M.
19	22E49	Transformer	Output
20	28E27	Volume Control	500,000 Ohm, with Switch
21	23E2027	Condenser	Ceramic, .00025 Mfd. 500 V. (used in 1U338 only)
22	27E105	Resistor	Carbon, 1 Megohm, 1/3 W. (used in 1U338 only)
23	23E2021	Condenser	Tubular, .2 Mfd. 400 V. (used in 1U338 only)

IMPORTANT: When ordering complete cabinet or cabinet parts, be sure to mention required color in addition to part number.

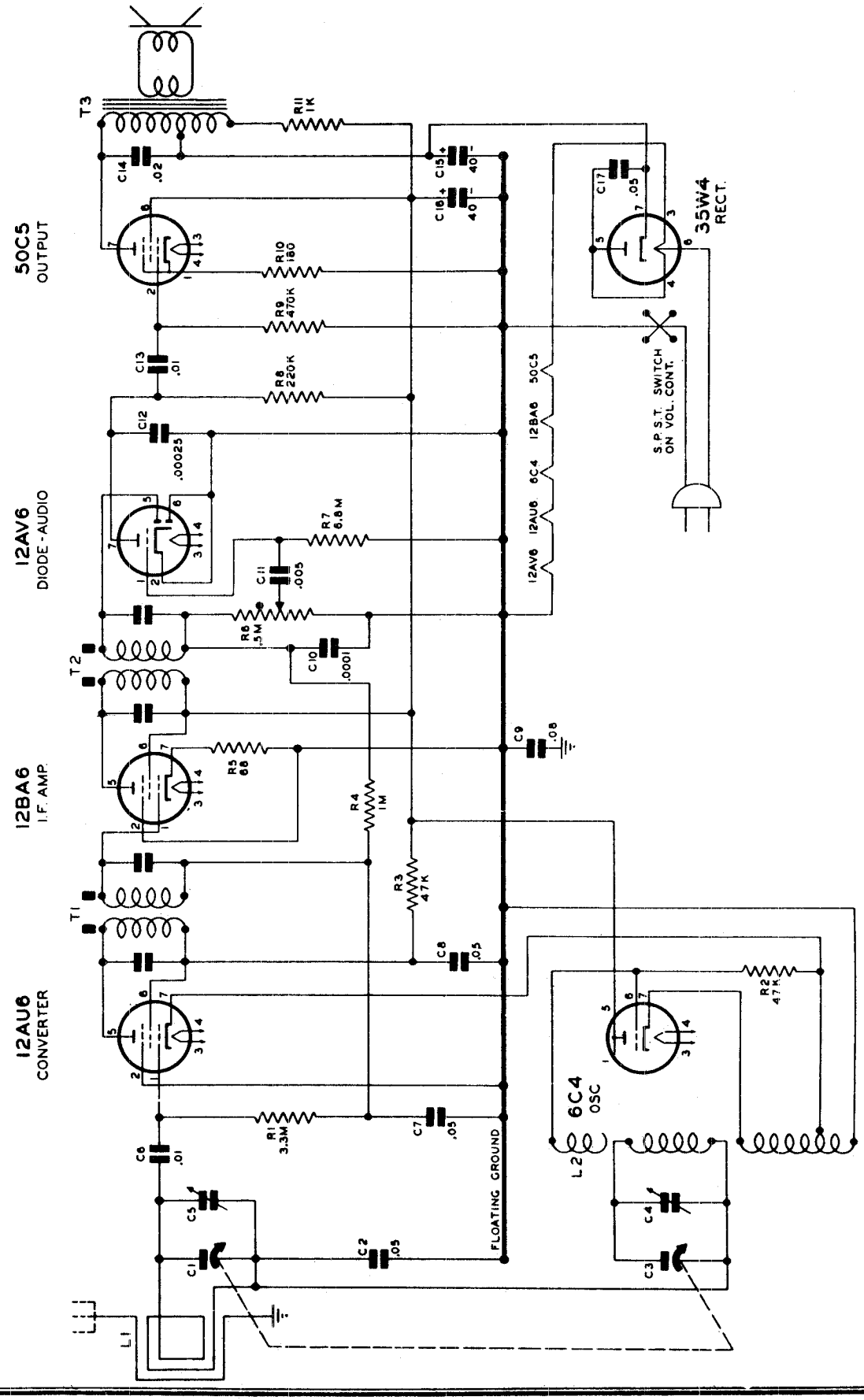
MISCELLANEOUS PARTS

Part No.	Part Name	Description
7E248	Cabinet	Walnut Plastic
7E248-2	Cabinet	Ivory Plastic
7E248-3	Cabinet	Red Plastic
41E14	Line Cord	5 Ft. Rubber Line Cord
20E253-25	Dial Cord	Dial Drive Cord
20E348-3	Dial Shaft Assembly	Dial Drive Shaft with Bracket
35E29	Dial Pointer	Dial Indicator
33E99	Pointer Insulator	Plastic, used to mount and insulate Pointer from Chassis
13E103-8	Pointer Tension Clip	Tension Spring for 33E99 Pointer Insulator
65E2	Dial Spring	Tension Spring for Dial Cord
37E52-15	Knob	For Walnut Cabinet
37E52-16	Knob	For Ivory and Red Cabinet
20E612	Speaker Baffle	Baffle Assembly with Grille Cloth

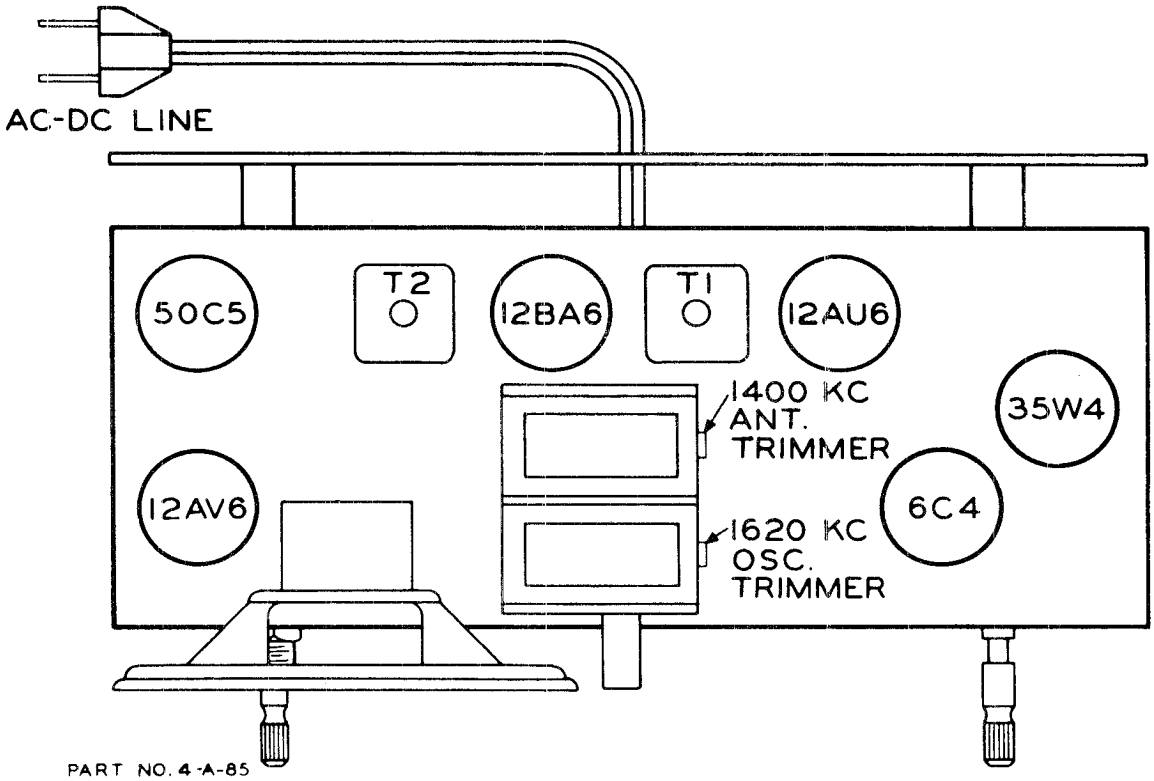
MOUNTING HARDWARE

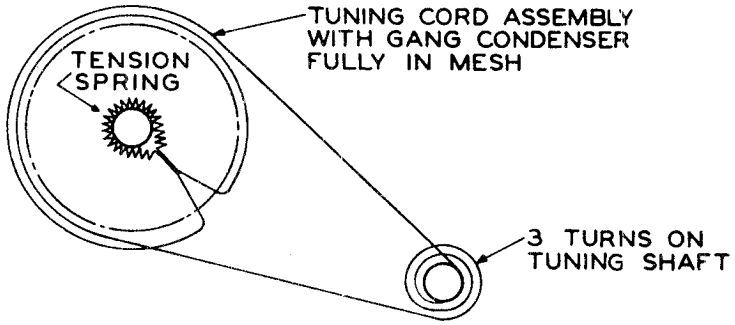
Part No.	Part Name	Description
10E42	Stud	Trimount Stud for mounting Loop and Cabinet Back to Cabinet
82E37-F10	Screw	Recessed 6-20 x 3/8 holds Chassis in Cabinet
19E29	Nut	Slotted Head, used to hold Chassis in Cabinet

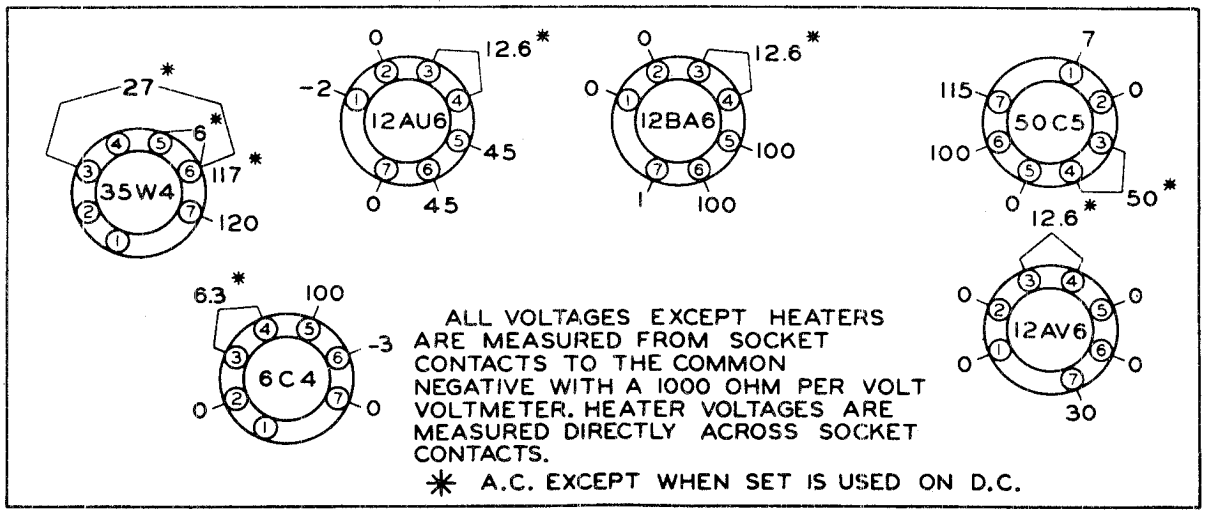
MODELS 314, 315



MODELS 314, 315







VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

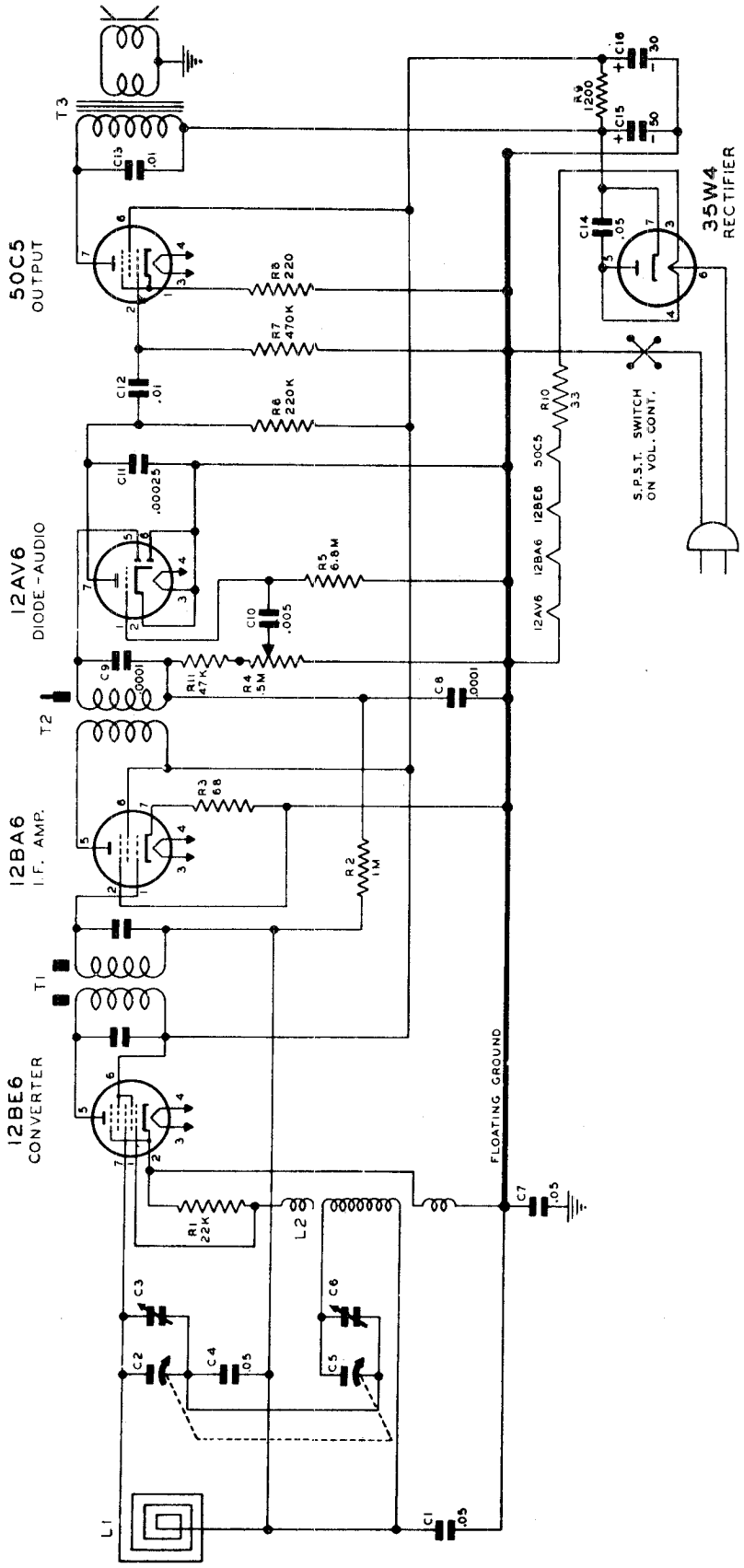
Before starting alignment:

(A) Remove the chassis and loop antenna from the cabinet at the same time. To accomplish this, remove the two fasteners holding the top of the back to the cabinet and remove the two screws on the rear apron of the chassis which fasten the chassis to the cabinet.

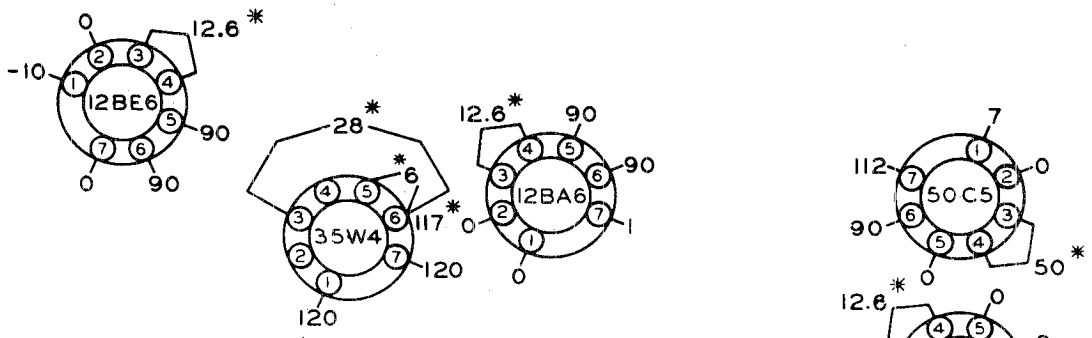
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

STEPS	Set Receiver dial to:	TEST OSCILLATOR		DUMMY ANTENNA	ADJUSTMENT
		Adjust test oscillator Frequency to:	Attach output of test oscillator to:		
1	Any point where no interfering signal is received.	Exactly 455 KC.	High side to grid of 12AU6 Tube. Low side to common negative.	.05 MFD Condenser.	Adjust slugs at top and bottom of 2nd. I.F. (T2) and then each of the slugs of the 1st. I.F. (T1) for maximum output.
2	Exactly 1620 KC.	Exactly 1620 KC.	External Antenna. Blue lead on loop.	100 MMFD Condenser	Adjust 1620 KC Oscillator trimmer for maximum output.
3	Approx. 1400 KC.	Approx. 1400 KC.	External Antenna. Blue lead on loop.	100 MMFD Condenser	Adjust 1400 KC Antenna trimmer for maximum output.

MODELS 316,
317, Ch. YHU



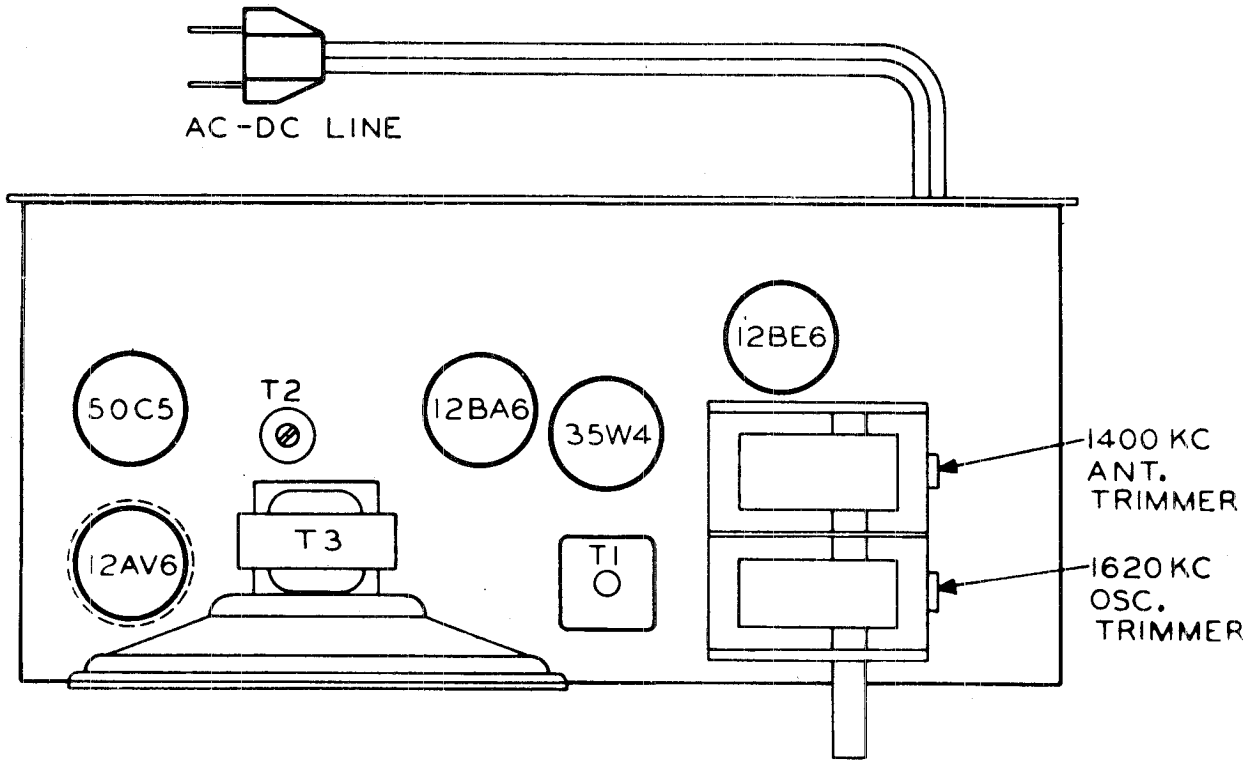
REAR OF CHASSIS



ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO THE COMMON NEGATIVE WITH A 1000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.
* A.C. EXCEPT WHEN SET IS USED ON D.C.

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PART NO. 4-A-90



PART NO. 4-A-90

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

BEFORE STARTING ALIGNMENT:

(A) Remove the chassis and loop antenna from the cabinet at the same time by removing the two screws on the rear apron of the chassis which fasten the chassis to cabinet.

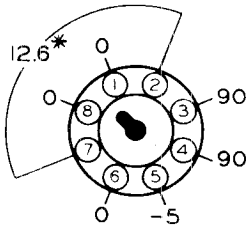
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

STEPS	Set Receiver dial to:	TEST OSCILLATOR		Dummy Antenna	Refer to parts designations in schematic drawing for trimmers mentioned below:
		Adjust test Oscillator Frequency to:	Attach Output of test oscillator to:		
1	Any point where no interfering signal is received.	EXACTLY 455 KC	High side to grid of Converter tube (*). Low side to common negative	.1 MFD CONDENSER	Adjust 2nd. I. F. (T2) and then each of the slugs of the 1st. I.F. (T1) for maximum output.
2	Exactly 1620 KC	Exactly 1620 KC	Dummy Antenna	2 Turns of Hookup Wire 6" in Dia. (Place Approx. a Foot from and in Same Plane as Loop)	Adjust 1620 KC oscillator trimmer for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	Dummy Antenna		Adjust 1400 KC antenna trimmer for maximum output.

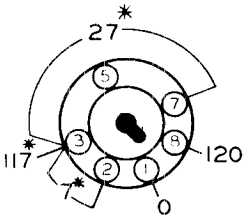
* Insert 12AU6 for S.R. & T.C. No. YHU. Insert 12SA7 for S.R. & T.C. No. YHAU

MODELS 316,
317, Ch. YHAU

REAR OF CHASSIS



12SA7



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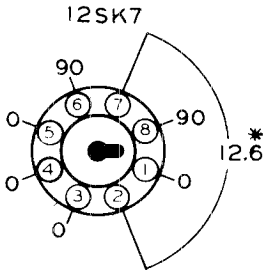
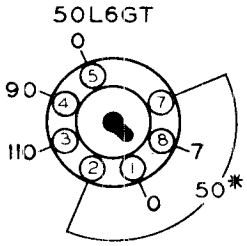
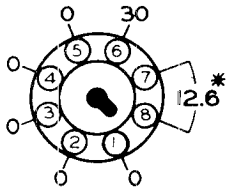




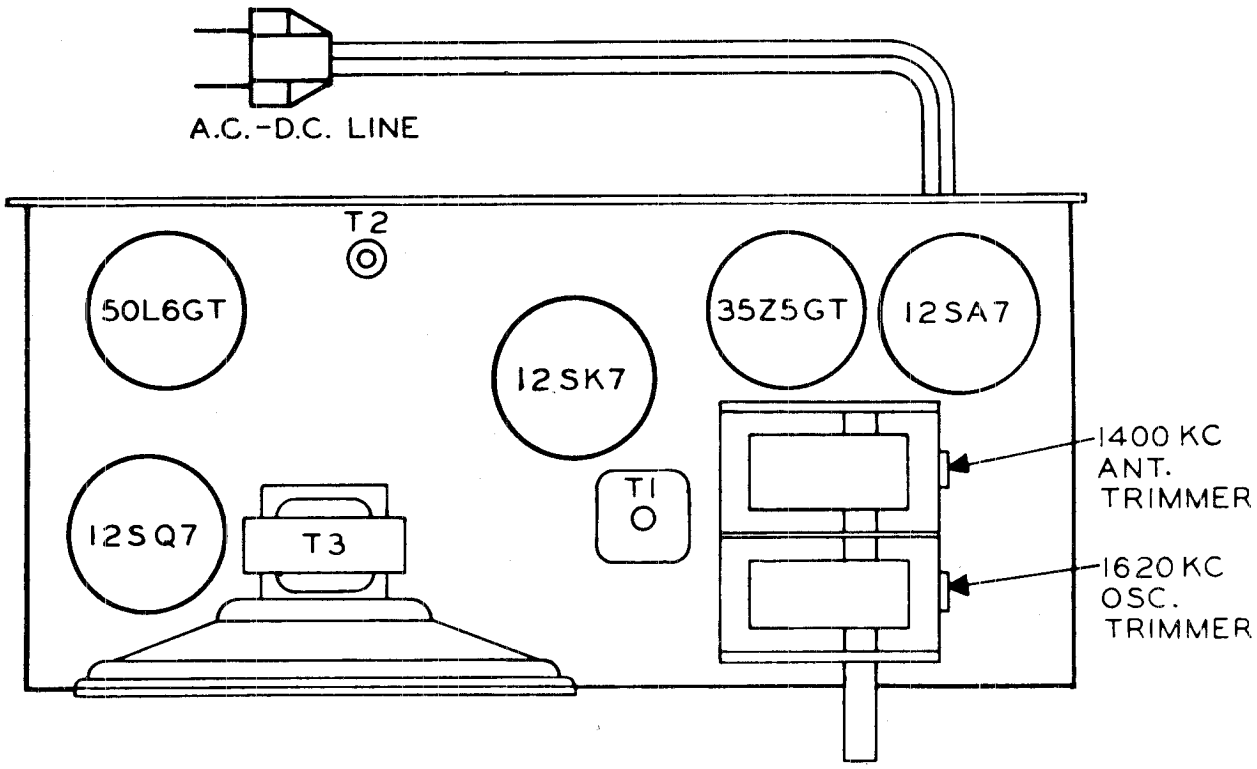


12SQ7

ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO THE COMMON NEGATIVE WITH A 1000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.

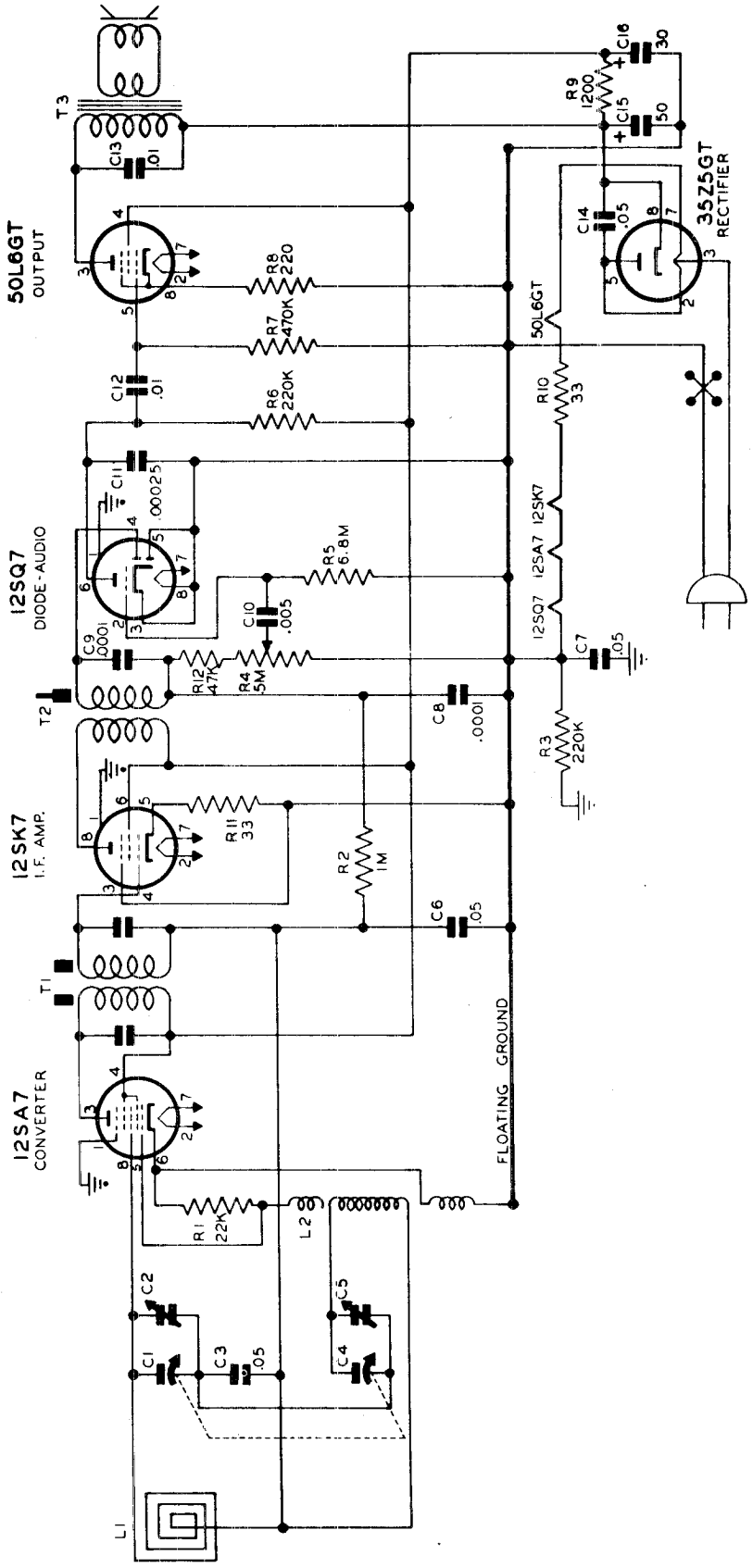
* A.C. EXCEPT WHEN SET IS USED ON D.C.

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)



PART NO. 4-A-90A

MODELS 316,
317, Ch. YHAU



MODEL 459.5022

BATTERY SUPPLIERS

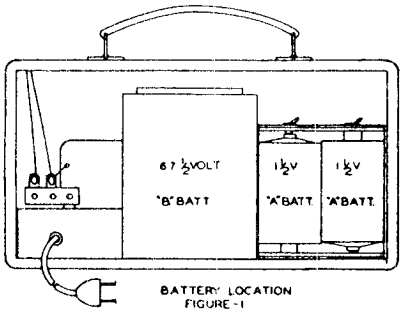
The batteries for this receiver may be purchased from any reliable dealer.

For proper operation this receiver requires two "A" batteries and one "B" battery.

The "A" batteries are size "D" flashlight cells and are made by all battery manufacturers.

The "B" battery is a 67 1/2 volt battery and is made by the following manufacturers.

Eveready	67 1/2 vlt.	#467
Burgess	67 1/2 vlt.	#XX45
General	67 1/2 vlt.	#W45A
Ray-O-Vac	67 1/2 vlt.	#4367
Aircastle	67 1/2 vlt.	#1523



BATTERY LOCATION
FIGURE-1

BATTERY SERVICING

(See Fig. No. 1)

To replace the batteries in this receiver.

Remove the back.

To the right, looking into the gear of the cabinet is the "A" or flashlight battery container. To the left is the "B" or 67 1/2 volt battery.

To replace the "A" batteries, pull the old batteries out of the container. Replace with fresh batteries, making sure the batteries are inserted according to the diagram on the inside of the container.

To replace the "B" battery, disconnect the snap fastener connectors. Replace with a fresh battery and snap the connectors into place. Replace the battery in the cabinet as shown in Fig. No. 1, making sure that the connector end faces the top of the cabinet.

After the batteries have been installed, replace the back, making sure that the two washers in the bottom of the back fit into the slot near the bottom edge of the cabinet.

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

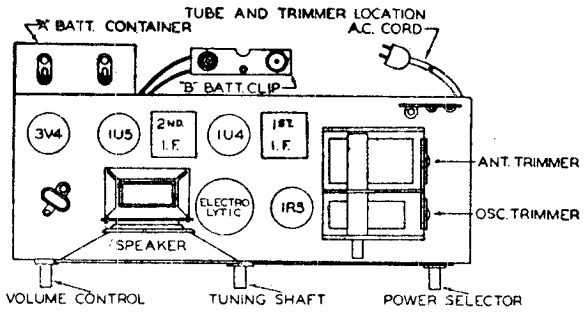
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

FIRST STEP: Connect the hot lead from the generator to the ANT. Section of the gang condenser through a .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the movable iron cores in the IF cans. These IF adjustments are made in the top and in the bottom of the can under the chassis. Adjust the cores until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

THIRD STEP: Remove the generator leads from the gang condenser and replace the chassis in the cabinet. Loosely couple the generator to the receiver loop by making a complete turn of wire over the outside of the cabinet. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer through the hole which is provided in the end of the cabinet until a maximum signal is noted on the output meter. The ANT. trimmer hole in the side of the cabinet is covered by a small plug button. Replace this button after adjustment has been made. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.



MODEL-5022
FIGURE-2

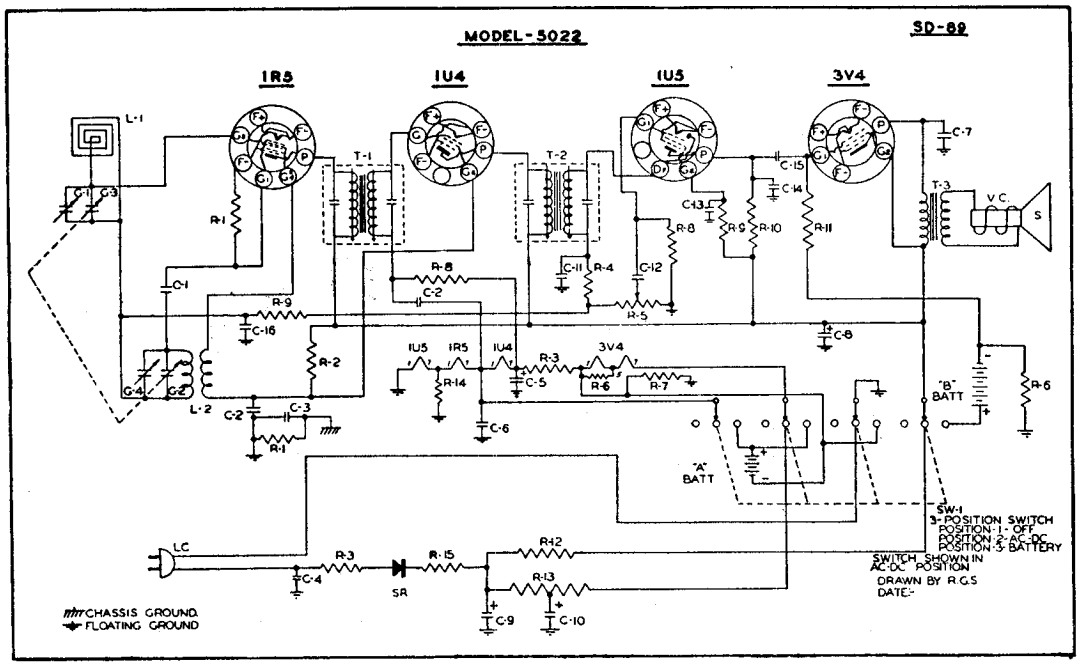
TL-89

16454-76

(5-50)

MODEL 459.5022

SCHEMATIC DIAGRAM - Model No. 459.5022



PARTS. LIST

PART NO.	SCHEMATIC LOCATION	DESCRIPTION.	PART NO.	SCHEMATIC LOCATION	DESCRIPTION
IR-20	R- 1	220M~ RESISTOR 1/2W 20%		C-11	150MMFD.
IR-37	R- 2	10M ~ RESISTOR 1/2W 20%		C-12	.002MFD.
IR-17	R- 3	33~ RESISTOR 1/2W 20%	MC-7	C-13	.005MFD.
IR-31	R- 4	82M~ RESISTOR 1/2W 10%		C-14	100MFD.
VC-11	R- 5	MEG. VOLUME CONTROL		C-15	.005MFD.
IR-33	R- 6	270~ RESISTOR 1/2W 10%	PC-2	C-16	.05MFD. CONDENSER 200W.V.
IR-39	R- 7	620~ RESISTOR 1/2W 5%		G-1	ANT. TRIMMER
IR-3	R- 8	10MEG. RESISTOR 1/2W 20%	GC-6	G-2	GANG CONDENSER
IR-23	R- 9	3.3MEG. RESISTOR 1/2W 20%		G-3	
IR-12	R-10	1MEG. RESISTOR 1/2W 20%	LL-23	L- 1	LOOP ANTENNA
IR-13	R-11	2.2MEG. RESISTOR 1/2W 20%	LO-8	L- 2	OSC. COIL
IR-40	R-12	3900~ RESISTOR 1W 10%	SR-2	SR	SELENIUM RECTIFIER
WR-7	R-13	1050-1050 CANDOHM RESISTOR 5W 5%	CO-1	LC	LINE CORD
IR-1	R-14	470~ RESISTOR 1/2W 20%	SW-8	SW-1	4 POLE 3 POSITION SWITCH
IR-41	R-15	47 ~ RESISTOR 1W 10%		"A"BATT.	2 "D"SIZE FLASHLITE CELLS 1½ VOLTS
MC-2	C- 1	100MMFD MICA CONDENSER		"B"BATT.	1-67½ VOLT BATTERY
PC-7	C- 2	.01MFD. CONDENSER 400W.V.	LI-5	T-1	INPUT IF TRANSFORMER
PC-8	C- 3	.1MFD. CONDENSER 400W.V.	LI-5	T-2	OUTPUT IF TRANSFORMER
PC-5	C- 4	.05MFD. CONDENSER 400W.V.		T-3	SPEAKER OUTPUT TRANSFORMER
EC-6	C- 5	70MFD. 10WV ELECTROLYTIC	SPK-16	VC	VOICE COIL
PC-3	C- 6	.1MFD. CONDENSER 200W.V.		S	3½" P.M. SPEAKER
PC-6	C- 7	.005MFD. CONDENSER 600W.V.		G-4	OSC. TRIMMER
EC-14	C- 8	40MFD.	TU-39	—	IR5-1U4-1U5-3V4
	C- 9	40MFD. -150W.V. ELECTROLYTIC			
	C-10	20MFD.			

OPERATING INSTRUCTIONS

MODEL 459.5044

POWER SOURCES: This combination will operate on alternating (AC) current only, of 105 to 125 volts at 60 cycles.

CAUTION: Always predetermine voltage of power source. Never try to plug this combination into a 220 volt line, this will cause serious damage. (Check your local power company if voltage is not known)

Never try to operate this combination on 50 cycle current, as this will cause the motor to rotate at an incorrect speed. The normal speed is 78 R.P.M. (revolutions per minute) and to insure proper reproduction of recordings 60 cycle current must be used.

Never plug the combination into a direct current (DC) source, this will seriously damage the motor which has been designed for AC operation only.

This receiver is equipped with a short hank of wire for an antenna and under ordinary conditions further external antenna is not required. However, in steel constructed buildings or if located some distance from station, the reception may be improved by using an outside antenna. This should be a single wire not more than 50 feet long and should be connected to the antenna lead that projects from the back of the receiver. Do not attach to Radiator or other grounded object as this can burn out the antenna coil. No ground wire is required at any time.

INSTALLATION: Unwind power cord and plug into a convenient power outlet. Follow instructions under 'controls' to operate receiver.

CONTROLS: Three controls are provided on the front panel for operation of this combination. The right hand control is the station selector which is used only in 'Radio' operation. The left hand control is a switch which selects operation of either 'Radio' or 'Phonograph'. The center control is used to adjust volume on either 'Radio' or 'Phonograph' and is also used as a power switch to turn the combination 'On' or 'Off.'

RADIO RECEPTION: After the power cord plug has been connected to your power outlet, turn the center control to the right in a clockwise direction and a click will be heard. This indicates that the power is turned on, and the pilot light in the dial should begin to glow. After about 30 seconds, the set will be ready for operation.

Make sure that the left hand control is turned to the left, in 'Radio' position. Turn the center control about halfway on, in a clockwise direction to increase volume. Rotate the right hand control to the right or left to select the desired station. By mentally adding a zero to the figures on the upper half of the dial, the result will be read directly in kilocycles (i.e., 60 plus 0 equals 600KC or 140 plus 0 equals 1400KC). After a station has been tuned in, adjust the center control to your desired volume.

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

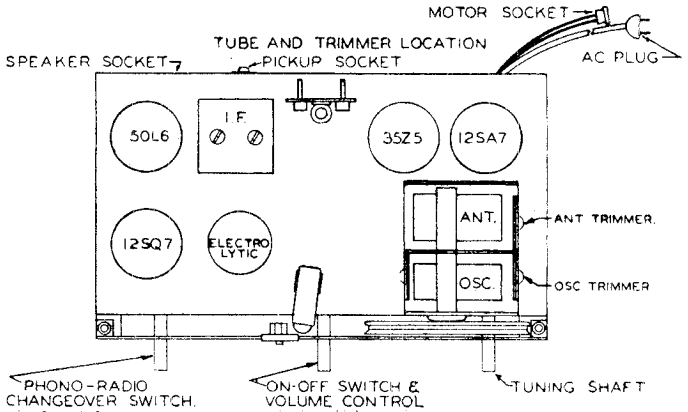
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

The receiver volume control should be turned to maximum during the I.E. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

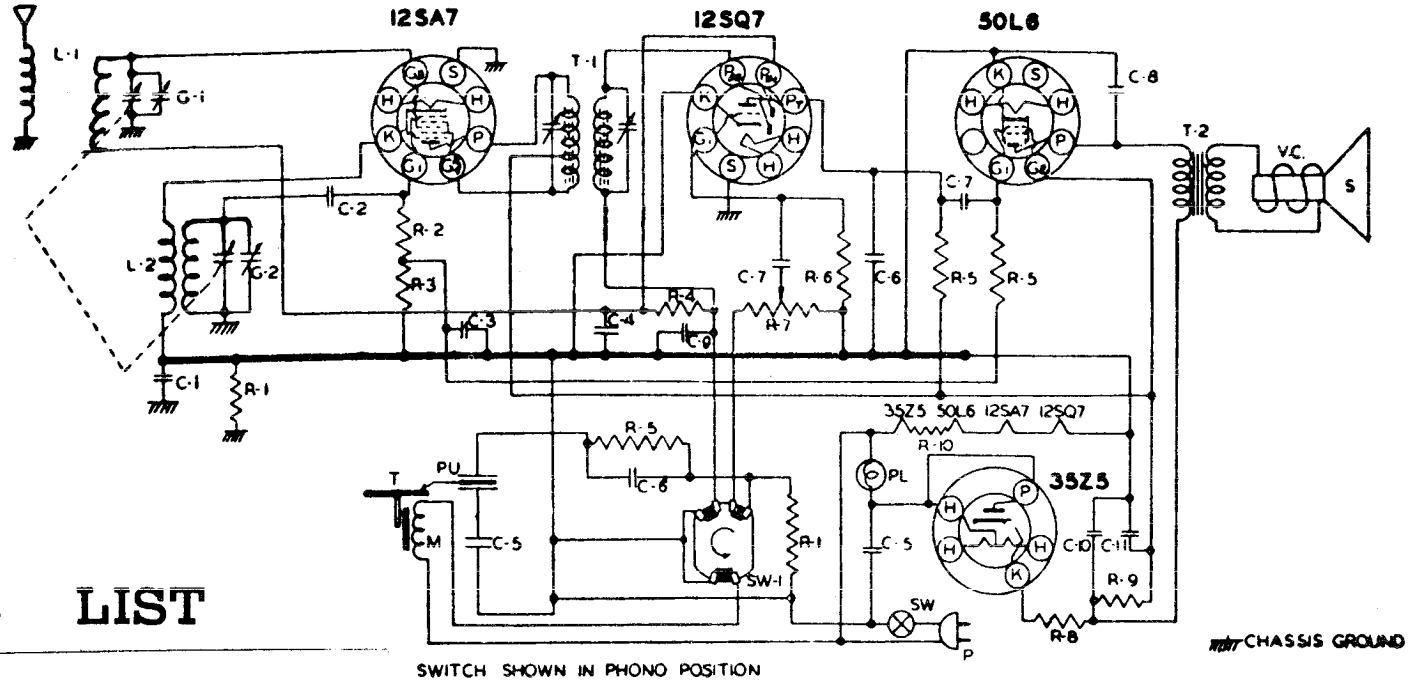
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.



16294-76 T-249



SWITCH SHOWN IN PHONO POSITION

PARTS LIST

PART NO.	SCHEMATIC LOCATION	DESCRIPTION
IR-20	R-1	220M ~ RESISTOR 1/2W 20%
IR-9	R-2	22M ~ RESISTOR 1/2W 20%
IR-10	R-3	47M ~ RESISTOR 1/2W 20%
IR-23	R-4	33MEG. ~ RESISTOR 1/2W 20%
IR-11	R-5	470M ~ RESISTOR 1/2W 20%
IR-3	R-6	10MEG. ~ RESISTOR 1/2W 20%
VC-4	R-7	1 MEG. VOLUME CONTROL
IR-17	R-8	33 ~ RESISTOR 1/2 W 20%
IR-25	R-9	2200 ~ RESISTOR 1 W 10%
IR-41	R-10	47 ~ RESISTOR 1 W 10%
PC-8	C-1	.1MFD. CONDENSER 400V
MC-4	C-2	50MMFD MICA
PC-4	C-3	.25MFD. CONDENSER 200V
PC-2	C-4	.05MFD. CONDENSER 200V
PC-5	C-5	.05MFD. CONDENSER 400V
MC-8	C-6	500MMFD. MICA

PART NO	SCHEMATIC LOCATION	DESCRIPTION
PC-10	C-7	.005 MFD. CONDENSER 400V
PC-7	C-8	.01MFD. CONDENSER 400V
MC-2	C-9	100MMFD. MICA
EC-12	C-10	40MFD.
	C-11	20MFD. ELECTROLYTIC
	SW	SWITCH ON VOLUME CONTROL
SW-1	SW-1	RADIO-PHONO. SWITCH
LI-8	T-1	I.F. TRANSFORMER
	T-2	OUTPUT TRANSFORMER
SPK-10	VC	VOICE COIL
	S	4" PM SPEAKER

105-125 V 60 CYCLE AC ONLY

LL-19	L-1	LOOP ANT.
LO-14	L-2	OSC: COIL
M-9	M-2	110V 60 CYCLES MOTOR
PU-10	PU	TONE ARM WITH L-75 CARTRIDGE
PB-1	PL	#47 PILOT BULB
CO-1A	P	LINE CORD
TT-9	T	8" TURNTABLE-(INCLUDED IN PRICE OF M-9)
GC-6	G-1	GANG CONDENSER
	G-2	

MODELS 594-306, 594-307

Instructions for Using Your RADIO-ALARM CLOCK Combination Receiver

This skillfully designed and carefully constructed combination will give you long and enjoyable service. This Receiver can perform the following services for the user:

1. Provide accurate time.
2. Receive broadcast programs being transmitted and within range—at any time.
3. Turn off radio program at will of user up to 60-minute interval or less.
4. Turn on radio program for awakening.
5. Turn buzzer alarm on 10 minutes after radio starts playing.
6. Turn on buzzer alarm for awakening — with radio silenced.

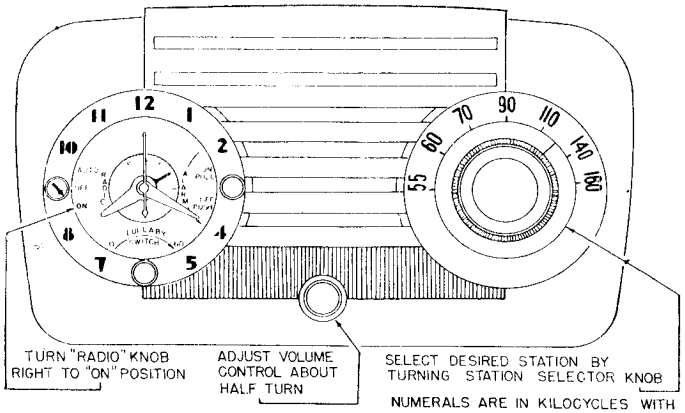
INSTALLATION—Check the voltage and cycles of the electric power supplied to your home. This combination will operate ONLY on 60 cycle alternating current (ac), from 105 to 125 volts. THIS SET WILL NOT OPERATE ON ANY OTHER TYPE OF CURRENT OR CYCLES. Your electric company will help you make certain that you have the correct kind of power.

This combination includes a sensitive five multi-purpose tube super-heterodyne radio including a rectifier tube. Your radio has a self contained duro-loop antenna capable of supplying sufficient volume in areas of normal reception. If you live in an area where radio reception is poor, you can improve the performance by connecting an outside antenna to the screw marked EXT. ANT. which you will find on the right hand side of the rear of the cabinet.

(1) TO SET THE CLOCK

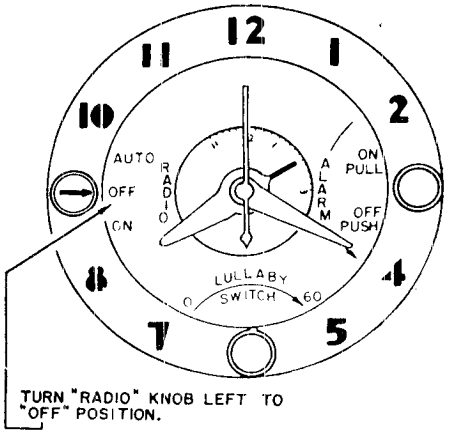
Your self-starting TELECHRON movement will begin operating when the set is plugged into the proper outlet and your sweep second hand begins to rotate. Set the correct time by means of the small knob at the right REAR of the cabinet. Turn ONLY in the direction shown on the back cover.

(2) TO TURN RADIO ON MANUALLY

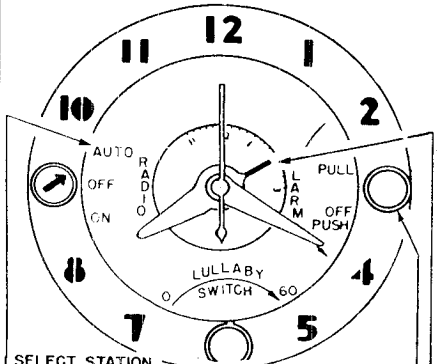


16015-76F

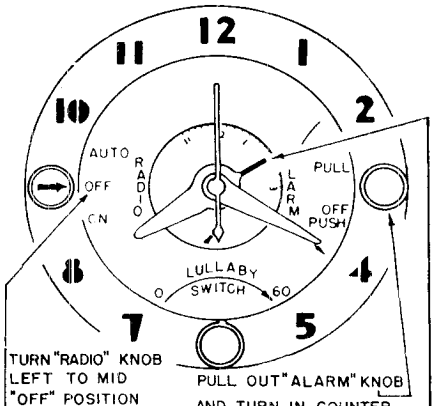
(3) TO TURN OFF RADIO MANUALLY



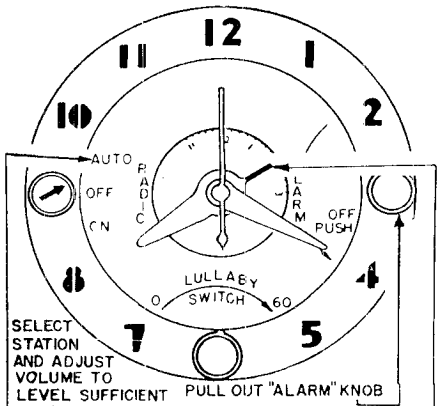
(4) TO AWAKEN TO MUSIC



(5) TO AWAKEN TO BUZZER ALARM

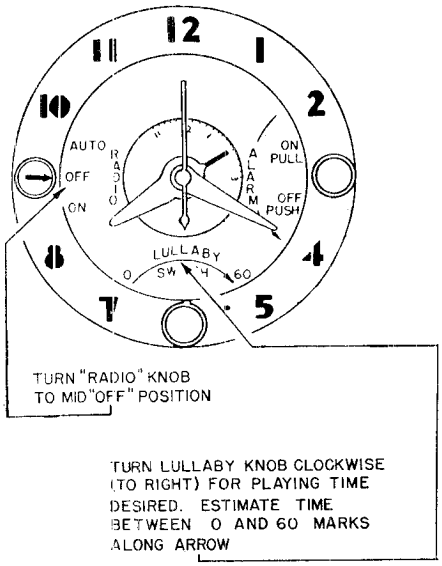


(6) TO AWAKEN TO MUSIC AND BUZZER ALARM



MODELS 594-306,
594-307

(7) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING



(8)—To Turn Radio Off Automatically When Retiring and Awaken to Music

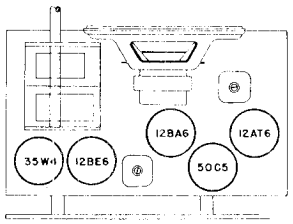
Set Controls as in Illustration 4.
Set "Lullaby" Knob as in Illustration 7.

(9)—To Turn Radio Off Automatically When Retiring and Awaken to Buzzer Alarm

Set Controls as in Illustration 5.
Set "Lullaby" Knob as in Illustration 7.

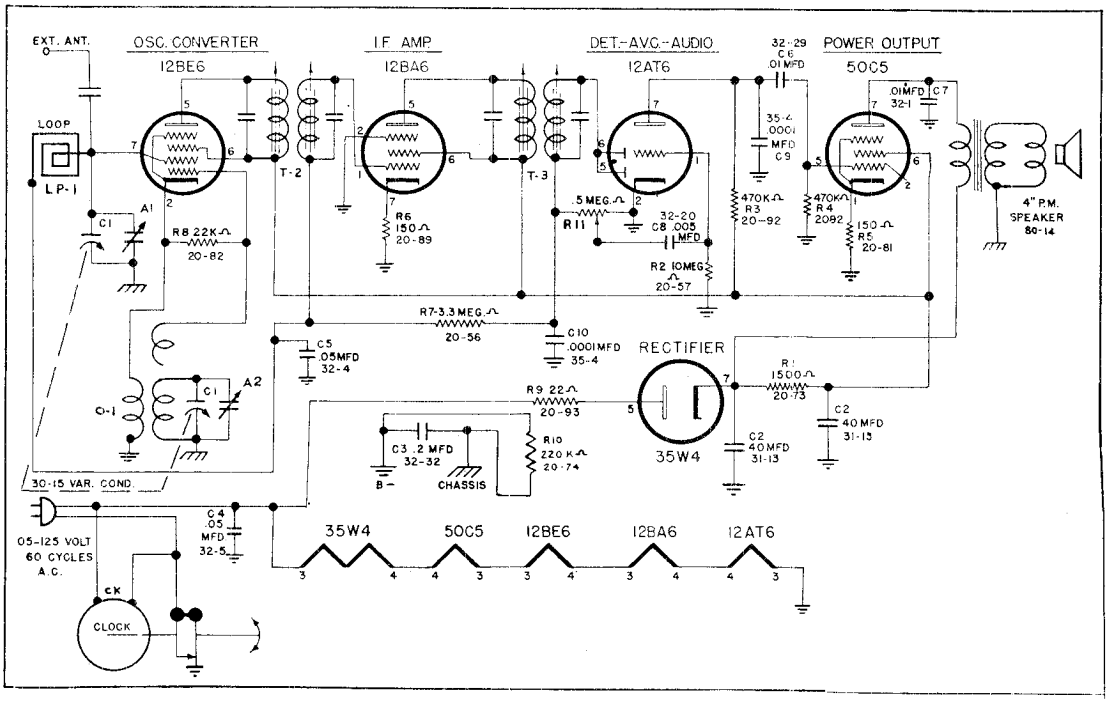
(10)—To Turn Radio Off Automatically When Retiring, Awaken to Music and Buzzer Alarm

Set Controls as in Illustration 6.
Set "Lullaby" Knob as in Illustration 7.



TUBE COMPLEMENT

12BE6 Converter
12BA6 I.F. Amplifier
12AT6 Det. AVC-AUDIO
50C5 Power Output
35W4 Rectifier



MODELS 594-306, 594-307

SERVICE DATA

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full mesh (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer A1

* Seven markings on the dial bracket represent respectively 550 kc, 600 kc, 700 kc, 900 kc, 1100 kc, 1400 kc, and 1600 kc reading from left to right. These points are to be used for the alignment of the receiver.

REPLACEMENT PARTS LIST

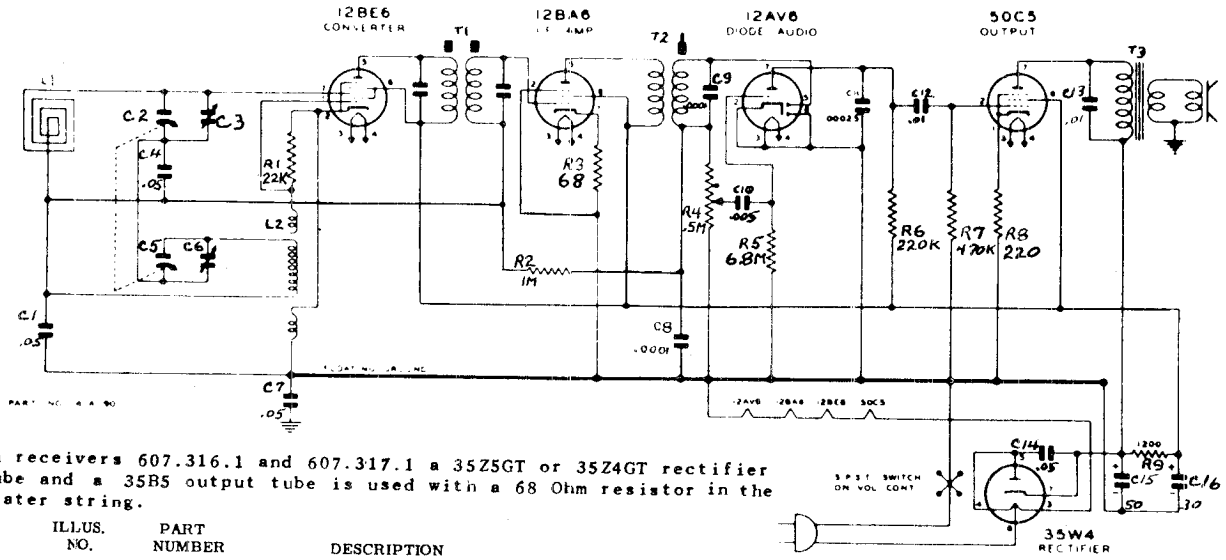
When ordering parts, specify part number and model number.

Ref. No.	*Part No.*	*DESCRIPTION*
		CAPACITORS
C1	30-15	Variable Condenser, 2 gang
C2	31-13	40 mfd.—40 mfd., 150 volt dual electrolytic condenser
C3	32-32	.2 mfd., 200 volt, paper
C4	32-5	.05 mfd., 400 volt, paper
C5	32-4	.05 mfd., 200 volt, paper
C6	32-1	.01 mfd., 400 volt, paper
C7	32-1	.01 mfd., 400 volt, paper
C8	32-20	.005 mfd., 600 volt, paper
C9	35-4	.0001 mfd., 500 volt, mica
C10	35-4	.0001 mfd., 500 volt, mica
		RESISTORS
R1	20-73	1500 ohm, 1 watt 20%
R2	20-57	10 megohm, ¼ watt 20%
R3	20-92	470,000 ohm, ¼ watt 20%
R4	20-92	470,000 ohm, ¼ watt 20%
R5	20-81	150 ohm, ½ watt 20%
R6	20-89	150 ohm, ¼ watt 20%
R7	20-56	3.3 megohm, ¼ watt 20%

Ref. No.	*Part No.*	*DESCRIPTION*
		RESISTORS — (Continued)
R8	20-82	22,000 ohm, ¼ watt 20%
R9	20-93	22 ohm, ½ watt 20%
R10	20-74	220,000 ohm, ¼ watt 20%
R11	50-15B	½ meg. volume control with switch
		COILS AND TRANSFORMERS
O-1	60-9	Oscillator coil
T-2	61-11	Input IF transformer
T-3	61-11	Output IF transformer
LP-1	62-15	Loop antenna
		MISCELLANEOUS
80-14	80-14	4 inch P.M. speaker with output transformer
	122-19	Selector knob
	122-15	Volume knob
	120-33	Cabinet—walnut
		ivory (Specify color)
CK	140-6	Clock

* Prices subject to change.

MODELS 607-316, 607-316-1,
607-317, 607-317-1



In receivers 607.316.1 and 607.317.1 a 35Z5GT or 35Z4GT rectifier tube and a 35B5 output tube is used with a 68 Ohm resistor in the heater string.

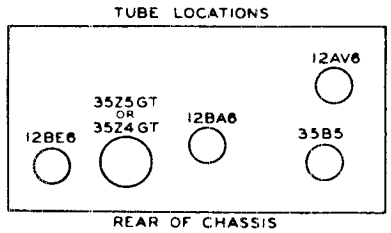
ILLUS. NO.	PART NUMBER	DESCRIPTION
C1,C4,C7	N-1345	Condenser, Paper .05 MFD. 200 V.
C8	N-6015	Condenser, Ceramic 100 MMFD. 500 V. 20%
* C9	N-7549	Condenser, Ceramic 100 MMFD. 500 V. 10%
C10	N-4894	Condenser, Paper .005 MFD. 600 V.
C11	N-6488	Condenser, Ceramic 250 MMFD. 500 V. 20%
C12,C13	N-1344	Condenser, Paper .01 MMFD. 400V.
C14	N-1346	Condenser, Paper .05 MFD 400 V.
C15	N-7889	Condenser, Dry Electrolytic (50 MFD. 150 V.)
C16		(30 MFD. 150 V.)
R1	N-4025	Resistor, Carbon 22,000 Ohm 1/2 W. 20%
R2	N-1262	Resistor, Carbon 1.0 Megohm 1/2 W. 20%
R3	N-6485	Resistor, Carbon 68 Ohm 1/2 W. 10%
R4	N-7890	Volume Control 500,000 Ohm with Switch
R5	N-4028	Resistor, Carbon 6.8 Megohm 1/2 W. 20%
R6	N-4026	Resistor, Carbon 220,000 Ohm 1/2 W. 20%
R7	N-4027	Resistor, Carbon 470,000 Ohm 1/2 W. 20%
R8	N-4024	Resistor, Carbon 220 Ohm 1/2 W. 10%
R9	N-4900	Resistor, Carbon 1,200 Ohm 1.0 W. 10%
T1	N-7888	Transformer, 1st I.F.
* T2	(N-7542	Transformer, 2nd. I.F. OR
	(N-8150	Transformer, 2nd. I.F.
T3		Output Transformer (Part of N-7824 Speaker Assembly)
L1	N-8138	Coil, Loop Antenna and Cabinet Back
L2	N-7139	Coil, Oscillator
	#316	Cabinet, Ivory Plastic
	#317	Cabinet, Walnut Plastic
	N-7824	Speaker, 4" PM with Output Transformer

* C9 (N-7549 Ceramic Condenser) is required only with N-7542 Transformer. This capacity is included in N-8150 Transformer.

Note: In some receivers the following components - R6,R7,C11, and C12 are replaced by the assembly listed below:

N-6477 Audio Coupling Plate

TUBE LOCATION CHART



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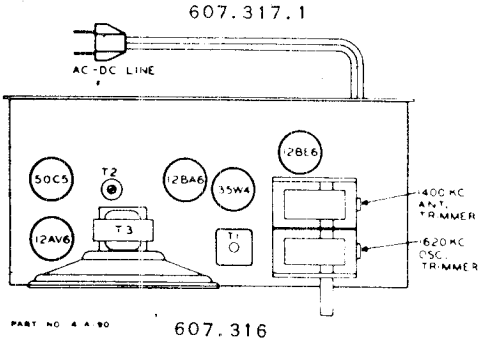
607.317.1



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607.317

ALIGNMENT PROCEDURE

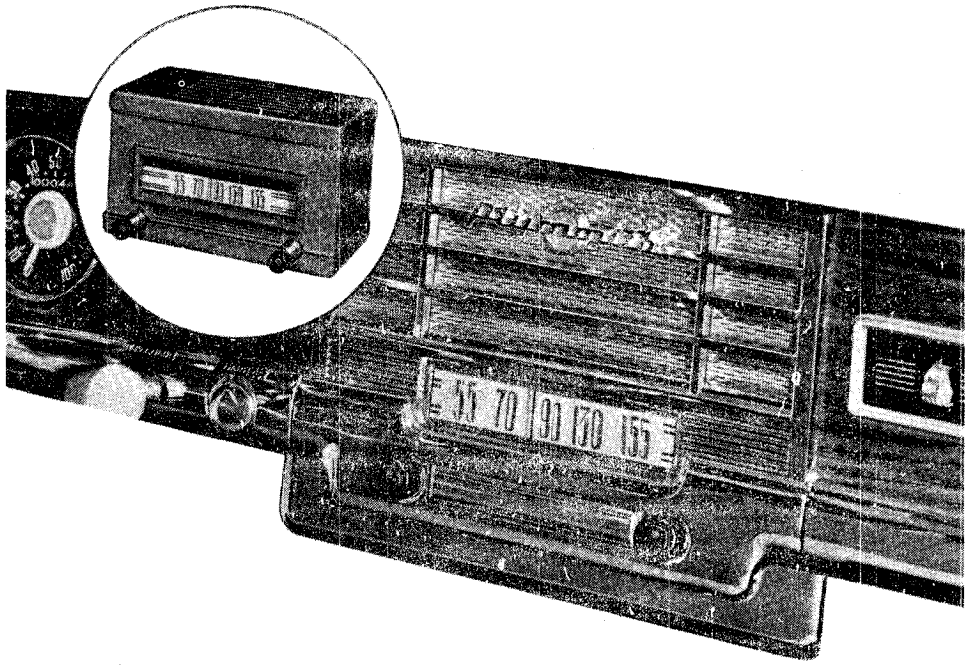
Step No.	Position of Gang	Signal Generator Frequency	Generator Connection	Dummy Antenna	Adjustment	Type of Adjustment
1.	Open	455 KC.	Rear Gang Terminal	.1 Mfd.	I.F. Slugs	Adjust for Maximum Output
2.	Open	1620 KC.	Dummy Antenna	2 Turns of Hookup Wire 6" in Dia. (Place Approx. a Foot from & parallel to loop.)	Front Gang Trimmer	Adjust for Maximum Output
3.	1400 KC	1400 KC.			Rear Gang Trimmer	Adjust for Maximum Output
4.	600 KC	600 KC.				Check Gang Align-ment

MODEL 610.D200,
Dodge, Plymouth

DESCRIPTION

Your new *AIRCASTLE* Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM oval speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. Any standard two or three section whip or "fish pole" antenna will provide good reception of distant or weak stations. The unit is simple to install and requires no electrical adjustment after installation.



OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to the required loudness. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

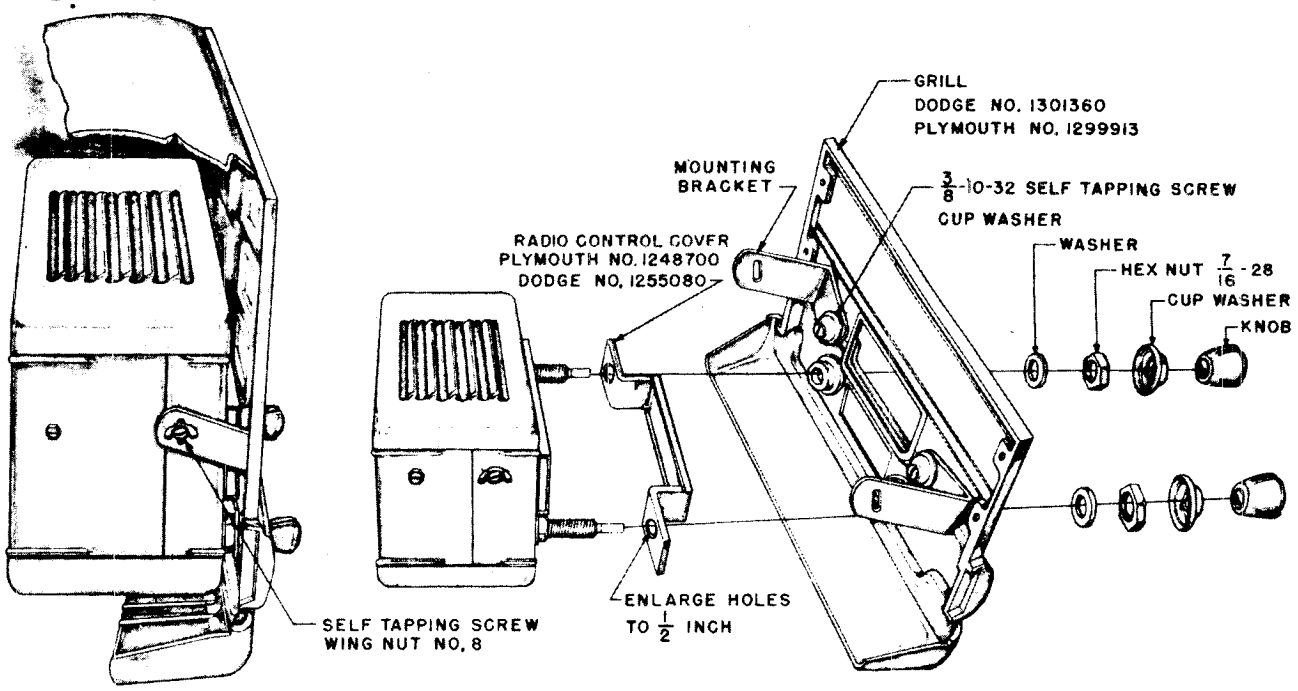
This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

PLYMOUTH P18 SPECIAL DELUXE

1. Remove four screws securing Radio Grill in place and remove Radio Grill.
2. Remove dummy plates covering radio dial and control openings.
3. Enlarge holes in radio control cover plate to ½ inch.
4. Remove knobs, cup washers, hex nuts and washers from control shafts and mounting bushings.
5. Secure two mounting brackets to Radio Grill with ⅜ inch long 10-32 self-tapping screws and cup washers as shown in detail assembly drawing.
6. Place radio control cover plate over mounting bushings.
7. Position receiver behind Radio Grill so that mounting bushings and shafts protrude through the grill.
8. Attach receiver by replacing washers and hex nuts on mounting bushings.
9. Replace cup washers and knobs over shafts.
10. Secure receiver to mounting brackets with two No. 8 self-tapping wing nuts.
11. Insert radio with attached grill through front opening on instrument panel.
12. Replace grill mounting screws.
13. Connect battery lead to terminal marked "ACC" on ignition switch.
14. Plug antenna cable into receiver.

MODEL 610.D200,
Dodge, Plymouth



DODGE "CORONET"

Install in the same manner as outlined for the P18 DeLuxe Plymouth except do not remove radio grill.

PLYMOUTH P17, P18 4-DOOR DELUXE AND P18 CLUB COUPE DELUXE DODGE "WAYFARER" AND "MEADOWBROOK"

These models are not equipped by the car manufacturers with a radio grill or a radio control cover plate.

The following parts must be obtained from any authorized Plymouth or Dodge dealer before an installation can be made in any of these cars.

Plymouth P17, P18 4-Door DeLuxe, P18 Club Coupe DeLuxe
- Radio Grill No. 1299913
- Radio control cover No. 1248700

Dodge "Meadowbrook" or "Wayfarer"
- Radio Grill No. 1301360
- Radio control cover No. 1255080

ACCESSORIES FURNISHED FOR INSTALLATION

MOUNTING PARTS KIT

The following mounting hardware parts are shipped attached to the receiver. (See detail assembly drawing FIG. 2)

- 2 Washers
- 2 7/16-28 hex nuts
- 2 Cup washers
- 2 Knobs
- 2 Mounting Brackets
- 2 No. 8 self-tapping wing nut screws

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

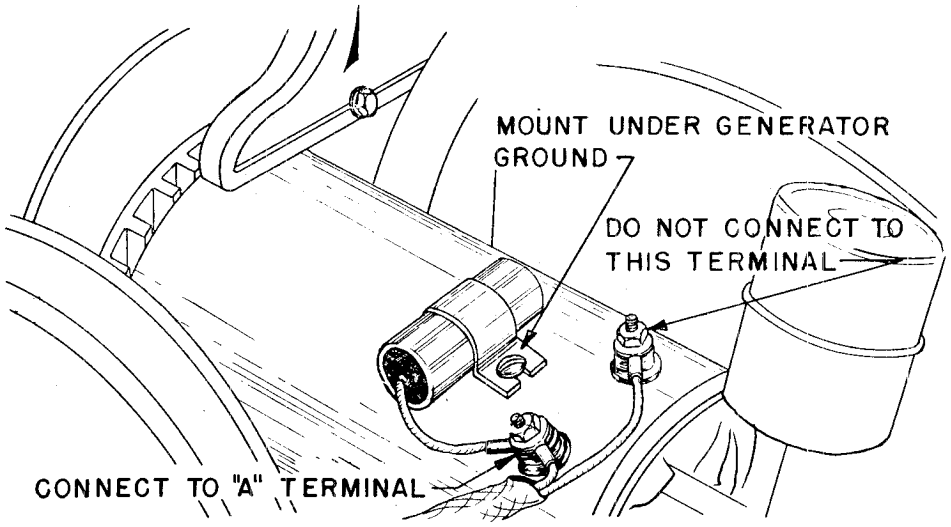
- 2 3/8 10-32 self-tapping screws
- 2 Cup washers

SUPPRESSION KIT

- 1 Distributor Suppressor
- 1 .5 MFD Generator Condenser

MOTOR NOISE ELIMINATION

GENERATOR CONDENSER



DISTRIBUTOR SUPPRESSOR

NOTE: 1950 Dodge and Plymouth automobiles do *not* require distributor suppressors.

1949 DODGE AND PLYMOUTH

Remove metal tip from the distributor center tower lead and screw lead into the suppressor. Plug suppressor with attached lead back into distributor head.
The generator condenser and distributor suppressor should eliminate all objectionable motor noise in most cases. If the motor noise persists the following steps should be taken. Check operation of radio as each step is made.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

AMMETER CONDENSER

A .5 MFD by-pass condenser should be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

MODEL 610.D200,
Dodge, Plymouth

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary to proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to *Schematic Diagram*

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connector*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T4 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T3 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	T2	Maximum	RF Stage
7) Tune in Signal from generator	600 KC	100 MMFD	Ant. lead	T1	Maximum	Antenna

8) Repeat steps 4 and 5

PARTS AND PRICE LIST

CONDENSERS

Schematic Diagram Reference	*Part No.*	*Description*
C2, C3, C4	C207	.05 MFD 200 volt condenser
C5	CC200	100 MMFD ceramic condenser
C6, C13, C14	CC201	200 MMFD ceramic condenser
C7	C203	.002 MFD 200 volt condenser
C8, C9	C206	.01 MFD 600 volt condenser
C10, C11	C209	.5 MFD 100 volt condenser
C12	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV-200	CV-200	3 section variable tuning condenser

RESISTORS

R1	R309	1 megohm ½ watt 20% resistor
R2	R306	20K ohm ½ watt 20% resistor
R3	R305	2K ohm ½ watt 20% resistor
R4	R310	2 megohm ½ watt 20% resistor
R5	R311	10 megohm ½ watt 20% resistor
R6	R307	250K ohm ½ watt 20% resistor
R7	R308	500K ohm ½ watt 20% resistor
R8	R303	330 ohm ½ watt 20% resistor
R9	R313	20K ohm 2 watt 20% resistor
R10, R11	R301	100 ohm ½ watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
RV-200	RV-200	Volume control ¾ megohm with switch

DIAL PARTS

D200	Dial Scale
PS200	Dial Pointer
DS200	Drive shaft assembly
H201	Grommet, rubber drive
T51	Pilot light
H202	Pilot light socket
H203	Pulley, idler
H204	Spring, Dial Drive Spring Tension
H205	String

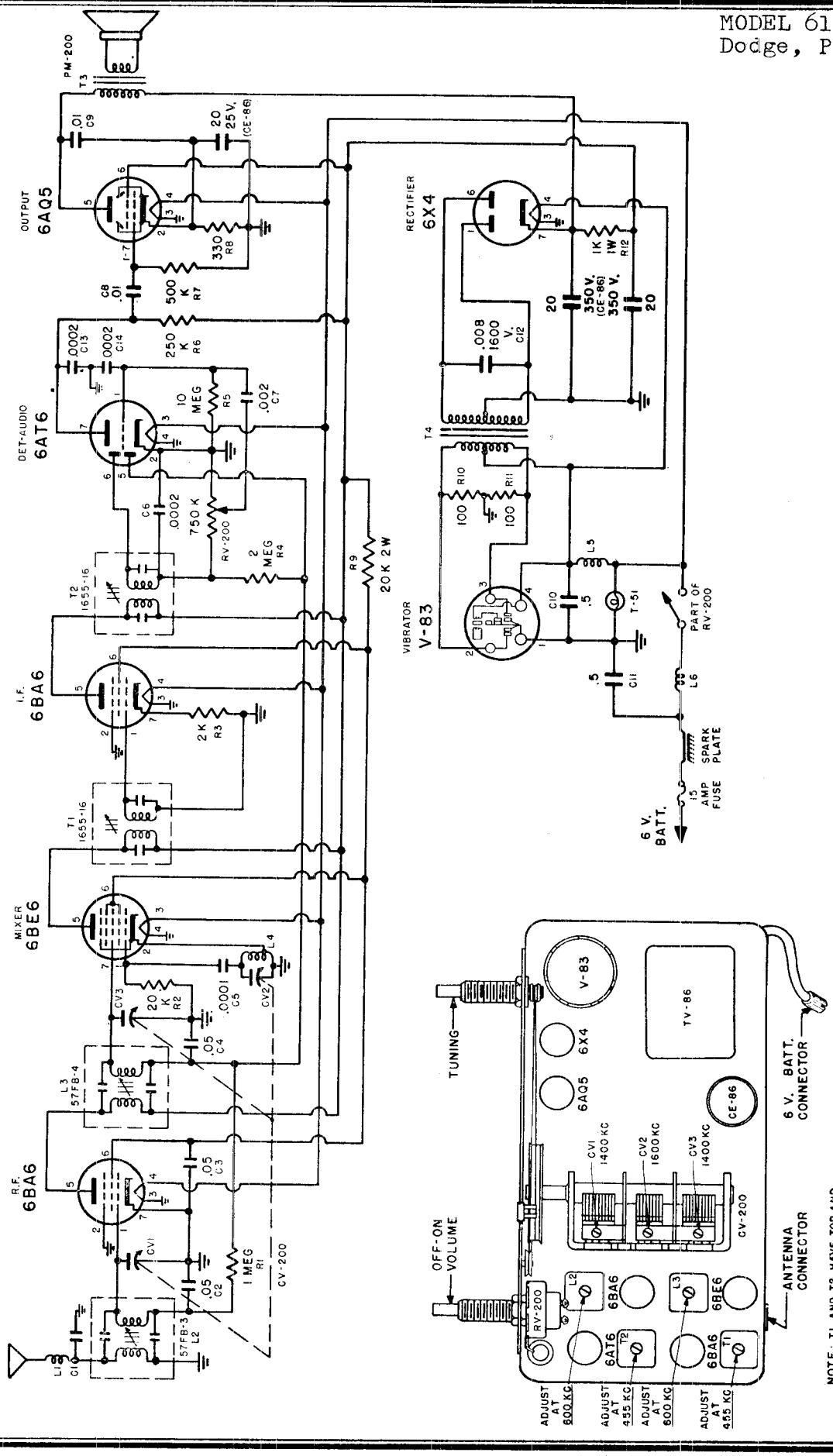
MISCELLANEOUS

A200	"A" lead assembly
H206	Case (less covers)
H207	Clip, anti-rattle
H208	Clip, coil mounting
H209	Cover, bottom case
H210	Cover, top case (with speaker louvres)
A201	Fuse, 15 Amp.
H211	Grommet, rubber, gang mounting
H212	Receptacle, antenna cable
PM-200	Speaker 4" x 6" PM (includes output transformer)
V-83	Vibrator

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	57FB-3	Antenna Coil
L3	57FB-4	RF coil
L4	L201	RF Oscillator coil
L5	L202	Choke, vibrator hash
L6	L203	Choke, "A" line
T1	1655-16	1st IF transformer
T2	1655-16	2nd IF transformer
T3		Output transformer (Part of speaker not furnished separately)
T4	TV-200	Vibrator transformer

MODEL 610.D200,
Dodge, Plymouth



MODELS 610,
F151, 1951 Ford

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. Any standard two or three section whip or "fish pole" antenna will provide good reception of distant or weak stations. The unit is simple to install and requires no electrical adjustment after installation.

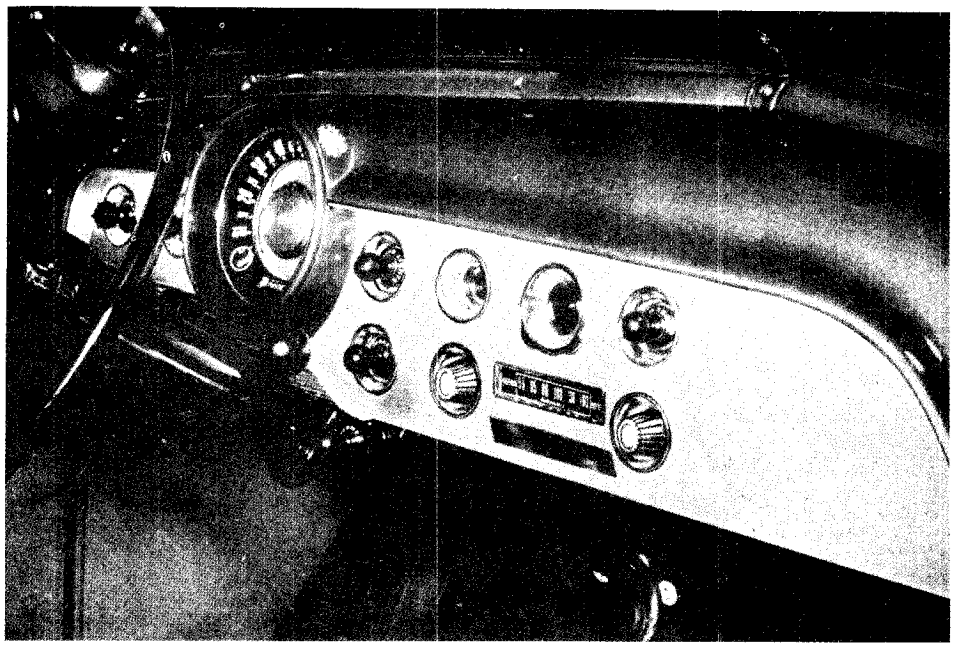


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION

1. Remove the radio opening cover plate by removing the speed nuts at the rear of the instrument panel.
2. Remove and discard radio bezel cups on car by removing hex nuts securing bezel cups to instrument panel.
3. Remove knobs, hex nuts, and bezel cups from tuning unit.
4. Carefully position tuning unit behind instrument panel so the mounting bushings and shafts protrude through the front panel.
5. Place bezel cups over mounting bushings.
6. Attach tuning unit and bezel cups to instrument panel with a hex nut on each mounting bushing.
7. Replace knobs.
8. Position mounting bracket over mounting stud located behind instrument panel and secure with a ¼" lockwasher and a ¼ - 20 nut.
9. Secure mounting bracket to side of tuning unit with hex head No. 8 self tapping screw, as shown in Fig. 2
10. Place speaker and power pack unit over three threaded stud bolts behind the instrument panel. (Position power pack unit so that power cable is located near the tuning unit.) See Fig. 2.
11. Secure power pack into position with the wing nuts supplied in the kit of mounting hardware.
12. Insert power cable plug into socket on rear of tuning unit.
13. Secure power cable under cable clamp and tighten clamp screw.
14. Plug antenna cable into tuning unit.
15. Connect "A" lead to terminal on ignition switch.

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MODELS 610,
F151, 1951 Ford

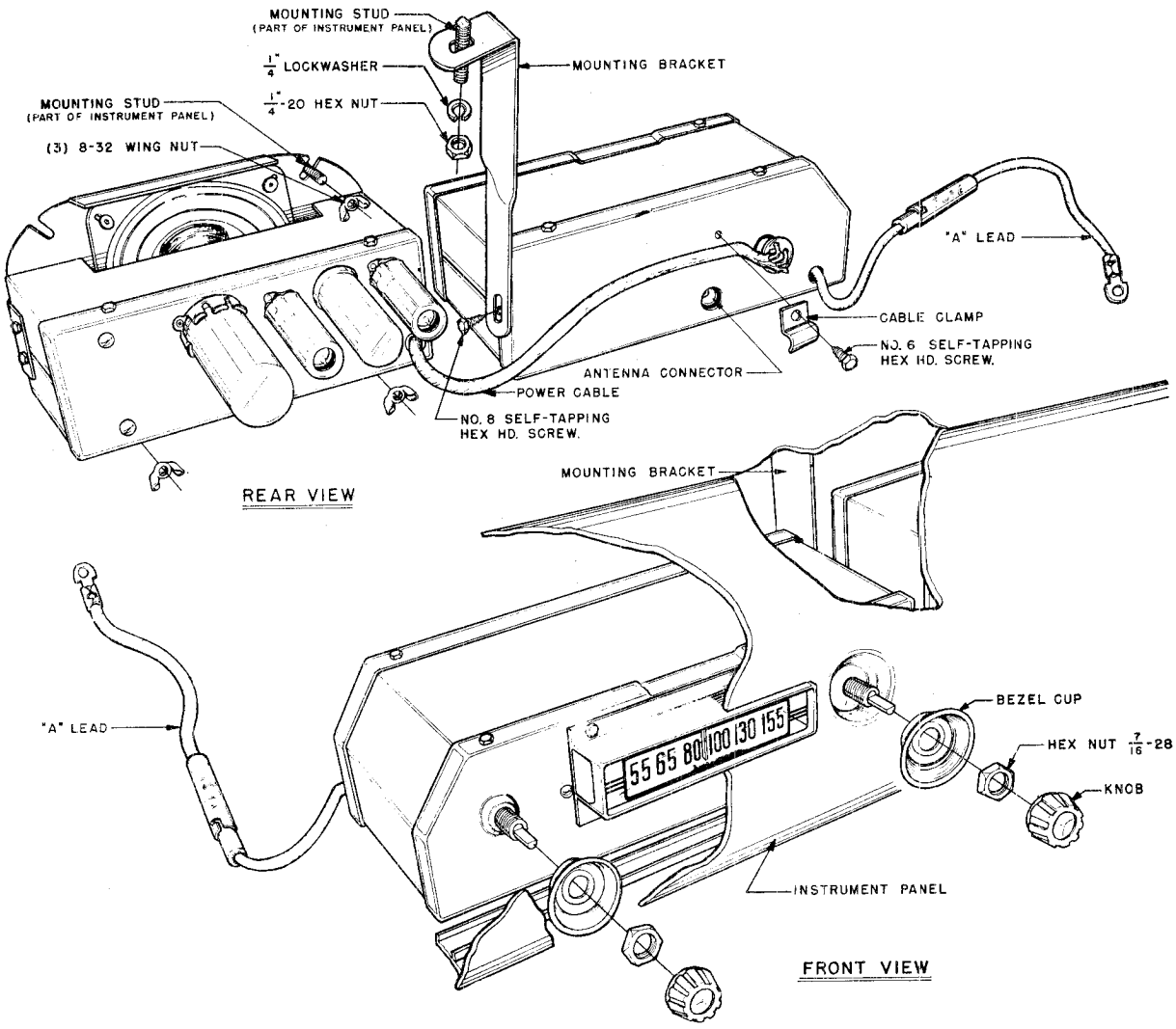


Fig. 2 DETAIL ASSEMBLY

ACCESSORIES FURNISHED FOR INSTALLATION

MOUNTING PARTS KIT

The following mounting hardware parts are shipped attached to the receiver.

(See detail assembly drawing FIG. 2)

2 Bezel cups
2 7/16 — 28 hex nuts
2 Knobs
1 Cable clamp

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

1 Supporting bracket
1 No. 8 self-tapping screw
1 1/4" lockwasher
1 1/4 — 20 nut
3 No. 8 — 32 wing nuts

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser
1 Distributor suppressor

Disconnect high tension wire that runs from the ignition coil to the center hole of the distributor head. Cut lead one and one-half inches back from metal tip end for 8 cylinder Ford or two and one-half inches back for 6 cylinder Ford. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead with attached suppressor, back into distributor head.

MODELS 610,
F151, 1951 Ford

DISTRIBUTOR SUPPRESSOR

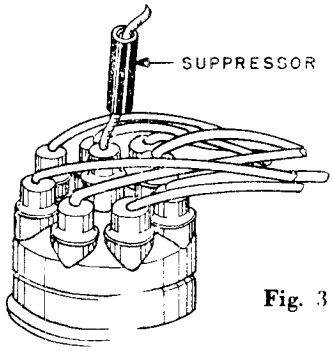


Fig. 3

DISTRIBUTOR 8 CYLINDER

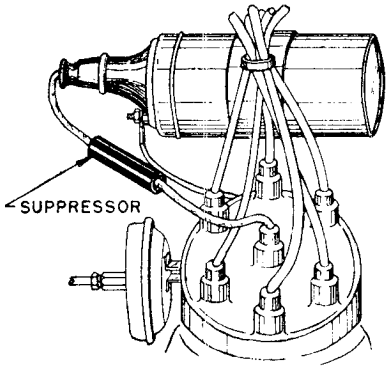


Fig. 4

DISTRIBUTOR-6 CYLINDER

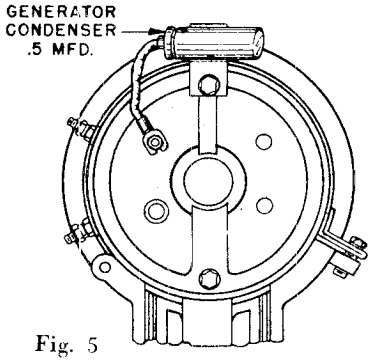


Fig. 5

GENERATOR CONDENSER

Loosen the top assembly bolt from the rear end plate of the generator. DO NOT REMOVE. Mount .5 MFD generator condenser under this bolt. Tighten bolt and connect condenser lead to the armature terminal of the generator.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA
ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier
(6AV6 used in place of 6AT6 on some models)

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a voltmeter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 7 and 7A).

All voltages should be measured with an input voltage of 6.3 volts DC.

To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

MODELS 610,
F151, 1951 Ford

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

If realignment is necessary follow the instructions given under the heading "Alignment Procedure." After realignment has been completed repeat the procedure as final check.

DIAL CORD DRIVE

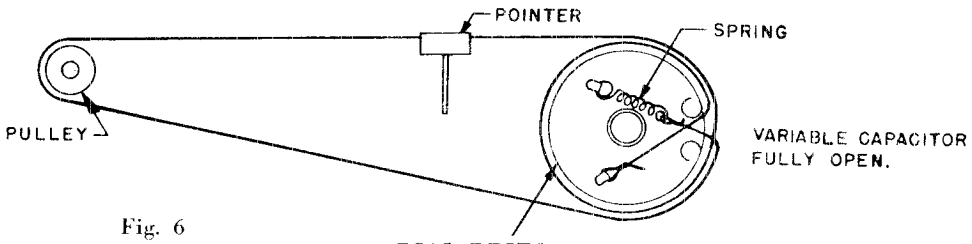


Fig. 6

HOW TO ORDER PARTS

Always give the part No. (No. printed on the part if different from that shown on this list) and the name of the part. When No. is not available, give complete description of part and the Model No. of this receiver.

REPLACEMENT PARTS LIST

SCHEMATIC DIAGRAM REF. NO.	PART NO.	DESCRIPTION
CONDENSERS		
C2, C3, C5	C207	.05 MFD 200 volt condenser
C4, C12	C209	.5 MFD 100 volt condenser
C6	CC200	100 MMFD ceramic condenser
C7, C9	CC201	200 MMFD ceramic condenser
C8	C203	.002 MFD 400 volt condenser
C10, C13	C206	.01 MFD 400 volt condenser
C11	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV1-CV2-CV3	CV-100A	3 section variable
RESISTORS		
R1	R309	1 megohm 1/2 watt 20% resistor
R2, R14	R303	330 ohm 1/2 watt 20% resistor
R3	R306	20K ohm 1/2 watt 20% resistor
R4	R314	1.5K ohm 1/2 watt 20% resistor
R5	RV-100	Volume control 3/4 megohm with switch
R6	R310	2 megohm 1/2 watt 20% resistor
R7	R311	10 megohm 1/2 watt 20% resistor
R8	R313	20K ohm 2 watt 20% resistor
R9	R307	250K ohm 1/2 watt 20% resistor
R10, R11	R301	100 ohm 1/2 watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
R13	R308	500K ohm 1/2 watt 20% resistor
COILS AND TRANSFORMERS		
L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke "A" line
L6	L202	Choke, vibrator hash

PART NO.	DESCRIPTION
T2	14977 or 1655-16 2nd IF transformer
T1	14977 or 1655-16 1st IF transformer
T3	TV-100 or 318V-2 Vibrator transformer
T4	Output transformer (Part of speaker not furnished separately)
DIAL PARTS	
D151	Dial Scale
H151	Dial Scale Holder
PS151	Dial Pointer
T47	Pilot Light
H114	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H115	String, dial drive
MISCELLANEOUS	
A300	"A" lead assembly
H152	Bezel Cup
H153	Case, less covers for Power Supply Unit
H154	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H102	Cover, power supply unit mounting (with speaker louvres)
A201	Fuse 15 Amp.
H155	Knob
H156	Mounting Bracket
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptacle, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5 1/4" PM (includes output transformer)
V-83	Vibrator
H311	Cup washer
H113	7/16—28 Hex nut
C100	.5 MFD generator condenser
R100	Distributor suppressor

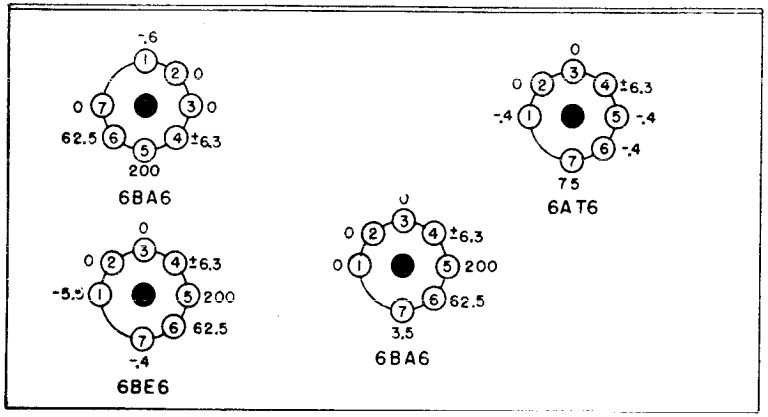
ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

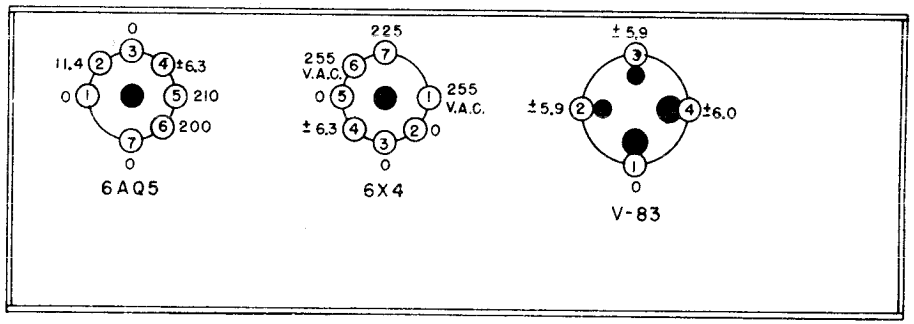
BOTTOM VIEW OF CHASSIS



FRONT OF CHASSIS

Fig. 7

BOTTOM VIEW OF POWER PACK



SOCKET VOLTAGES

Fig. 7A

MODELS 610,
F151, 1951 Ford

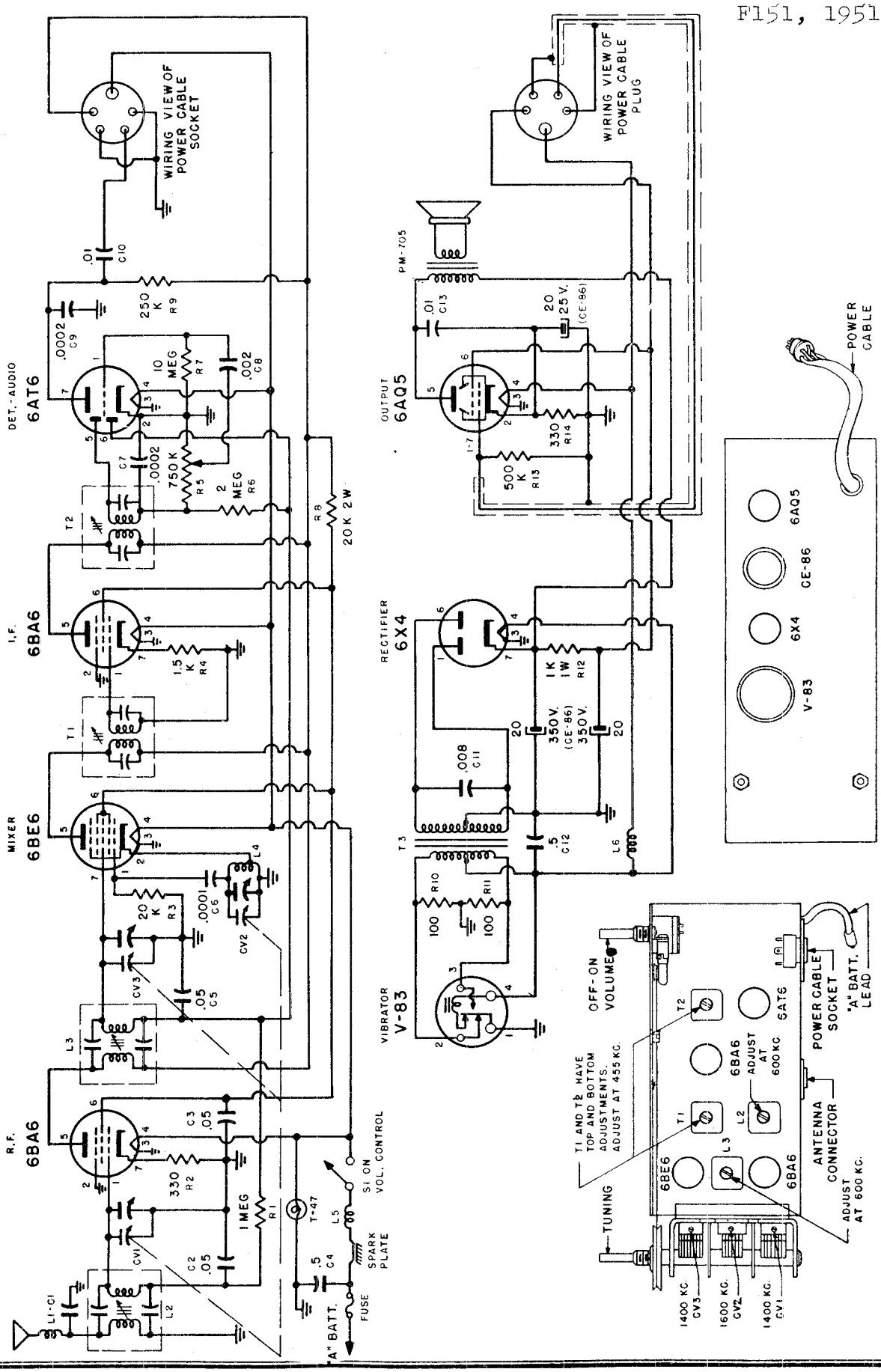
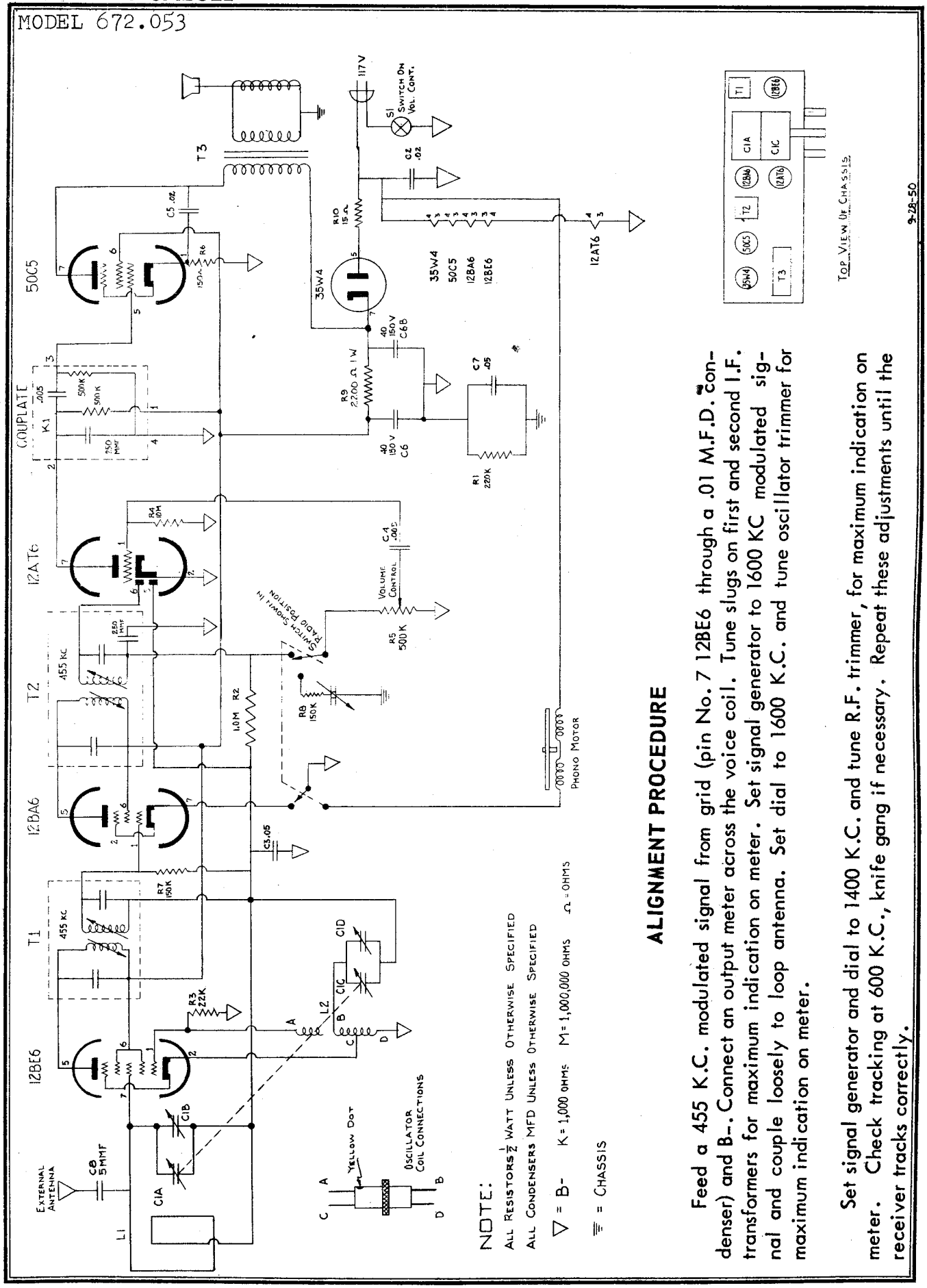


Fig. 8

(NOTE: 6AV6 Tube used in place of 6AT6 on some models.)
V-84 Vibrator used in place of V-83 on some models.

MODEL 672.053



ALIGNMENT PROCEDURE

Feed a 455 K.C. modulated signal from grid (pin No. 7 12BE6 through a .01 M.F.D. condenser) and B-. Connect an output meter across the voice coil. Tune slugs on first and second I.F. transformers for maximum indication on meter. Set signal generator to 1600 KC modulated signal and couple loosely to loop antenna. Set dial to 1600 K.C. and tune oscillator trimmer for maximum indication on meter.

Set signal generator and dial to 1400 K.C. and tune R.F. trimmer, for maximum indication on meter. Check tracking at 600 K.C., knife gang if necessary. Repeat these adjustments until the receiver tracks correctly.

MODEL 672.053

VOLTAGE CHART

PIN	#1	#2	#3	#4	#5	#6	#7
12BE6	-7.5	0	12AC	23AC	90	90	0
12BA6	-0.8	0	23AC	35AC	90	90	0
12AT6	-0.8	0	0	12AC	-0.8	-0.5	45
50C5	6	0	35AC	83AC	0	90	120
35W4	0	0	83AC	117AC	115AC	0	130

NOTES:
1. Measured with VTVM from indicated pin to B - line.
2. Phono-radio switch in radio position.
3. Line voltage set at 117V 60~AC.
4. Voltages may vary considerably due to variations in line voltage and components.

PARTS LIST

CAPACITORS

REF. NO.	PART NO.	DESCRIPTION
C_1	A-1200-6	TUNING CAPACITOR
C_2	CWZ 04203 M	.02 Mfd 400 volts
C_3	CWZ 04503 M	.05 Mfd 400 volts
C_4	CWZ 06502 M	.005 Mfd 600 volts
C_5	CWZ 04203 M	.02 Mfd 400 volts
C_6	CED-4415	DUAL 40 Mfd 150 volt electrolytic capacitor
C_7	CWR-04503 M	.05 Mfd resonant
C_8	CCC, 05050 M	5 Mmf ceramic or mica

RESISTORS

REF. NO.	PART NO.	DESCRIPTION
R_1	RCC 224 M	220,000 ohms ± 20% ½ watt Resistor
R_2	RCC 105 M	1.0 megohms ± 20% ½ watt Resistor
R_3	RCC 223 M	22,000 ohms ± 20% ½ watt Resistor
R_4	RCC 106 M	10 megohms ± 20% ½ watt Resistor
R_5	RVC-301S	500,000 ohms volume control audio taper with switch
R_6	RCC 151 M	150 ohms ± 20% ½ watt
R_7	RCC 154 M	150,000 ohms ± 20% ½ watt
R_8	RCC 154 M	150,000 ohms ± 20% ½ watt
R_9	RCF 222 M	2,200 ohms ± 20% 1 watt
R_{10}	RCC 150 M	15 ohms ± 20% ½ watt

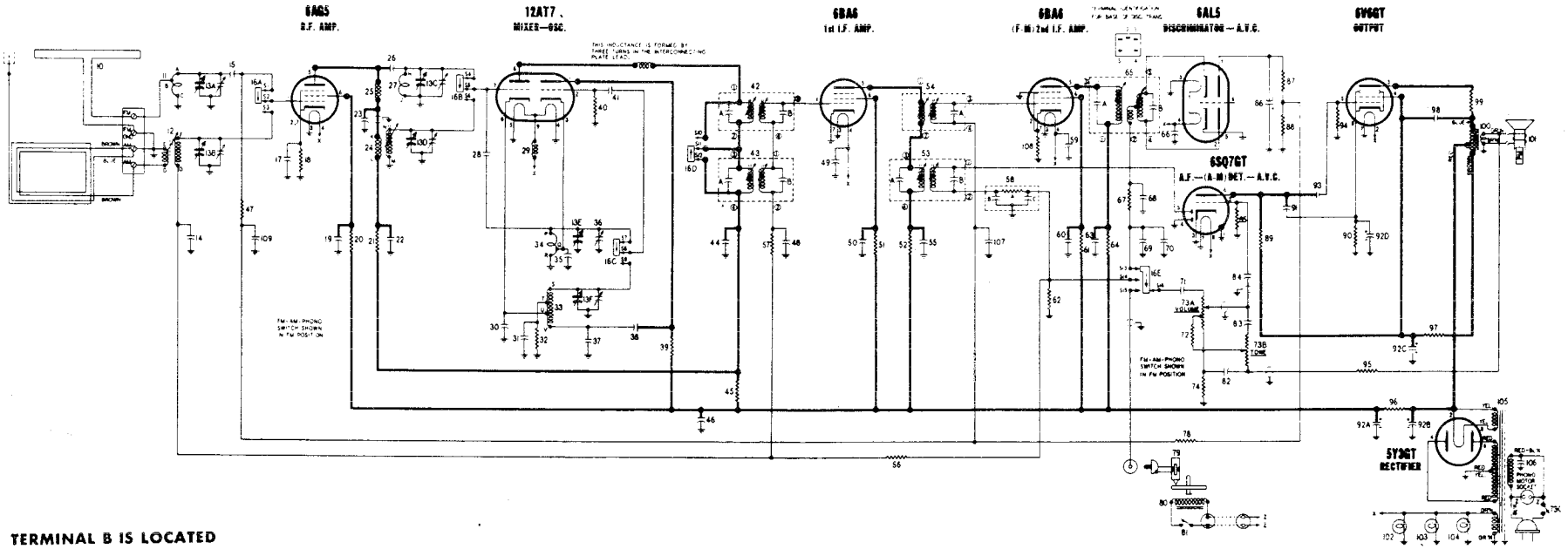
COILS AND TRANSFORMERS

REF. NO.	PART NO.	DESCRIPTION
L_1	A-1493-10	Loop Antenna
L_2	A-1492-10	Oscillator Coil
T_1	A-1490-10	Input IF Transformer
T_2	A-1491-10	Output IF Transformer
T_3	A-1656-13	Audio Output Transformer 2500Ω to 3.2

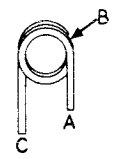
MISCELLANEOUS

C-2500-14	Record changer - VM
A-1059-4	Control knob
A-1060-4	Pointer knob
100-84	Record Changer - Webster

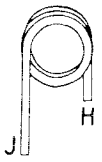
SERVICE DATA FOR STEWART-WARNER MODELS 9150-D & 9150-DZ



TERMINAL B IS LOCATED 1¼ TURN FROM TERMINAL A

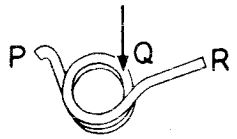


FM ANT. COIL 506353

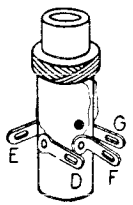


FM R.F. COIL 506351

TERMINAL Q IS LOCATED ⅜ TURN FROM TERMINAL R

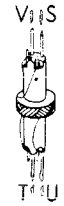


FM OSC. COIL 506352



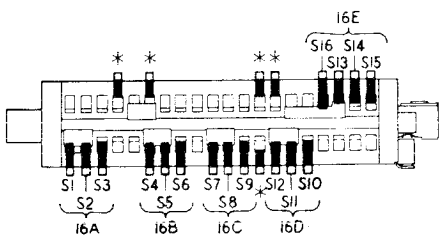
AM ANT. COIL 506354

AM R.F. COIL 506345



AM OSC. COIL 506335

NOTE: For additional data, See Model 9150-B, Pgs. 21-1 to 21-8.



★ Not used; may serve as wiring junction point.

BAND SWITCH 506347

Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

SOCKET VOLTAGES

Voltages measured at certain tube socket terminals on 9150-D and 9150-DZ chassis will differ as follows from those shown on the voltage chart for Model 9150-B on Page 1950-47; all other socket voltages remain unchanged.

Pin 1 of 12AT7 Mixer Osc.	203 v.
Pin 7 of 12BA6 (FM) 2nd I.F. Amp.	1 v.

MODELS 9150-D,
9150-DZ

PRODUCTION CHANGES

The Models 9150-D and 9150-DZ chassis have been designed to provide greater stability in the oscillator circuit and to adapt a single needle, ceramic type cartridge in the phono circuit, making it possible to play both standard and long playing records without changing cartridge or needle position. The phono pick-up filter circuit has been eliminated.

The circuit shown on this page applies to Models 9150-D and 9150-DZ chassis.

The following tabulation furnishes complete details on the circuit differences between the Model 9150-B chassis and the Models 9150-D and 9150-DZ chassis. Chassis incorporating these changes have the letter "A" stamped on rear surface of the chassis.

Diagram No.	Description	Used On 9150-B	Used On 9150-D and/or 9150-DZ
39	Resistor	1,000 Ohms	4,700 Ohms
75	Resistor	68,000 Ohms	Omitted
76	Condenser	.01 MFD	Omitted
77	Resistor	220,000 Ohms	Omitted
95	Resistor	4,700 Ohms ±20%	4,700 Ohms ±10%
108	Resistor	Omitted	68 Ohms
109	Condenser	Omitted	5000 Mmfd.
79	Pick-Up Cartridge	Crystal	Ceramic
80	Phono Motor	508120—Used with VM-508222 Record Changer.	509301—Used with VM-509032 Record Changer on Model 9150-D. 520053—Used with GI-509522 Record Changer on Model 9150-DZ.
81	Switch-"ON-OFF" for Record Changer	505269—Used with VM-508222 Record Changer.	509205—Used with VM-509032 Record Changer on Model 9150-D. 520037—Used with GI-509522 Record Changer on Model 9150-DZ.

PARTS LIST

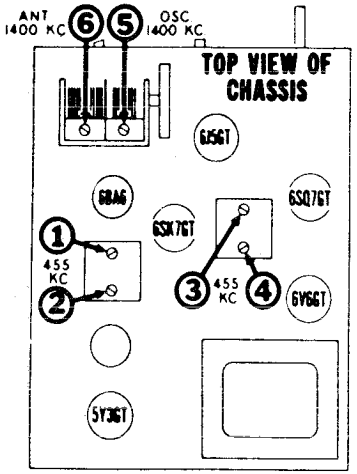
These parts are common to Models 9150-D and 9150-DZ only.
(Complete parts list given on service data sheet for Model 9150-B, Page 1950-48.)

DIAGRAM NO.	PART NO.	DESCRIPTION
ELECTRICAL PARTS		
39	510249	Resistor—carbon 4,700 ohms ±20%, 1 W
95	510148	Resistor—carbon 4,700 ohms ±10%, ½ W
108	510115	Resistor—carbon 68 ohms ±10%, ½ W
109	513013	Condenser—ceramic 5,000 Mmfd. 450 Volt
RECORD CHANGER PARTS		
		(For mechanical parts, see page 129 in Record Changer Section of manual for information on VM-509032 used on Model 9150-D; or page 145 in Record Changer Section of manual for information on G1-509522 used on Model 9150-DZ.)
	509032	Record Changer (3 speed) for Model 9150D
	509522	Record Changer (3 speed) for Model 9150-DZ
79	509160	Cartridge, ceramic (includes needle)
80	509301	Motor—115 Volt, 60 Cycle; Model 9150-D
	520053	Motor—115 Volt, 60 Cycle; Model 9150-DZ
	509161	Needle, phonograph; Models 9150-D and 9150-DZ
81	509205	Switch-changer, "OFF-ON"; Model 9150-D
	520037	Switch-changer, "OFF-ON"; Model 9150-DZ
	508533	Inserts for 45 R.P.M. records; package of 12
CABINET PARTS		
	508991	Bracket-tie, for record changer pull-out mechanism; Models 9150-D and 9150-DZ
	509033	Cabinet for Model 9150-D
	509533	Cabinet for Model 9150-DZ
	509025	Door, changer compartment; Models 9150-D and 9150-DZ
	509026	Door, radio tilt, assembly (less pivot screws and door pull); Models 9150-D and 9150-DZ
	509027	Door, record compartment; Models 9150-D and 9150-DZ
	509051	Record changer base assembly; Model 9150-D
	509781	Record changer base assembly; Model 9150-DZ
	508990	Rod-tie, for record changer pull-out mechanism; Models 9150-D and 9150-DZ

ALIGNMENT PROCEDURE

1. With the gang condenser fully meshed, the dial pointer should be in a horizontal position at low end of dial, parallel to the bottom edge of dial scale. If it is set incorrectly, merely hold tuning control shaft steady and turn pointer to correct position.
2. Connect an output meter across the speaker voice coil or from the plate of the 6V6GT tube to chassis through a .1 Mfd. condenser.
3. Connect the ground lead of signal generator to the receiver chassis.
4. Set volume control at maximum position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIG. GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. Condenser	Lug on trimmer No. 6 on antenna section of gang (see figure below for location of trimmer).	**455 KC** 400 cycle Modulation	Any point where it does not affect the signal.	**1-2**	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Clip	**1400 KC** 400 cycle Modulation	1400 KC	**5**	Broadcast Oscillator	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip	**1400 KC** 400 cycle Modulation	Tune to 1400 KC generator signal	**6**	Broadcast Antenna	Adjust for maximum output.

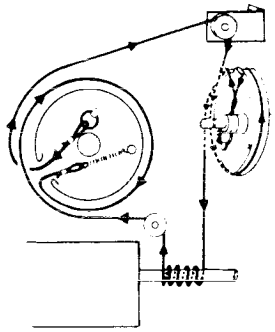


TRIMMER LOCATIONS

To string dial cord, set gang condenser to fully open position and use the following parts:

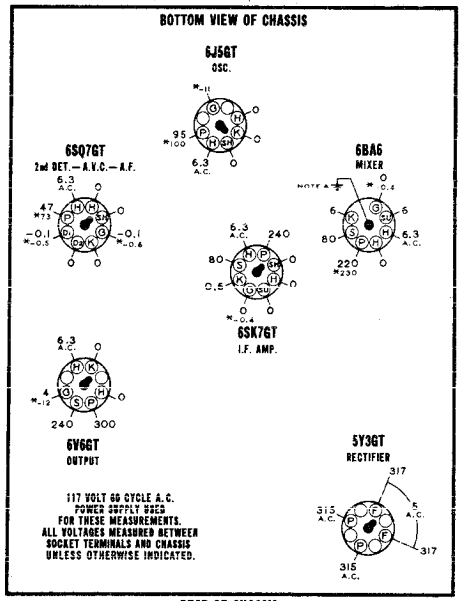
114955 Clip on end of cord
117057 Cord (3 feet)
119087 Ring for dial cord
505161 Tension spring

To replace and properly position pointer see step 1 in "Alignment Procedure" above.



DIAL AND POINTER DRIVE CORD ARRANGEMENT

SIDE VIEW



SOCKET VOLTAGES

All measurements made with a voltmeter having a sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

DIAL TUNED TO 540 KC.

VOLUME ON FULL WITH NO SIGNAL

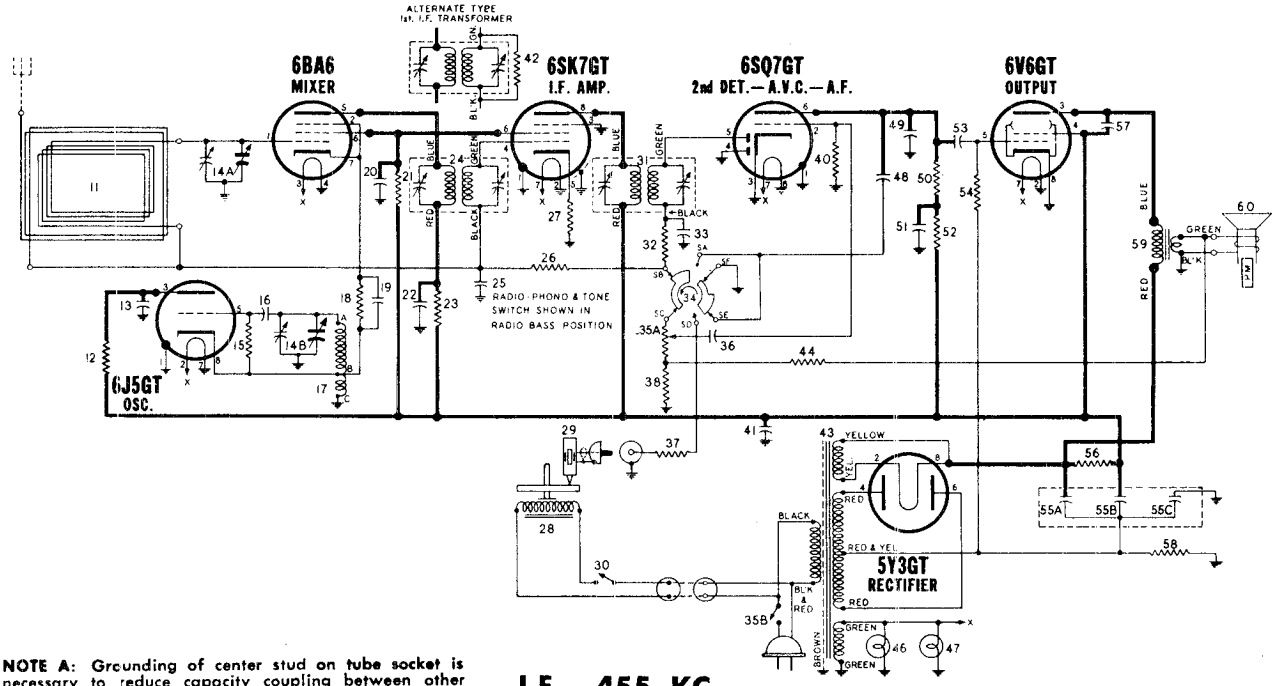
RADIO-PHONO & TONE SWITCH IN "RADIO-BASS" POSITION

AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and should it ever be necessary to replace the speaker or output transformer it is important to maintain a definite phase relationship in the feed-back circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the speaker.

MODELS 9154-C, 9154-CZ

MODELS 9154-C,
9154-CZ

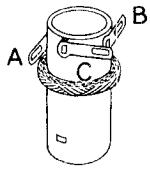


NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

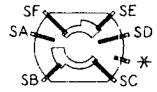
I.F. 455 KC.

PARTS LIST

OSCILLATOR COIL 505326



RADIO-PHONO & TONE SWITCH 505317



REAR VIEW

*Not used; may serve as wiring junction point.

Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13	512010	Condenser—.01 Mfd. 400 volt
14-A,B,	505315	Condenser—variable gang (with drum)
16	512503	Condenser—mica 100 Mmfd. 500 volt
19	512026	Condenser—.05 Mfd. 200 volt
20	512028	Condenser—.05 Mfd. 400 volt
22	512016	Condenser—.02 Mfd. 400 volt
25	512026	Condenser—.05 Mfd. 200 volt
33	512503	Condenser—mica 100 Mmfd. 500 volt
36	512006	Condenser—.005 Mfd. 600 volt
41	512028	Condenser—.05 Mfd. 400 volt
48	512006	Condenser—.005 Mfd. 600 volt
49	512509	Condenser—mica 260 Mmfd. 500 volt
51	512034	Condenser—.1 Mfd. 400 volt
53	512016	Condenser—.02 Mfd. 400 volt
55-A, B, C,	502207	Condenser—electrolytic A—20 Mfd.—400 volt B—10 Mfd.—400 volt C—20 Mds.— 25 volt
57	512006	Condenser—.005 Mfd. 600 volt
		RESISTORS
12	510263	Resistor—carbon 33,000 Ohms ± 10% 1 watt
15	510167	Resistor—carbon 47,000 Ohms ½ watt
18	510143	Resistor—carbon 2,200 Ohms ½ watt
21	510267	Resistor—carbon 47,000 Ohms 1 watt
23	510152	Resistor—carbon 6,800 Ohms ½ watt
26	510194	Resistor—carbon 3.3 Meg. ½ watt
27	510112	Resistor—carbon 47 Ohms ± 10% ½ watt
32	510167	Resistor—carbon 47,000 Ohms ½ watt
35-A,B,	505318	Volume Control 1 Meg. (with switch)
37	510185	Resistor—carbon 470,000 Ohms ½ watt
38	510122	Resistor—carbon 150 Ohms ½ watt
40	510195	Resistor—carbon 4.7 Meg. ½ watt
42	510191	Resistor—carbon 1 Meg. ½ watt
44	510146	Resistor—carbon 3,300 Ohms ½ watt
50, 52	510179	Resistor—carbon 220,000 Ohms ½ watt
54	510185	Resistor—carbon 470,000 Ohms ½ watt
56	510346	Resistor—carbon 3,300 Ohms 2 watt
58	510707	Resistor—wire wound 200 Ohms ± 5% 2 watt
		COILS AND TRANSFORMERS
11	505306	Loop antenna
17	505326	Coil-oscillator
24	502657	Transformer—1st I.F.
31	502658	Transformer—2nd I.F.
43	502174	Transformer—power
59	505305	Transformer—output

OTHER ELECTRICAL PARTS

28	509301	Motor—115 V., 60 cycle, for type VM-509032 record changer; used on Model 9154-C
	520053	Motor—115 V., 60 cycle, for type GI-509522 record changer; used on Model 9154-CZ
29	509160	Pick-up cartridge
30	509205	Switch—"OFF-ON" for type VM-509032 record changer; used on Model 9154-C
	520037	Switch—"OFF-ON" for type GI-509522 record changer; used on Model 9154-CZ
34	505317	Switch—radio-phono-tone
46, 47	110629	Lamp—dial (Mazda #44) 6.3 V. 0.25 A.
60	508174	Speaker—P. M. dynamic (6" x 9")

MISCELLANEOUS PARTS

116467	Base for mtg. electrolytic condenser
505165	"C" Washer
509300	Cabinet for Model 9154-C
509530	Cabinet for Model 9154-CZ
112745	Clip for mounting oscillator coil
114955	Clip—retainer on end of dial cord
160326	Clip—retains dial background
117057	Cord—dial drive (3 ft. required)
509471	Dial scale (foil)
509819	Drawer assembly for Model 9154-C
509473	Drawer assembly for Model 9154-CZ
508350	Escutcheon and dial window assembly
508404	Handle for record changer drawer
505344	Knob—tuning
505345	Knob—"VOLUME"
505346	Knob—"RADIO-PHONO"
509161	Needle for record changer
500966	Plug—phono. pick-up cable
501031	Plug—phono. motor cable
505686	Pointer
509472	Rail for drawer
509032	Record changer (3 speed) for Model 9154-C
509522	Record changer (3 speed) for Model 9154-CZ
119087	Ring for dial cord
505944	Rubber pad for mounting chassis
79993	Screw—No. 8 x 1¼" for mtg. chassis
162054	Shaft and drum for pointer
505313	Shaft, tuning
117716	Shield—tube
504397	Socket—miniature
116690	Socket—octal base
160392	Socket—octal (rectifier)
160039	Socket—phono. input
505307	Socket and phono. motor cable
505459	Socket—dial lamp
505161	Spring—dial cord tension
111456	Washer—spring washer for tuning shaft

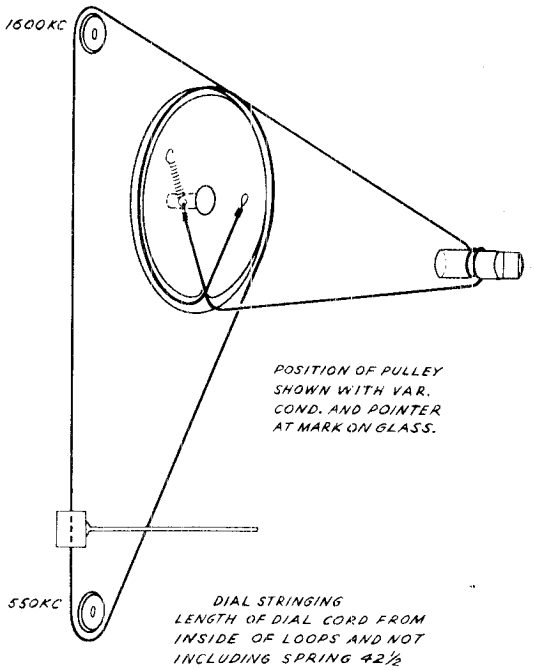
MODELS 1507PLA,
1507PLM, Ch. 112113

SPECIFICATIONS

Voltage Rating	117 Volts, 60-Cycle
Type of Circuit	Superhetrodyne
Tuning Range	AM — 535 KC to 1630 KC FM — 87 MC to 109 MC
Input Power Rating	Radio 80 Watts Phono 110 Watts
Intermediate Frequency	AM — 455 KC FM — 10.7 MC
Speaker Voice Coil Impedance	3.2 Ohms
Power Output	3.8 Watts at 10% Distortion

TUBE COMPLEMENT

4	6BA6	RF & IF Amplifiers
1	12AT7	FM Converter
1	6BE6	AM Converter
1	6AL5	Ratio Detector
1	6AU6	Audio Amplifier
1	6V6GT	Power Output
1	5Y3GT	Rectifier



ALIGNMENT PROCEDURE 1507

On IF and Radio Detector transformers, primary slugs are under chassis and secondary slugs above chassis.
Adjust AM loop trimmer after chassis is in cabinet for best reception at 1500 Kc.
Adjust dial pointer to marker at top left of dial with condenser plates fully meshed.

A.M. - I.F.

Band & Pointer	Signal Generator	VTVM or Scope Connection	Adjustment and Notes
1. AM low end of dial.	455 Kc. 400 cy. mod. to Pin 7 (Grid) of 6BE6 tube through .01 cap.	Term. 1 of T-2 and ground.	Adj. two AM-IF trans. using —3V DC Scale.
2. "	455 Kc. swept 15 Kc.	"	Adjust same for best double-trace curve on scope.

F.M. - I.F.

1. FM low end of dial.	10.7 Mc. 400 cy. mod. to Pin 2 (Grid) of 12AT7 tube at RF Coil thru .01 capacitor.	Across C-72 (5 MF electrolytic)	Adj. two FM-IF trans. and pri. ratio det. trans., using—3 VDC scale.
2. "	10.7 Mc. swept 150 Kc.	"	Disconnect ground end of C-72 (5 mfd. electrolytic). Adj. as step 1 for best double-trace curve on scope.
3. "	10.7 Mc. 400 cy. mod. to Pin 2 (Grid) of 12AT7 tube at RF Coil thru .01 capacitor.	Center of 2-100K resistors placed across C-72 and junction of C-73 and R-71.	Be sure VTVM is not grounded. Connect C-72, Adj. sec. ratio det. for 0 voltage.

A.M. - R.F.

1. AM 1500 Kc.	1500 Kc. 400 cy. mod. coupled loosely to loop leads.	Term. 1 of T-2 and ground.	Adj. two trimmers on tuning cond., using low —DC scale.

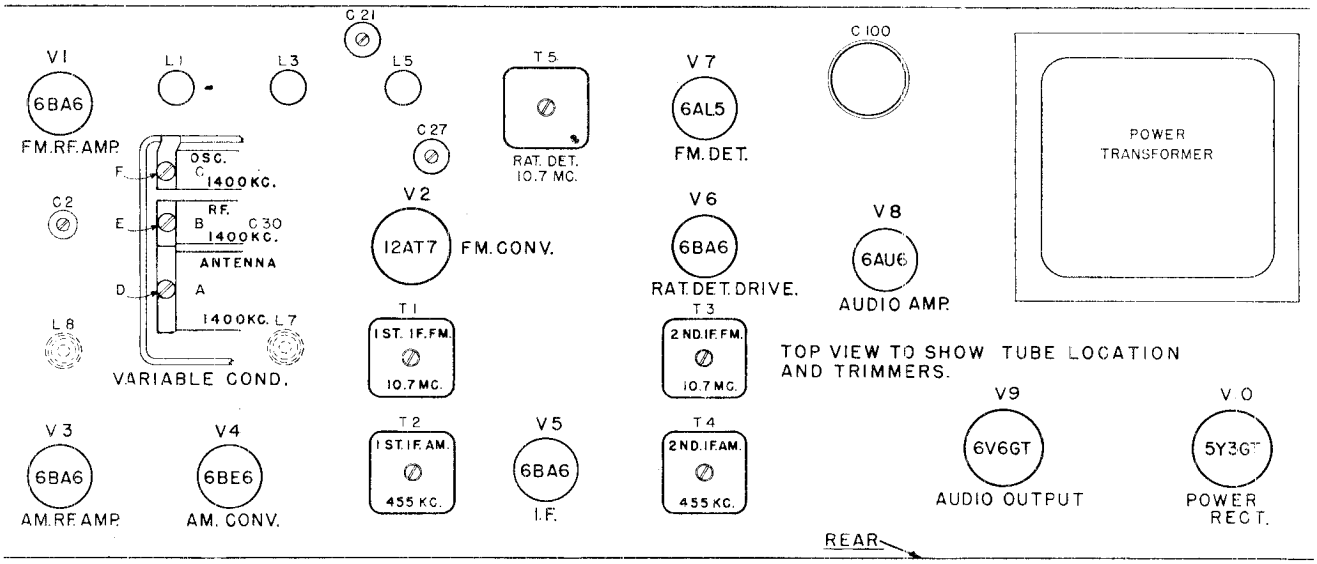
F.M. - R.F.

1. FM 100 mc.	100 Mc. 400 cy. mod. to FM Ant. Terms., thru 270 ohm resistor.	Across C-72.	Adj. C-27 (Osc.) C-21 (RF) and C-2 (Ant.) on low —DC scale.

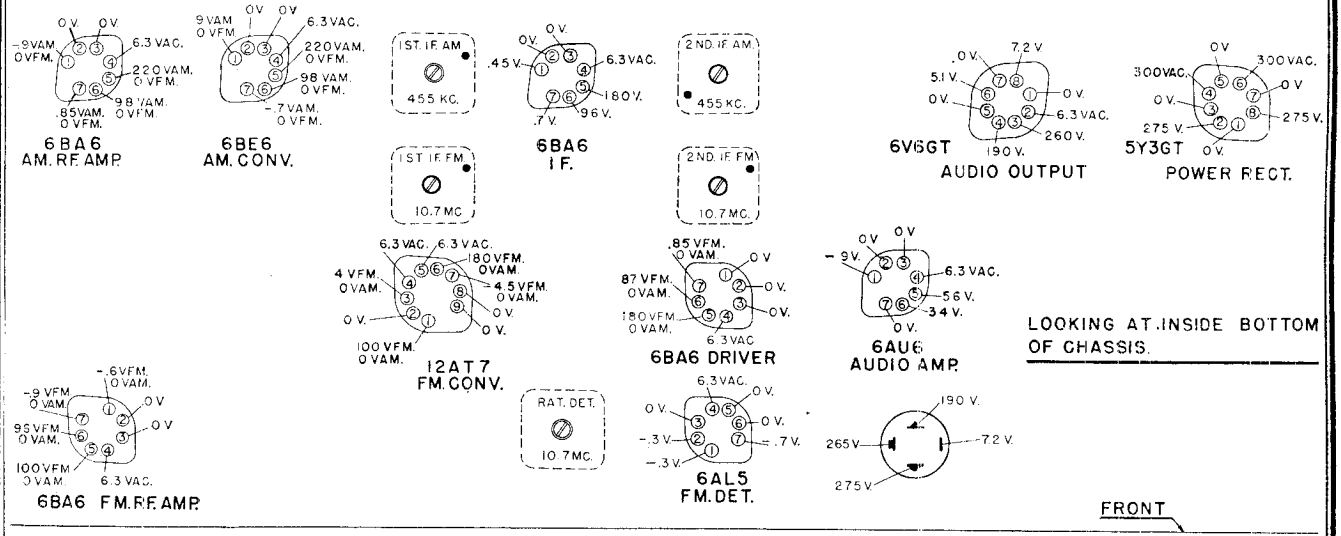
Align both IF channels if either is out of adjustment.
Use a non-metallic screwdriver and light pressure for slug adjustment.
If FM osc. coil is replaced, adjust placement of its ground lead for tracking at 88 mc.

MODELS 1507PLA,
1507PLM, Ch. 112113

No. 1507 TUBE LOCATION CHART

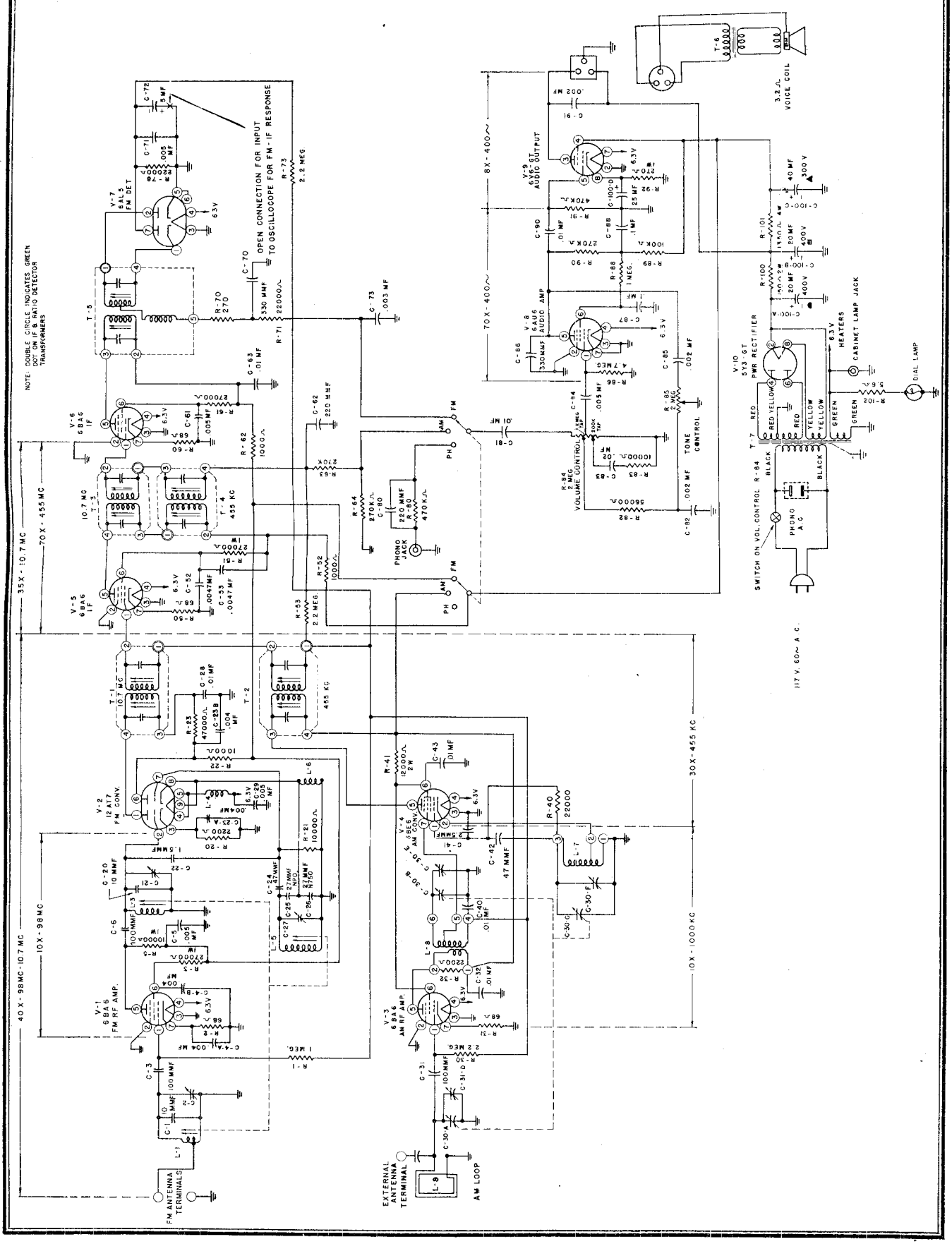


No. 1507 VOLTAGE CHART



ALL MEASUREMENTS MADE WITH SWITCH IN FM POSITION UNLESS OTHERWISE SPECIFIED. VOLTAGES MEASURED WITH RESPECT TO CHASSIS GROUND. DOTS ON I.F. TRANSFORMERS INDICATE THE POSITION OF THE COLOR CODED TERMINAL.

MODELS 1507PLA,
1507PLM, Ch: 112113



MODELS 1507PLA, 1507PLM, Ch. 112113

Resistors

Circuit Symbol	S-C Part No.	Resistance	Watt	Tol.
R-80	149117	470K ohms	½	20%
R-82	28178	56K ohms	½	10%
R-83	149107	10K ohms	½	20%
R-84	114118	2 Meg.	Pot.	
R-85	145119	2 Meg.	Pot.	
R-86	149123	4.7 Meg.	½	20%
R-88	149119	1 Meg.	½	20%
R-89	149113	100K ohms	½	20%
R-90	28184	270K ohms	½	10%
R-91	149117	470K ohms	½	20%
R-92	149170	270 ohms	1W	10%
R-100	149071	150 ohms	2W	20%
R-101	149321	1350 ohms	4W	10%
R-102	149374	5.6 ohms	½	10%

Coils

Circuit Symbol	S-C Part No.	Type
L-1	114097	ANT. COIL (FM)
L-3	114098	RF COIL (FM)
L-4	114693	RF CHOKE (HEATER)
L-5	114098	OSC. COIL (FM)
L-6	114693	RF CHOKE (CATHODE)
L-7	114096	OSC. COIL (AM)
L-8	114095	RF COIL (AM)
L-9	139043	LOOP ASM.

Transformers

Circuit Symbol	S-C Part. No.	Description
T-1	114403	1st IF (10.7 Mc. FM)
T-2	114364	1st IF (455 KC. AM)
T-3	114363	2nd IF (10.7 Mc. FM)
T-4	114337	2nd IF (455 KC. AM)
T-5	114404	RATIO DETECTOR
T-6	161257	AUDIO OUTPUT TRANSFORMER
T-7	161032	POWER TRANSFORMER

Miscellaneous Chassis Parts

Description	Chassis Model
Chassis Assembly	112113
Dial Lamp	29956
Phono Socket	31539
Dial Cord	81702
IF Transformer Mtg. Clip	113030
Core, FM Tuner Coil	118045
Dial Glass	122039
Pointer	144022
Drum Pulley Assembly	147072
Shield, 12AT7	151067
Shield Base, 12AT7	151069
Socket, Octal	152014
Socket, Speaker	152033
Socket, 12AT7	152076
Socket, 7 Pt. min.	152098
Socket, Dial Lamp	152099
Spring, Dial Cord	156042
Switch, Range	158044

General Assembly Parts

Description	PLM	PLA
Phono Back Panel	101165	101165
Phono Drawer Panel Bracket, Left	105263	105263
Phono Drawer Panel Bracket, Right	105264	105264
Cabinet Assembly	108184	108183
Escutcheon	125057	125057
Phono Slide	132160	132160
Knob	134058	134058
Knob — Indicator	134070	134070
Phono Assembly	148045	148045
Cab Light Socket & Plug Assem.	152009	152009
Speaker Assembly	155190	155190
Speaker	155154	155154
Lamp Cap Red	801401	801401

Capacitors

Circuit Symbol	S-C Part No.	Capacity	Type	Voltage
C-1	110469	10 MMF	NPO Ceramic	500
C-2	110045	1-12 MMF	Trimmer	
C-3	110460	100 MMF	GP Ceramic	500
C-4	110685	.004 MF Dual	Disc Ceramic	
C-5	110586	.005 MF	Disc Ceramic	500
C-6	110451	100 MMF	GP Ceramic	500
C-20	110469	10 MMF	NPO Ceramic	400
C-21	110045	1-12 MMF	Trimmer	
C-22	110438	1.5 MMF		500
C-23	110685	.004 MF Dual	Disc Ceramic	
C-24	110458	47 MMF	GP Ceramic	500
C-25	110689	27 MMF	NPO Ceramic	400
C-26	110690	27 MMF	N750 Ceramic	400
C-27	110045	1-12 MMF	Trimmer	
C-28	110687	.01 MF	Tubular	400
C-29	110586	.005 MF	Disc Ceramic	500
C-30	110044	3 Gang Variable		
C-31	110451	100 MMF	GP Ceramic	500
C-32	110687	.01 MF	Tubular	400
C-40	110672	.01 MF	Disc Ceramic	450
C-41	110412	2.5 MMF	N750 Ceramic	400
C-42	110458	47 MMF	GP Ceramic	500
C-43	110687	.01 MF	Tubular	400
C-52	110538	.0047 MF	Tubular	400
C-53	110538	.0047 MF	Tubular	400
C-61	110586	.005 MF	Disc Ceramic	
C-62	110462	220 MMF	GP Ceramic	350
C-63	110540	.01 MF	Tubular	400
C-70	110463	330 MMF	GP Ceramic	350
C-71	110586	.005 MF	Disc Ceramic	500
C-72	111047	5 MF	Electrolytic	50
C-73	46315	.003 MF	Tubular	400
C-80	110462	220 MMF	GP Ceramic	
C-81	110687	.01 MF	Tubular	400
C-82	27646	.002 MF	Tubular	600
C-83	25150	.02 MF	Tubular	400
C-84	110688	.005 MF	Tubular	400
C-85	27646	.002 MF	Tubular	600
C-86	110463	330 MMF	GP Ceramic	
C-87	25483	.1 MF	Tubular	400
C-88	25483	.1 MF	Tubular	400
C-90	25485	.01 MF	Tubular	600
C-91	27646	.002 MF	Tubular	600
C-100	111090	20-20 MF	Electrolytic	450
		40 MF	Electrolytic	350
		25 MF	Electrolytic	25

Resistors

Circuit Symbol	S-C Part No.	Resistance	Watt	Tol.
R-1	149119	1 Meg.	½	20%
R-2	28144	68 ohms	½	10%
R-3	34578	27K ohms	1W	10%
R-5	30417	10K ohms	1W	10%
R-20	28162	2200 ohms	½	10%
R-21	149107	10K ohms	½	20%
R-22	149101	1000 ohms	½	20%
R-23	149111	47K ohms	½	20%
R-30	149121	2.2 Meg.	½	20%
R-31	28144	68 ohms	½	10%
R-32	28162	2200 ohms	½	10%
R-40	149109	22K ohms	½	20%
R-41	149055	12K ohms	2W	10%
R-50	28144	68 ohms	½	10%
R-51	34578	27K ohms	1W	10%
R-52	149101	1000 ohms	½	20%
R-53	149121	2.2 Meg.	½	20%
R-60	28144	68 ohms	½	10%
R-61	34578	27K ohms	1W	10%
R-62	149101	1000 ohms	½	20%
R-63	28184	270K ohms	½	10%
R-64	28184	270K ohms	½	10%
R-70	28151	270 ohms	½	10%
R-71	149109	22K ohms	½	20%
R-72	149107	10K ohms	½	20%
R-73	149121	2.2 Meg.	½	20%

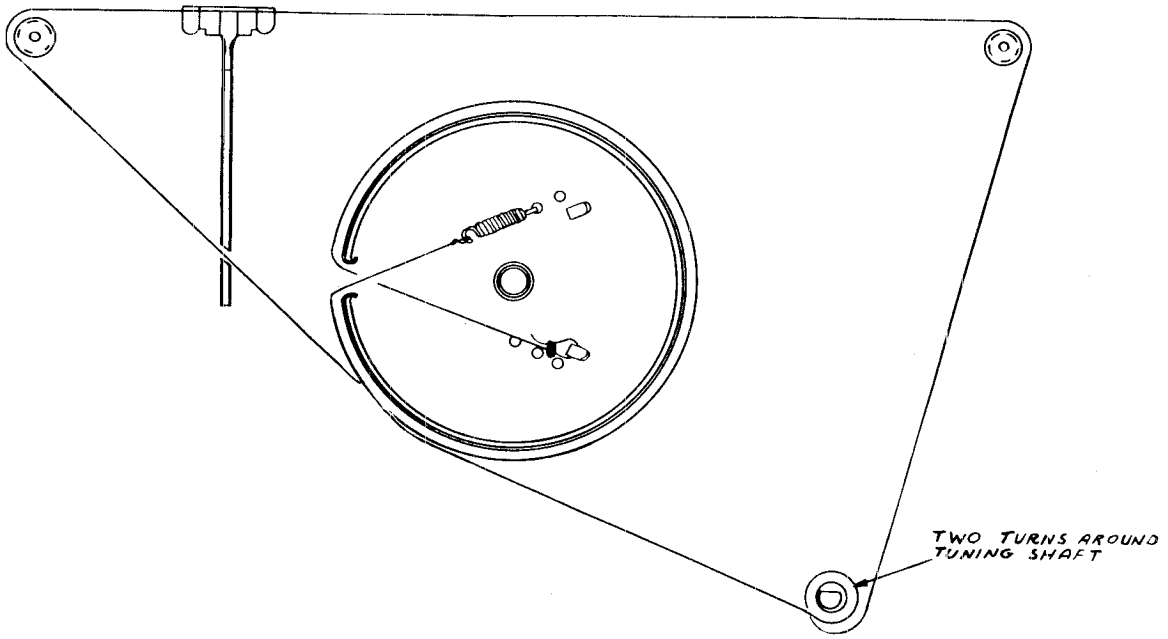
MODEL 1608,
Ch. 112125

TUBE COMPLEMENT

1	6BA6	RF Amplifier
1	6BE6	Converter
1	6BA6	IF Amplifier
1	6AV6	Detector and Phase Inverter
1	6AV6	Audio Amplifier
2	6V6-GT	Push Pull Power Output
1	5Y3-GT	Rectifier

SPECIFICATIONS

Voltage Rating	117 Volts, 60 Cycle
Type of Circuit	Superhetrodyne
Tuning Range	540 KC to 1630 KC
Input Power Rating	115 Watts
Intermediate Frequency	455 KC
Speaker Voice Coil Impedance	3.2 Ohms
Power Output	10 Watts at 10% distortion



POSITION OF PULLEY SHOWN WITH VARIABLE CONDENSER CLOSED AND POINTER AT MARK ON DIAL

ALIGNMENT PROCEDURE 1608

Adjust dial pointer to marker at extreme low frequency end of dial with variable condenser fully meshed.

Adjust AM loop trimmer after chassis is in cabinet for best reception at 1500 Kc.

Use a non-metallic screwdriver and light pressure for slug adjustment.

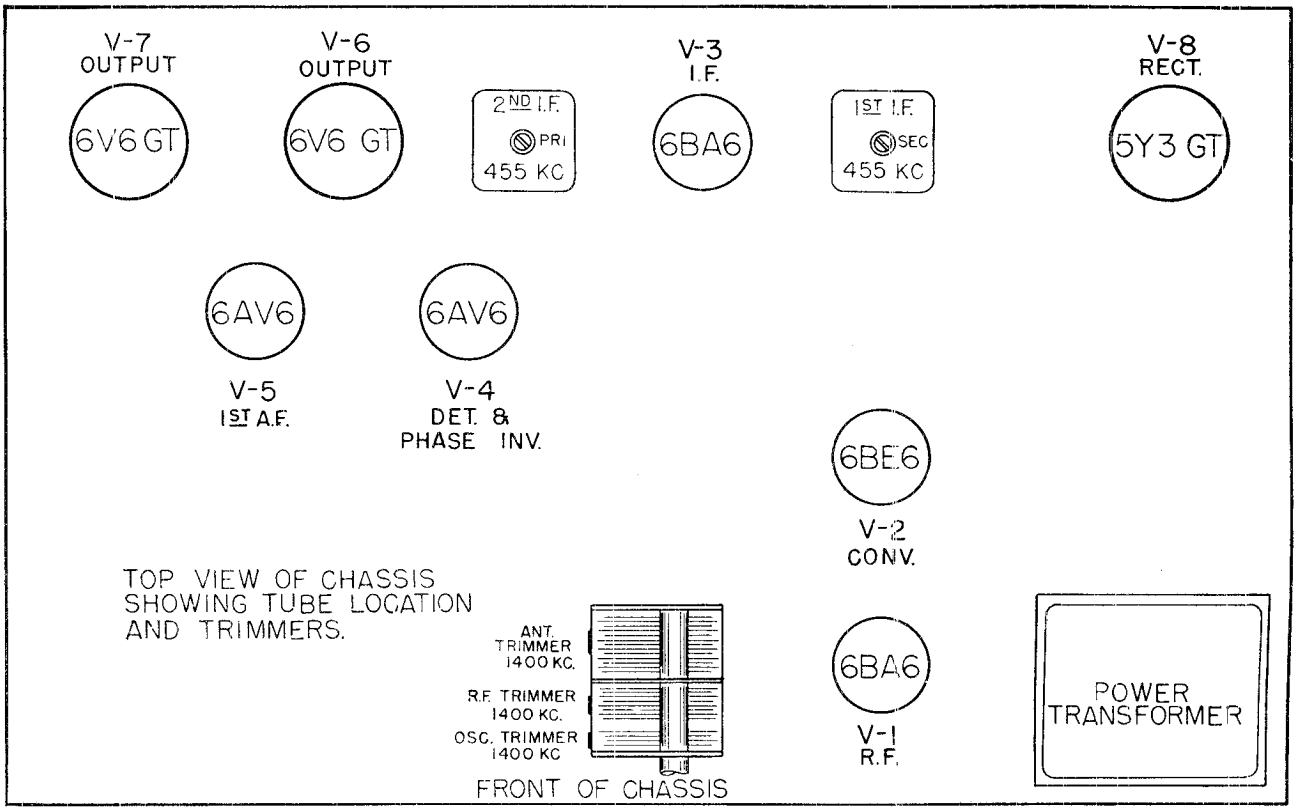
Set volume and tone controls for maximum.

A.M. - I.F.

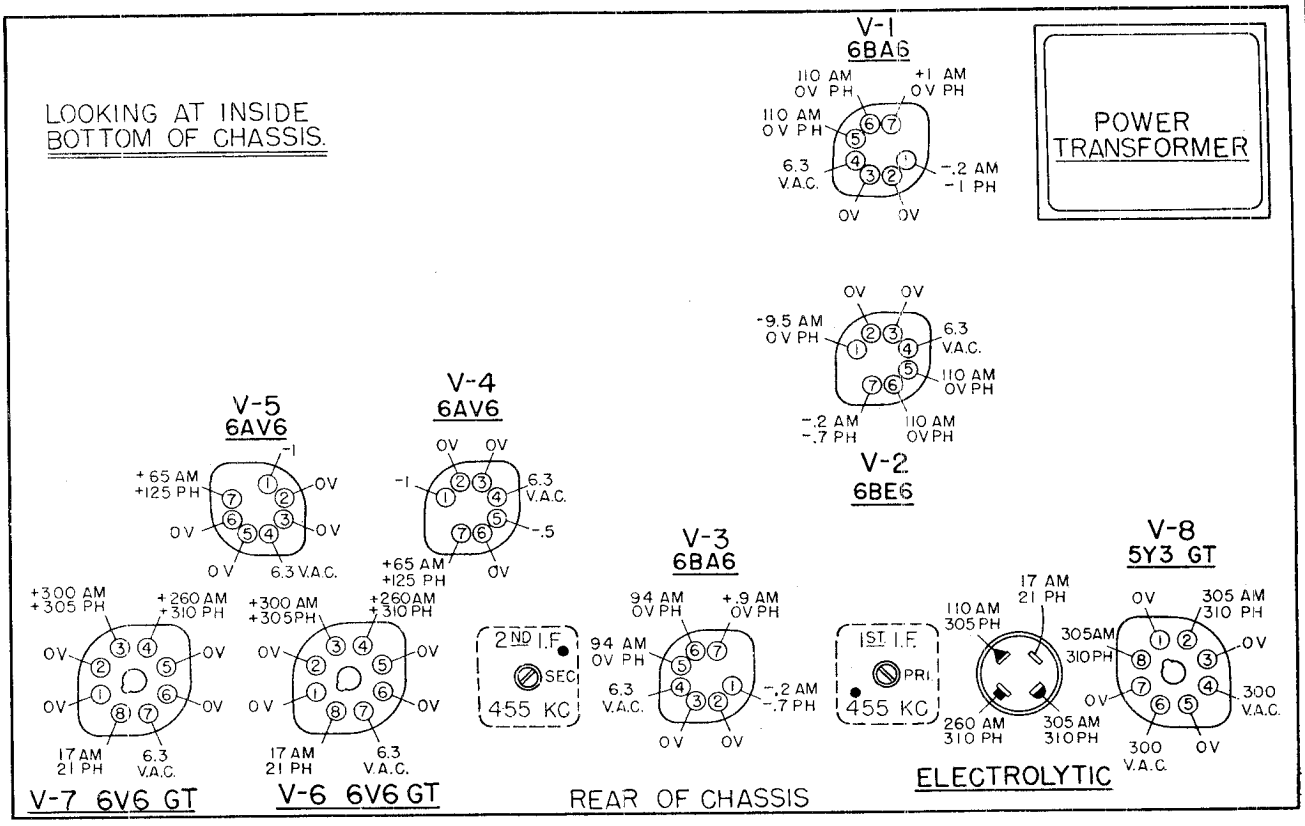
Pointer	Signal Generator	VTVM Connection	Adjustment and Notes
1. Pointer at 1000 Kc. approx.	455 Kc.-400 cy. modulation to grid of converter (pin 7 of V-2, 6BE6).	Terminal 2 of T-3.	Adjust top and bottom slugs of T-3 and T-4 for maximum output on VTVM.
2. Pointer at 1400 Kc.	1400 Kc.-400 cy. modulation to stator terminal of C-1-A.	Same as 1.	Adjust C-1-F and C-1-D for maximum output on VTVM.
3. Pointer at 1400 Kc.	1400 Kc.-400 cy. coupled through radiating loop.	Same as 1.	Readjust C-1-F, C-1-D, and C-1-B for maximum output on VTVM.

MODEL 1608,
Ch. 112125

No. 1608 TUBE LOCATION CHART



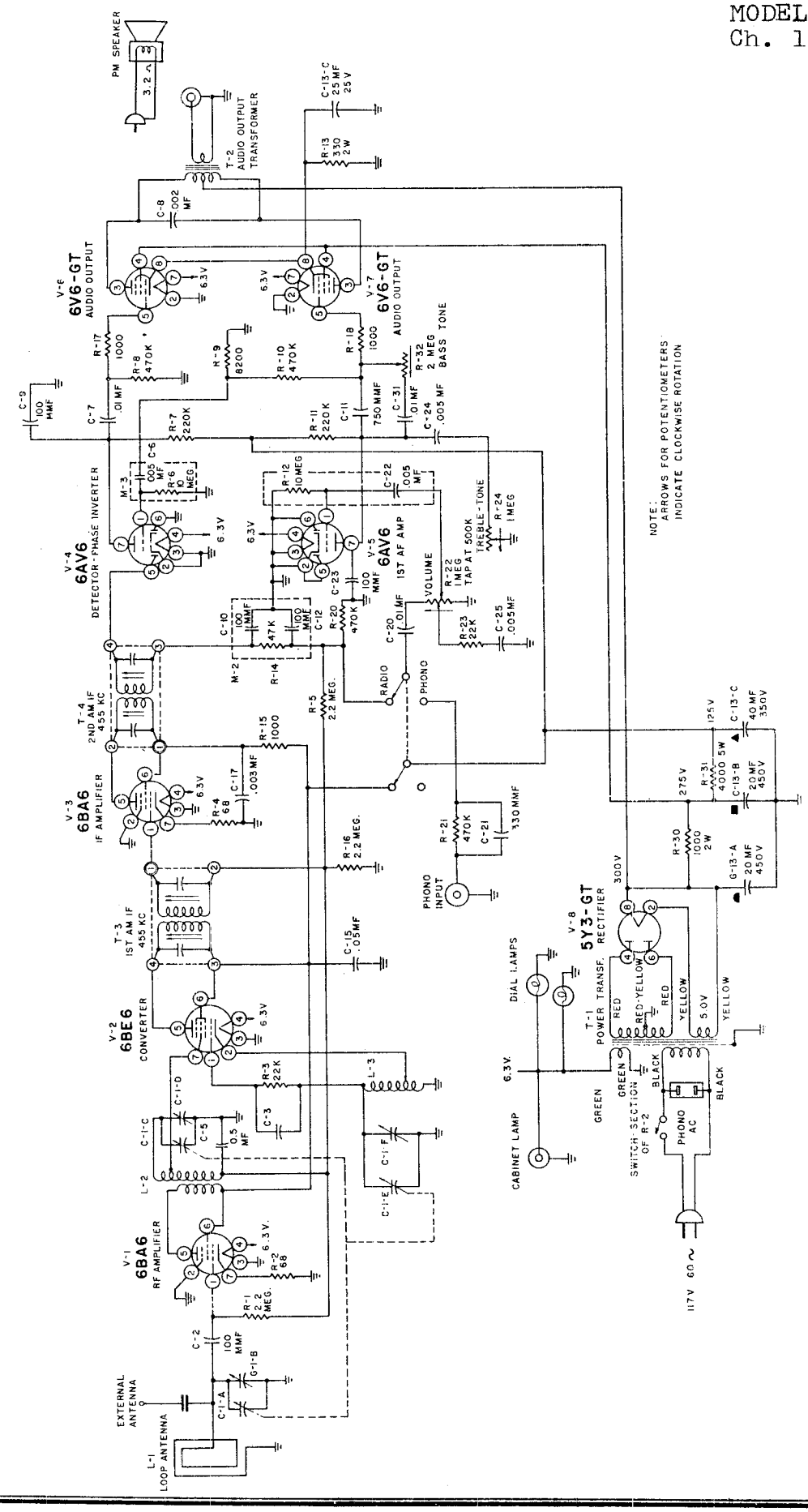
No. 1608 VOLTAGE CHART



VOLTAGES MEASURED TO CHASSIS GROUND WITH VTVM TYPE METER.
DOTS ON I.F. TRANSFORMERS INDICATE THE POSITION OF COLOR CODED TERMINAL.

MODEL 1608,
Ch. 112125

No. 1608 SCHEMATIC DIAGRAM



MODEL 1608,
Ch. 112125

No. 1608 PARTS LISTS

CAPACITORS

Circuit Symbol	S-C Part No.	Capacity	Type	Voltage
C-1	110051	3 Gang	Variable	
C-2	110694	100 MMF	Ceramic GP	
C-3	110695	47 MMF	Ceramic GP	
C-5	110801	.05 MF	Paper	400
*C-6	See M-3	.005 MF	Paper	400
C-7	110806	.01 MF	Paper	600
C-8	110804	.002 MF	Paper	600
C-9	110694	100 MMF	Ceramic GP	
*C-10	See M-2	100 MMF	Ceramic GP	
C-11	110676	750 MMF	Ceramic GP	350
*C-12	See M-2	100 MMF	Ceramic GP	
C-13	111090		Electrolyt	
C-15	110801	.05 MF	Paper	400
C-17	110698	.003 MF	Paper	400
C-20	110687	.01 MF	Paper	400
C-21	110463	330 MMF	Ceramic GP	350
*C-22	See M-1	.005 MF	Paper	400
C-23	110694	100 MMF	Ceramic GP	500
C-24	110688	.005 MF	Paper	400
C-25	110688	.005 MF	Paper	400
C-31	110806	.01 MF	Paper	600

RESISTORS

Circuit Symbol	S-C Part No.	Resistance	Watt	Tol.
R-1	149121	2.2 Meg.	½	20%
R-2	149094	68 ohms	½	20%
R-3	149109	22K ohms	½	20%
R-4	149094	68 ohms	½	20%
R-5	149121	2.2 Meg.	½	20%
*R-6	See M-3	10 Meg.	½	20%
R-7	149117	470K ohms	½	20%
R-8	149117	470K ohms	½	10%
R-9	28169	8200 ohms	½	10%
R-10	149115	220K ohms	½	20%
R-11	149115	220K ohms	½	20%
*R-12	See M-1	10 Meg.	½	20%
R-13	149020	330 ohms	2 W	10%
*R-14	See M-2	47K ohms	½	10%
R-15	149101	1000 ohms	½	20%
R-16	149121	2.2 Meg.	½	20%
R-17	149101	1000 ohms	½	20%
R-18	149101	1000 ohms	½	20%
R-20	149117	470K ohms	½	20%
R-21	149117	470K ohms	½	20%
R-22	145135	1 Meg., Pot. Volume Control		
R-23	149109	22K ohms	½	20%
R-24	145137	1 Meg., Pot. Treble Control		
R-30	149076	1000 ohms	2 W	20%
R-31	149330	4000 ohms	5 W	
R-32	145136	2 Meg., Pot. Bass Control		

TUBES

Circuit Symbol	S-C Part No.	Description
V-1	162012	6BA6 — RF AMPLIFIER
V-2	162013	6BE6 — CONVERTER
V-3	162012	6BA6 — IF AMPLIFIER
V-4	162066	6AV6 — DET & PHASE INVERT.
V-5	162066	6AV6 — 1st AF AMP.
V-6	162136	6V6-GT — AUDIO OUTPUT
V-7	162136	6V6-GT — AUDIO OUTPUT
V-8	162108	5Y3-GT — RECTIFIER

COILS

Circuit Symbol	S-C Part No.	Type
L-1	139051	LOOP ANTENNA
L-2	114405	RF COIL
L-3	114096	OSC. COIL

TRANSFORMERS

Circuit Symbol	S-C Part No.	Description
T-1	161032	POWER TRANSFORMER
T-2	161261	AUDIO OUTPUT
T-3	114364	1st AM IF (455 Kc.)
T-4	114364	2nd AM IF (455 Kc.)

MISCELLANEOUS

Circuit Symbol	S-C Part No.	Description
M-1	128201	CIRCUIT NETWORK
M-2	110478	DIODE FILTER
M-3	128201	CIRCUIT NETWORK

Note:

For substitution of networks with separate components, use the following:

R-6 S-C #149125
R-12 S-C #149125
R-14 S-C # 28177

C-6 S-C #110688
C-10 S-C #110694
C-12 S-C #110694
C-22 S-C #110688

GENERAL ASSEMBLY

Description	SC Part No.
Pilot Lamp	29956
Back Panel	101191
Cabinet Assembly	108216
Chassis Assembly	112125
Escutcheon	125061
Phono-Slide	132160
Knob-off-on-volume	134171
Knob-Bass-Tone	134171
Knob-Treble-Tone	134171
Knob-Tuning	134171
Knob-Phono-Radio	134172
Phono-Assembly	148050
Pilot Lamp Socket and Plug	152050
Speaker Assembly	155199
Grille Cloth	130166
Bullet Catch	132016
Door Pull	132188
Hinge, R-H	132186
Hinge, L-H	132187
Door Set	81789

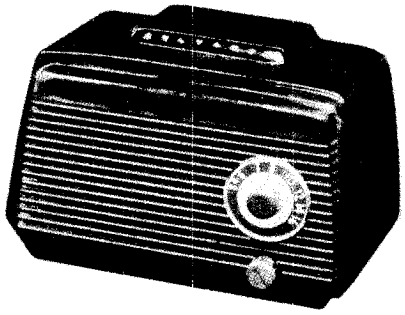
CHASSIS PARTS

Description	SC Part No.
Tuning Shaft C-Washer	27668
Dial Lamp	29956
Speaker Socket	31539
Phono Socket	34421
Bracket — R. H. Dial	105337
Bracket — L. H. Dial	105338
Bracket — Antenna	105341
IF Transformer Clip	113030
Antenna Loop Assm.	139051
Dial Plate	142172
Pointer Assembly	144023
Idler Pulley	147029
Dial Light Shield	151001
Tube Shield Base	151077
Tube Shield	151094
Socket-octal	152014
Socket — AC outlet	152038
Socket — 7 pt min.	152098
Socket — Dial Light Assem.	152109
Dial Cable Spring	156042
Dial Cable	81791

MODELS 1-250, 1-251, 1-252, Ch. 1-215

GENERAL DESCRIPTION

Models 1-250, 1-251 and 1-252 are compact, 5 tube AC-DC type broadcast receivers. The models are the same except for cabinet color. Model 1-250 is a black molded plastic. Model 1-251 is walnut finish and Model 1-252 is finished in ivory. The receiver has a built-in loop antenna and once the station is tuned in, the receiver should be rotated and left in the position where the signal is received with maximum volume. There is no provision for an external antenna connection. The circuit is of the isolated chassis type. Controls are provided for tuning and on-off and volume.



SPECIFICATIONS

POWER SUPPLY ..... 117 Volts DC, 60 cycle AC, 30 Watts

FREQUENCY RANGE ..... 535-1620 Kc.

INTERMEDIATE FREQUENCY ..... 455 Kc.

POWER OUTPUT
- Undistorted ..... 1.0 Watt
- Maximum ..... 1.5 Watts

SPEAKER ..... 5" P.M., 4.7 oz. magnet

SYLVANIA TUBE COMPLEMENT

Function	Type
Converter	12BE6
I. F. Amplifier	12BA6
2nd Det. - A.V.C. 1st A.F.	12AT6
Audio Output	50C5
Rectifier	35W4

ALIGNMENT PROCEDURE

PRELIMINARY ADJUSTMENTS

Set volume control to maximum position.

Allow chassis and signal generator to warm up for several minutes.

No output meter need be used.

I. F. ALIGNMENT

1. Tune receiver to approximately 1000 Kc.; where no audible reception is heard.
2. Tune signal generator to 455 Kc. with 400 cycle modulation and connect output between receiver B- and control grid (pin 7) of 12BE6 converter tube through a 0.1 mfd. capacitor.
3. Align I. F. transformers T1 & T2 by aligning first the cores accessible from under the chassis and then the top cores.
4. Keep the output from the generator at its lowest possible value to prevent the AVC from interfering with accurate alignment.

R. F. ALIGNMENT

1. Connect a Hazeltine Loop to the output of the signal generator to radiate the signal into the receiver.
2. Set receiver variable capacitor to minimum capacity.
3. Tune the signal generator to 1650 Kc. with 400 cycle modulation and adjust the oscillator trimmer C4 for maximum output.
4. Tune the receiver to a frequency between 1420 Kc. and 1500 Kc.; where no audible reception is heard.
5. Adjust antenna trimmer C2 for maximum output.

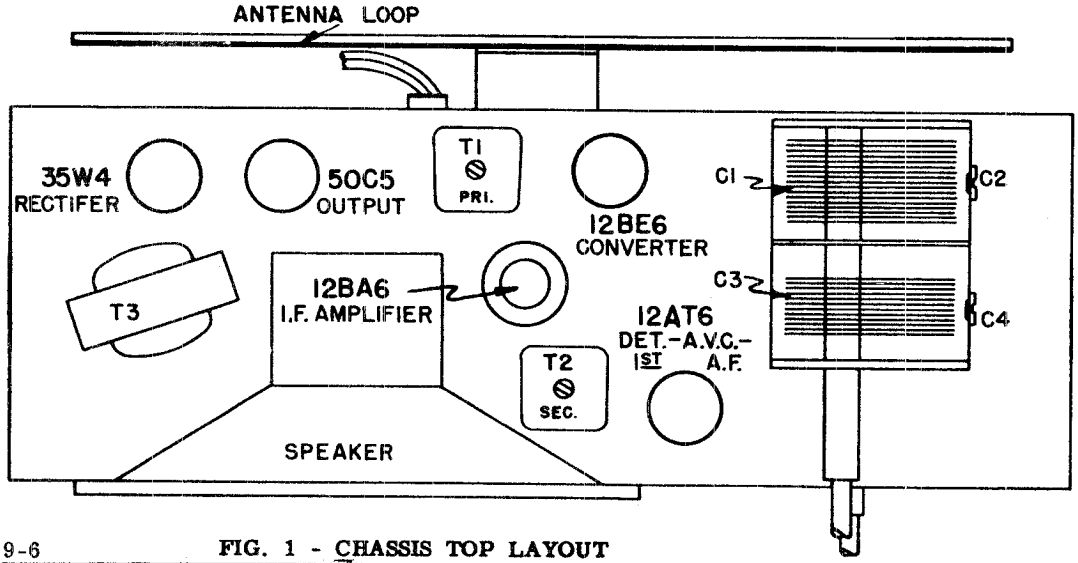


FIG. 1 - CHASSIS TOP LAYOUT

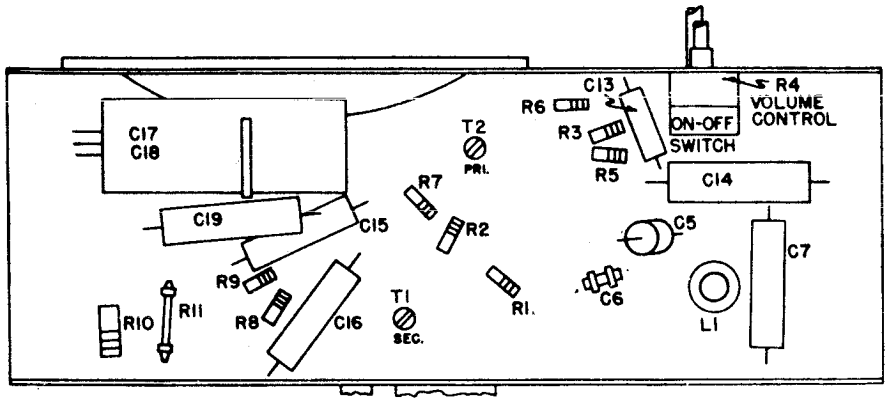


FIG. 2 - CHASSIS BOTTOM LAYOUT

REPAIR PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	482-0002	Base - 12BA6 Tube Shield
	497-0005	Bushing & Retainer - Line Cord
	813-0001	Cabinet - Black - Molded
	813-0002	Cabinet - Walnut - Molded
	813-0003	Cabinet - Ivory - Molded
C13	162-04247	Capacitor - Paper - .0047 Mfd. - 400 V.
C15	162-0625	Capacitor - Paper - .005 Mfd. - 600 V.
C5	162-0411M	Capacitor - Paper - .01 Mfd. - 400 V.
C16	162-0612	Capacitor - Paper - .02 Mfd. - 600 V.
C7, C14, C19	162-0615	Capacitor - Paper - .05 Mfd. - 600 V.
C6	166-0100P	Capacitor - Ceramic - .0001 Mfd. - 500 V.
C17	161-2002	Capacitor - Electrolytic - 40 Mfd. - 150 V.
C18		40 Mfd. - 150 V.
C1, C3	170-0002	Capacitor - 2 Gang Variable
	487-0004	Clip - I.F. Transformer Mtg.
L1	113-0015	Coil - Oscillator
R4	152-0004	Control - On-Off & Volume
	195-0002	Cord - A.C. Line
	722-0010	Dial - Station - Plastic
	740-0005	Knob (For Black Cabinet)
	740-0007	Knob (For Walnut Cabinet)
	740-0008	Knob (For Ivory Cabinet)
	582-0002	Loop - Antenna
R9	181-0151	Resistor - 150 Ohm - 1/2 W.
R10	182-0122	Resistor - 1,200 Ohm - 1 W.
R1	181-0223	Resistor - 22,000 Ohm - 1/2 W.
R3, R6	181-0473	Resistor - 47,000 Ohm - 1/2 W.
R7, R8	181-0474	Resistor - 470,000 Ohm - 1/2 W.
R2	181-0225	Resistor - 2.2 Megohm - 1/2 W.
R5	181-0106	Resistor - 10 Megohm - 1/2 W.
R11	189-0013	Resistor - 25 Ohm - 1 W.
	482-0003	Shield - 12BA6 Tube
	412-0015	Socket - Tube - 7 Prong Miniature
	539-0501	Speaker - 5" P.M.
T1	121-0013	Transformer - I.F. #1
T2	122-0013	Transformer - I.F. #2
C12	166-0100P	Capacitor - .0001 Mfd. - Ceramic
T3	143-0011	Transformer - Output
	623-0012	Tube - 12BA6
	623-00139	Tube - 12BE6
	623-0016G	Tube - 12AT6
	623-0015G	Tube - 50C5
	634-00029	Tube - 35W4

12-21-50 *SUPPLEMENT NO. 1 TO* 9-6

ADDITION TO SERVICE INFORMATION FOR CHASSIS 1-215

Repair Parts for the I.F. Transformers in the Repair Parts List should read as follows:

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION	
T1	121-0013	Transformer - I.F. #1 (R69301)	matched
T2	122-0013	Transformer - I.F. #2 (R69302)	pair
T1	121-0016	Transformer - I.F. #1 (R69303)	matched
T2	122-0016	Transformer - I.F. #2 (R69304)	pair

These two sets of I.F. transformers are matched pairs and must be matched for replacement. The "R" number above is stamped on the shield in each case. Replacement must be made only with a transformer having the same "R" number stamped on the shield as the old part.

CODE CHANGES FOR CHASSIS 1-215

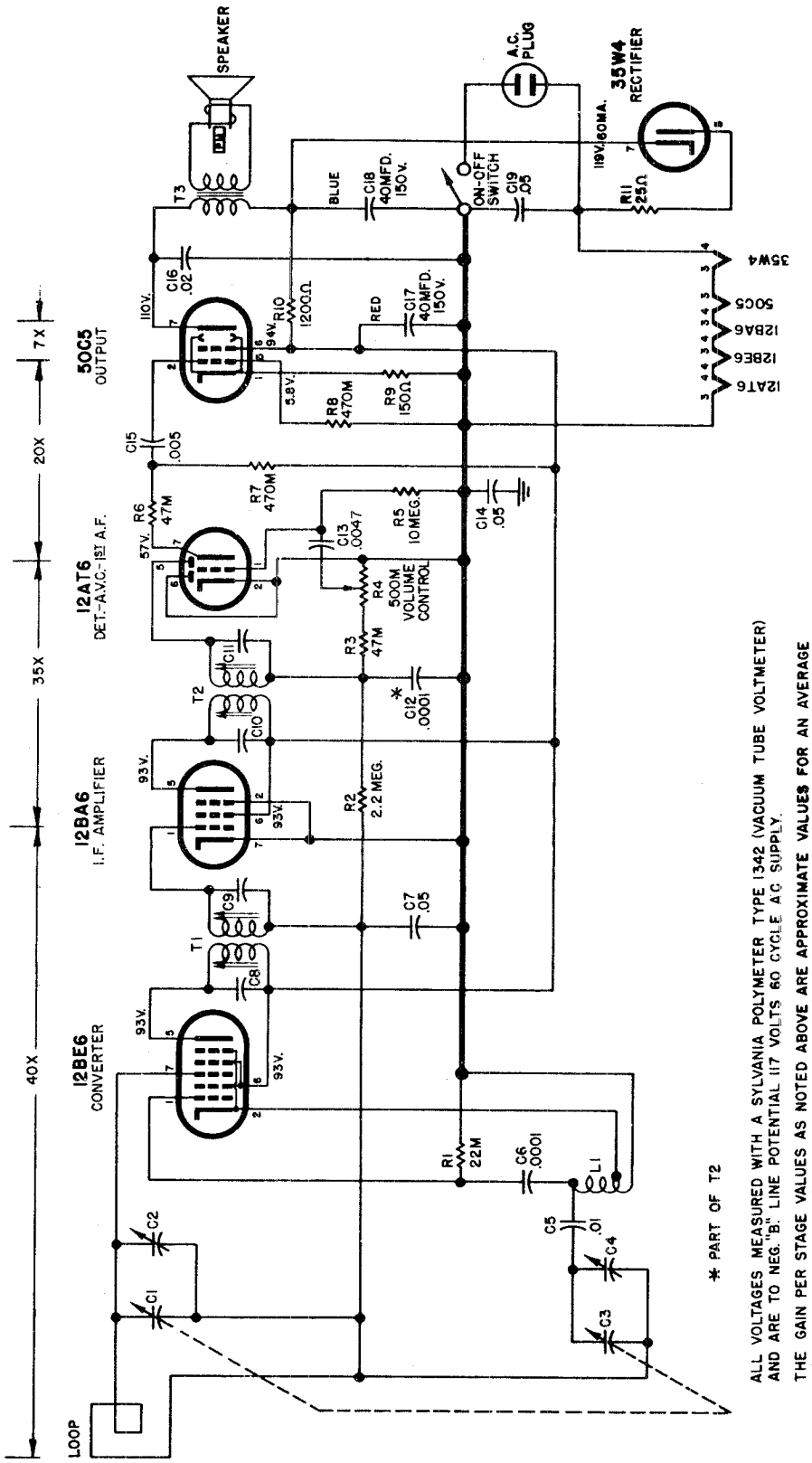
C01 - certain changes to meet Underwriter's requirements
C02 - factory information only, does not affect service

ADDITION OF NEW MODELS

Models 510B, 510H, 510W are compact 5 tube AC-DC type broadcast receivers which supersede models 1-250, 1-251 and 1-252 in later production. Model 510B is finished in black, model 510H in ivory, and 510W in walnut.

Reference for all service data and repair parts should be made to Bulletin 9-6.

MODELS 1-250, 1-251, 1-252, Ch. 1-215



* PART OF T2

ALL VOLTAGES MEASURED WITH A SYLVANIA POLYMETER TYPE 1342 (VACUUM TUBE VOLTMETER) AND ARE TO NEG. "B" LINE POTENTIAL 117 VOLTS 60 CYCLE AC SUPPLY.

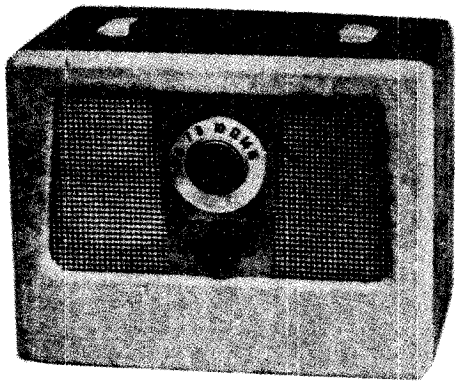
THE GAIN PER STAGE VALUES AS NOTED ABOVE ARE APPROXIMATE VALUES FOR AN AVERAGE STAGE, RATHER THAN AN ABSOLUTE VALUES.

FIG. 3 - SCHEMATIC DIAGRAM OF 1-215 CHASSIS

MODEL 430L,
Ch. 1-254

GENERAL DESCRIPTION

Model 430-L is a compact 4 tube AC-DC-Battery 3 way portable type broadcast receiver. The receiver has a built-in loop antenna and once the station is tuned in, the receiver should be rotated and left in the position where the signal is received with maximum volume. There is no provision for an external antenna. Battery operation is obtained by inserting the line cord plug in the socket at the rear of the chassis. Controls are provided for tuning and on-off and volume.



SPECIFICATIONS

POWER SUPPLY
AC-DC Operation, 117 Volts DC, 60 cycle AC
Battery Operation
"A" Battery, 7 1/2 Volt Eveready 717
"B" Battery, 90 Volt Eveready 490

FREQUENCY RANGE ..... 540 - 1650 KC.

INTERMEDIATE FREQUENCY ..... 455 KC.

SPEAKER ..... 4" P. M., 0.68 oz. magnet

SYLVANIA TUBE COMPLEMENT

Function	Type
Converter	1R5
I. F. Amplifier	1U4
2nd Det. -AVC-1st A. F.	1U5
Audio Output	3V4

ALIGNMENT PROCEDURE

PRELIMINARY ADJUSTMENTS

Set volume control to maximum position.

Allow chassis and signal generator to warm up for several minutes.

No output meter need be used.

I. F. ALIGNMENT

1. Tune receiver to 540 Kc. (variable capacitor fully closed).
2. Tune signal generator to 455 Kc. with 400 cycle modulation and connect output between receiver ground and control grid of 1R5 converter tube (pin 6 or antenna trimmer) through a 0.25 capacitor.
3. Align I. F. transformers T1 & T2 by adjusting the top and bottom slugs to give maximum readings.
4. Keep the output from the generator at its lowest possible value to prevent the AVC from interfering with accurate alignment.

R. F. ALIGNMENT

1. Connect a Hazeltine Loop to the output of the signal generator to radiate the signal into the receiver.
2. Set receiver variable capacitor to minimum capacity.
3. Tune the signal generator to 1650 Kc. with 400 cycle modulation and adjust the oscillator trimmer for maximum output.
4. Close the variable capacitor and check for 540 Kc.
5. Set signal generator to 1500 Kc. Rotate variable capacitor until signal is brought in and peak antenna trimmer to give maximum reading.

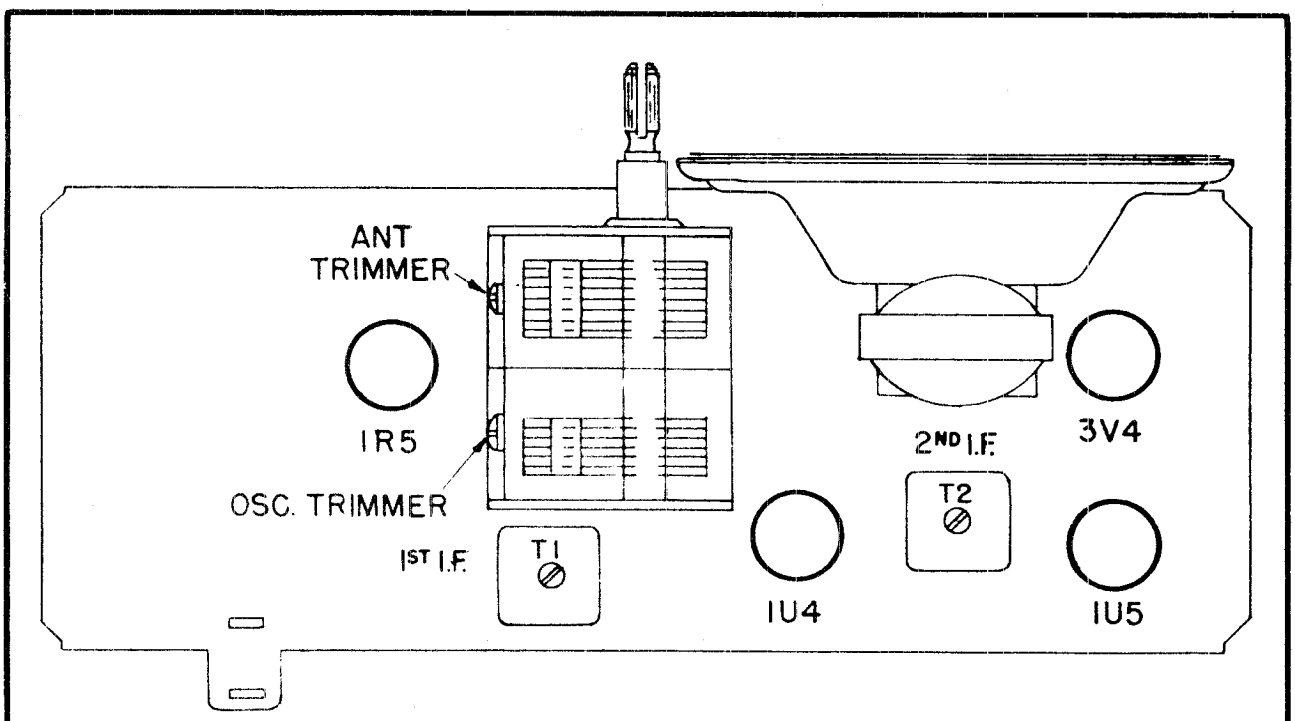


FIG. 1 - CHASSIS TOP LAYOUT

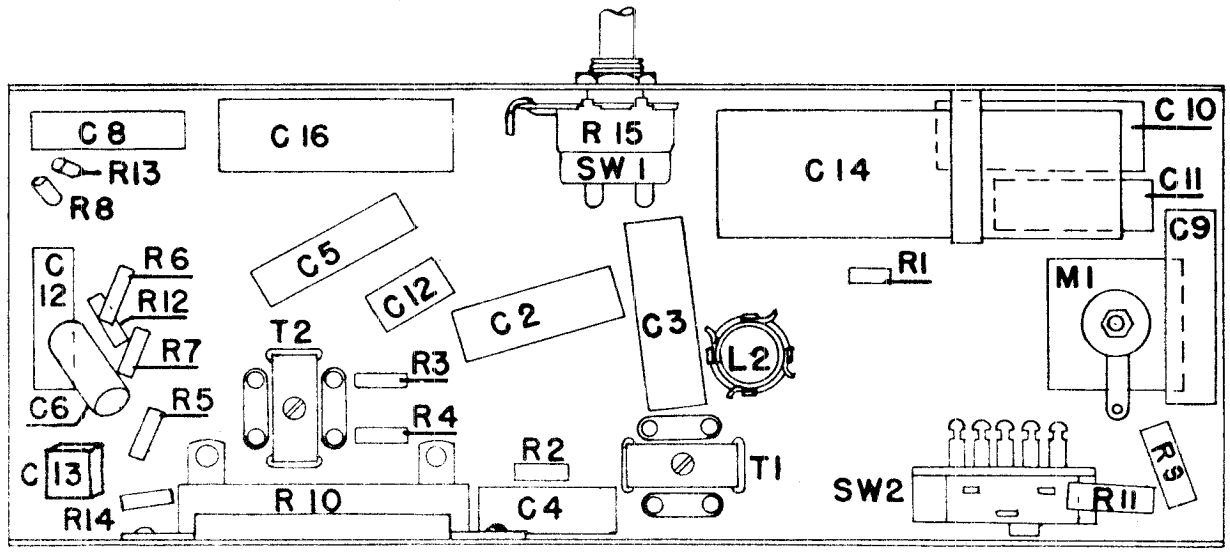
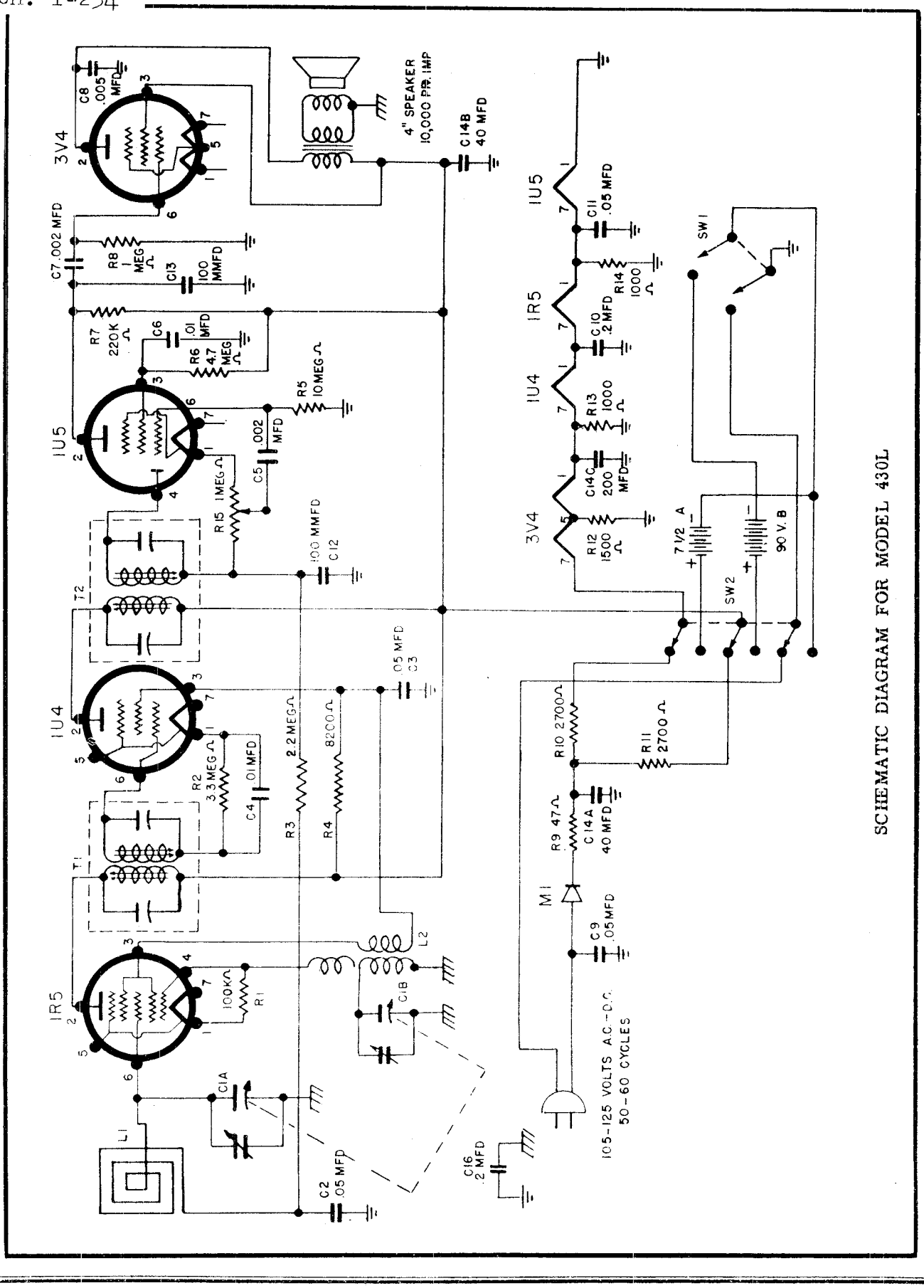


FIG. 2 - CHASSIS BOTTOM LAYOUT

MODEL 430L,
Ch. 1-254



MODEL 430L,
Ch. 1-254

REPAIR PARTS LIST

SCHEMATIC LOCATION	SERVICE PART NUMBER	DESCRIPTION
	814-0001	Cabinet - Wood
C5, C7	162-0622	Capacitor - Paper - .002 Mfd. - 600 V.
C8	162-0425	Capacitor - Paper - .005 Mfd. - 400 V.
C4, C6	162-0411	Capacitor - Paper - .01 Mfd. - 400 V.
C2	162-0215	Capacitor - Paper - .05 Mfd. - 200 V.
C3, C9, C11	162-0415	Capacitor - Paper - .05 Mfd. - 400 V.
C10, C16	162-0402	Capacitor - Paper - .2 Mfd. - 400 V.
C12, C13	163-0100	Capacitor - Mica - .0001 Mfd. - 500 V.
	170-0003	Capacitor - 2 Gang - Variable
C14	161-3009	Capacitor - Electrolytic - 40 Mfd. - 150 V. 40 Mfd. - 150 V. 200 Mfd. - 15 V.
L2	113-0017	Coil - Oscillator
R15	152-0009	Control - On-Off & Volume
	195-0002	Cord - Line
	722-0016	Dial
	776-0001	Front Plate & Baffle Board Assy. (with Metal Trim Plate)
	740-0009	Knob - Dial
	740-0010	Knob - On-Off & Volume
L1	581-0001	Loop - Antenna (without back cover)
	196-0008	Plug - Lead Assy. - "A" Battery
	196-0009	Plug - Lead Assy. - "B" Battery
M1	517-0002	Rectifier - Selenium
R9	182-0470	Resistor - 47 Ohm - 1 W.
R13, R14	181-0102	Resistor - 1,000 Ohm - 1/2 W.
R12	181-0152	Resistor - 1,500 Ohm - 1/2 W.
R10	189-0022	Resistor - 2,700 Ohm - W. W.
R11	182-0272	Resistor - 2,700 Ohm - 1 W.
R4	181-0822	Resistor - 8,200 Ohm - 1/2 W.
R1	182-0104	Resistor - 100,000 Ohm - 1 W.
R7	181-0224	Resistor - 220,000 Ohm - 1/2 W.
R8	181-0105	Resistor - 1 Megohm - 1/2 W.
R3	181-0225	Resistor - 2.2 Megohm - 1/2 W.
R2	181-0335	Resistor - 3.3 Megohm - 1/2 W.
R6	181-0475	Resistor - 4.7 Megohm - 1/2 W.
R5	181-0106	Resistor - 10 Megohm - 1/2 W.
	412-0013	Socket - Tube
	539-0400	Speaker
SW2	573-0002	Switch - 3 P.D.T. (AC -DC-Bat.)
	143-0015	Transformer - Output
	623-0018G	Tube - 1R5
	623-0019G	Tube - 1U4
	623-0020G	Tube - 1U5
	623-0021G	Tube - 3V4

MODELS 540B, 540H,
540M, Ch. 1-253

GENERAL DESCRIPTION

Models 540B (Black), 540H (Ivory), and 540M (Mahogany) are plastic-cased 5 tube clock radios which tune the standard broadcast band. The receivers have built-in loop antennas and once a station is tuned in, the receiver should be rotated and left in position where the signal is received with maximum volume. If desired, an external antenna may be connected to the terminal provided for that purpose on the back cover.

The clock may be used to:

(A) Provide correct time.

(B) Turn on radio program for awakening.

(C) Turn the buzzer alarm on 10 minutes after the radio starts playing.

(D) Turn on the buzzer alarm for awakening with the radio silenced.

Front panel controls are provided for tuning and volume. On the clock face are the alarm set and operating selector controls.

SPECIFICATIONS

POWER SUPPLY
105-125 Volts, 60 cycle AC, 30 Watts

FREQUENCY RANGE..... 540-1650 Kc.

INTERMEDIATE FREQUENCY..... 455 Kc.

SPEAKER.....4" P.M., 1.0 oz. Magnet

SYLVANIA TUBE COMPLEMENT

Function	Type
Oscillator-Converter	12BE6
I.F. Amplifier	12BA6
Detector - AVC - 1st Audio	12AT6
Audio Output	50C5
Rectifier	35W4

ALIGNMENT PROCEDURE

PRELIMINARY INSTRUCTIONS

Set volume control to maximum position.

Allow chassis and signal generator to warm up for several minutes.

Connect an A.C. voltmeter across voice coil terminals.

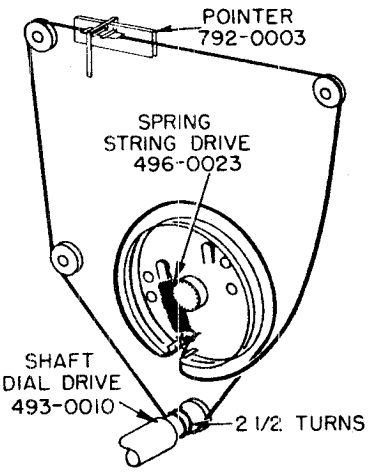
I.F. ALIGNMENT

1. Set the variable tuning capacitor to fully open position (capacitor plates out of mesh).
2. Tune signal generator to 455 Kc. with 400 cycle modulation and connect output between receiver B- and control grid (pin 7) of 12BE6 converter tube through a 0.1 mfd. capacitor.
3. Align I.F. transformers T1 and T2 by aligning first the cores accessible from under the chassis and then the top cores.
4. Keep the output from the generator at its lowest possible value to prevent the AVC from interfering with accurate alignment.

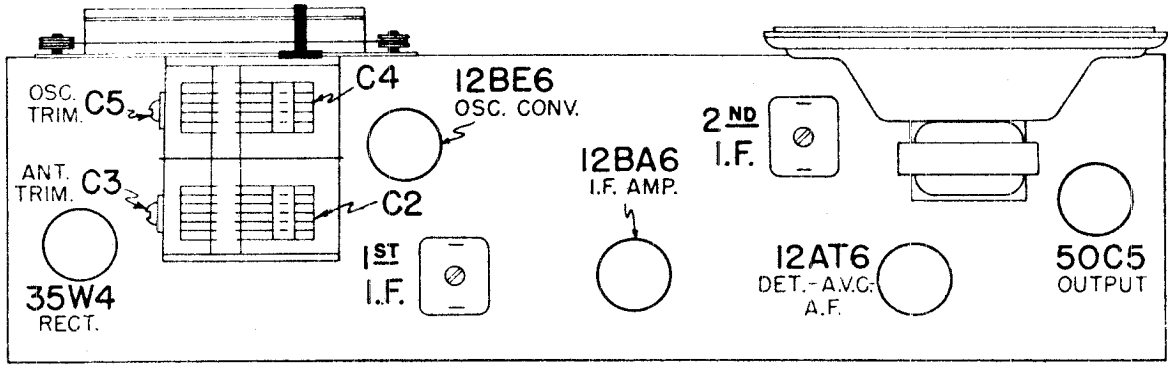
MODELS 540B, 540H, 540M, Ch. 1-253

R.F. ALIGNMENT

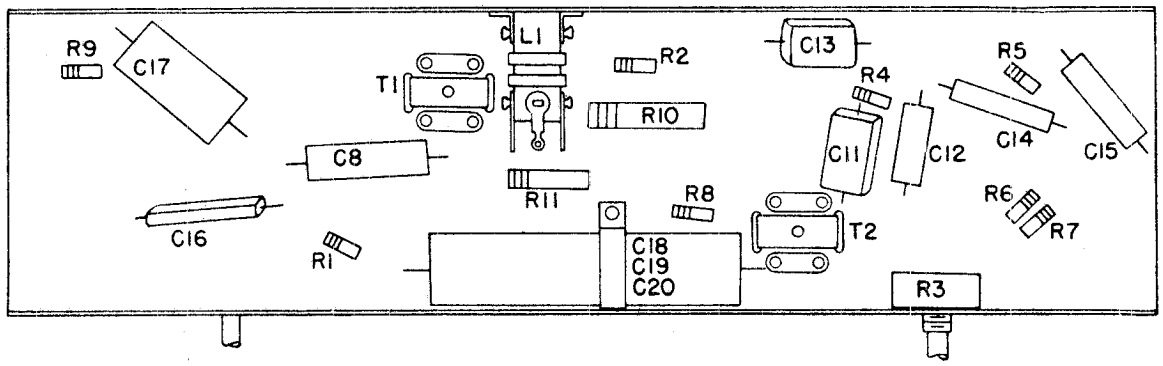
1. With the variable tuning capacitor fully open and the signal generator connected between receiver B- and control grid (pin 7) of 12BE6 converter tube through a 0.1 mfd. capacitor, tune signal generator to 1650 Kc.
2. Adjust the oscillator trimmer C5 (on front section of variable capacitor) for maximum output.
3. Tune the receiver to 1500 Kc.
4. Connect a Hazeltine Loop to the output of the signal generator to radiate a 1500 Kc. signal into the receiver.
5. Adjust antenna trimmer C3 (on rear section of variable capacitor) for maximum output.



DIAL CORD HOOKUP

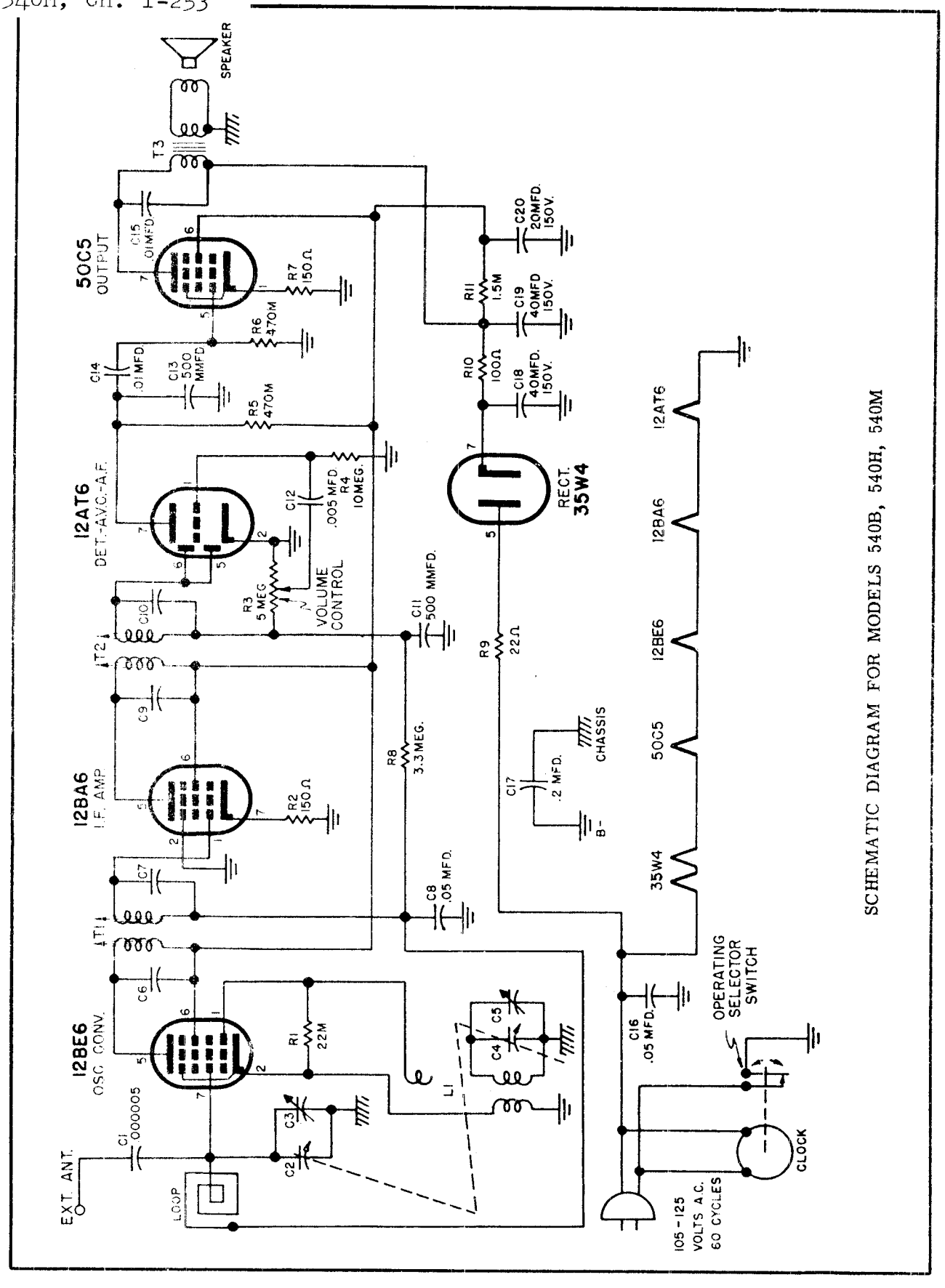


CHASSIS TOP LAYOUT



CHASSIS BOTTOM LAYOUT

MODELS 540B, 540H,
540M, Ch. 1-253



MODELS 540B, 540H, 540M, Ch. 1-253

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	813-0004	Cabinet - Plastic - Mahogany (Grille Insert not included)
	813-0005	Cabinet - Plastic - Black (Grille Insert not included)
	813-0006	Cabinet - Plastic - Ivory (Grille Insert not included)
C2,C4	172-0004	Capacitor - Variable
C18	161-3010	Capacitor - Electrolytic - 40 Mfd. - 150 V.
C19		40 Mfd. - 150 V.
C20		20 Mfd. - 150 V.
C12	162-0625	Capacitor - Paper - .005 Mfd. - 600 V.
C14,C15	162-0411	Capacitor - Paper - .01 Mfd. - 400 V.
C8	162-0415	Capacitor - Paper - .05 Mfd. - 400 V.
C16	160-0415	Capacitor - Phenolic - .05 Mfd. - 400 V.
C17	162-0402	Capacitor - Paper - .2 Mfd. - 400 V.
C11,C13	163-0500	Capacitor - Mica - .0005 Mfd. - 500 V.
L1	113-0018	Coil - Oscillator
R3	153-0012	Control - Volume - 500,000 Ohm
	195-0002	Cord - Line
	717-0001	Glass (Clock Crystal)
	776-0002	Insert - Plastic (Grille - Dial - Cloth Insert)
	740-0015	Knob - Alarm Set
	743-0005	Knob - Operating Selector
	740-0008	Knob - Volume and Tuning Controls
	582-0004	Loop & Back Cover Assembly
C1		Capacitor - .000005 Mfd.
	714-0002	Metal Bezel (Clock Numerals)
	792-0003	Pointer - Dial
R9	181-0220	Resistor - 22 Ohm - 1/2 W.
R10	183-0101	Resistor - 100 Ohm - 2 W.
R2,R7	181-0151	Resistor - 150 Ohm - 1/2 W.
R11	182-0152	Resistor - 1,500 Ohm - 1 W.
R1	181-0223	Resistor - 22,000 Ohm - 1/2 W.
R5,R6	181-0474	Resistor - 470,000 Ohm - 1/2 W.
R8	181-0335	Resistor - 3.3 Megohm - 1/2 W.
R4	181-0106	Resistor - 10 Megohm - 1/2 W.
	493-0010	Shaft - Dial Drive
	412-0013	Socket - Tube
	539-0401	Speaker (includes Output Transformer)
	496-0023	Spring - String Drive
T1,T2	121-0101	Transformer - I.F. - Input & Output
T3	143-0016	Transformer - Output
	623-0016G	Tube - 12AT6
	623-0012G	Tube - 12BA6
	623-0013G	Tube - 12BE6
	634-0002G	Tube - 35W4
	623-0015G	Tube - 50C5

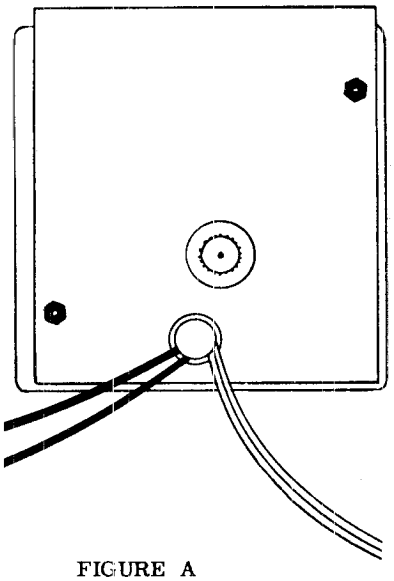


FIGURE A

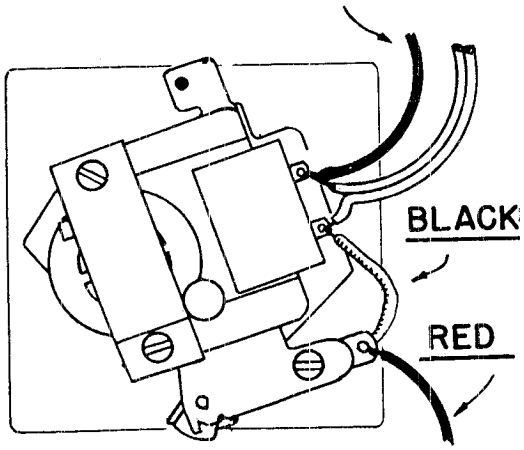


FIGURE B

To take clock movement out of cabinet proceed as follows:

Remove the following:

A - Line cord from power line

B - Tuning knob, volume control knob, and chassis from cabinet.

C - 2 nuts holding clock clamping shield shown in Figure A.

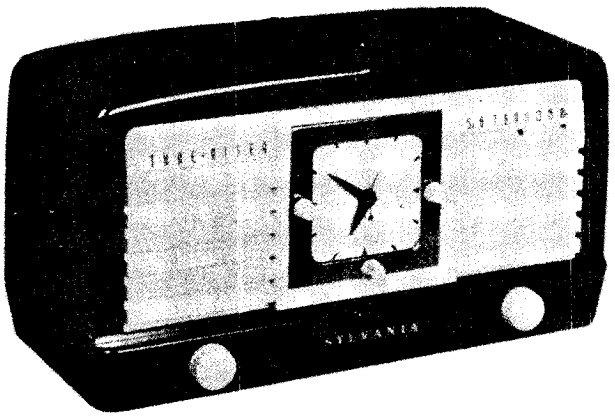
D - As this shield is sufficiently pulled back, unsolder red and blue wires and power cord shown in Figure B

E - The movement may then be withdrawn through the opening in the front of the cabinet.

F - In shipping a movement to a service station, be certain that it is suitably packed to withstand transportation. Care should be taken with the glass crystal so that it is not subject to strain during shipment.

MODELS 540BA, 540HA, 540MA, Ch. 1-253

GENERAL DESCRIPTION



Models 540BA (Black), 540HA (Ivory), and 540MA (Mahogany) are plastic cabinet 5 tube clock radios which tune the standard broadcast band. Each receiver has a built-in loop antenna, and once a station is tuned in, the radio should be rotated and left in position where the signal is received with maximum volume. If desired, an external antenna may be connected to the terminal provided for that purpose on the back cover.

The clock may be used to:

(A) Provide accurate sweep second time.
(B) Turn off radio or appliance up to 60 minute period or less.
(C) Turn on radio program for awakening.
(D) Turn on buzzer alarm 10 minutes after radio starts playing.
(E) Turn on buzzer alarm for awakening with radio and appliance turned off.
(F) Turn radio off automatically after retiring.
(G) Turn radio off automatically and awaken to music with appliance operating.
(H) Turn appliance on and off with radio off.

Front panel controls are provided for tuning and volume. On the clock face are the alarm set, operating selector, and rock-a-bye controls.

SPECIFICATIONS

POWER SUPPLY
105-125 Volts, 60 Cycle AC, 30 Watts

APPLIANCE OUTLET
Maximum Load 1100 Watts

FREQUENCY RANGE.....540-1650 Kc.

INTERMEDIATE FREQUENCY.....455 Kc.

LOUD SPEAKER.....4" P.M., 1.0 oz. Magnet

SYLVANIA TUBE COMPLEMENT

Function	Type
Oscillator-Converter	12BE6
I.F. Amplifier	12BA6
Detector - AVC - 1st Audio	12AT6
Audio Output	50C5
Rectifier	35W4

ALIGNMENT PROCEDURE

PRELIMINARY INSTRUCTIONS

Set volume control to maximum position.

Allow chassis and signal generator to warm up for several minutes.

Connect an A.C. voltmeter across voice coil terminals.

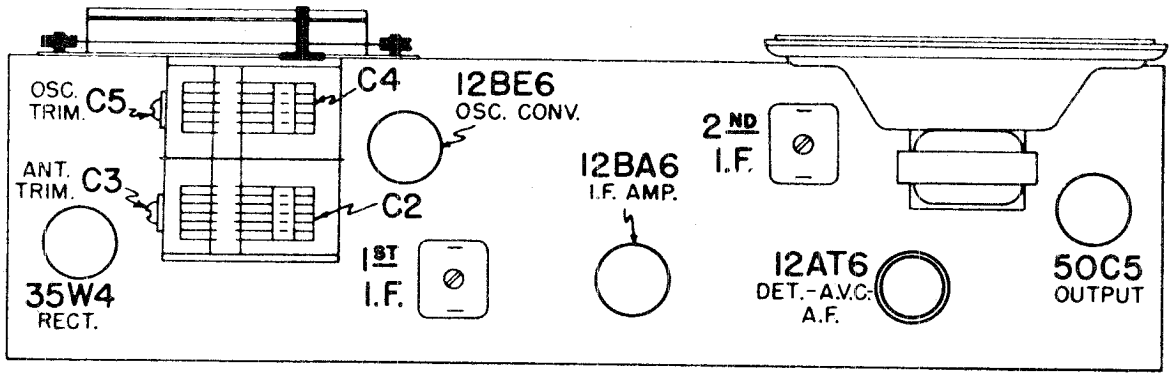
I.F. ALIGNMENT

1. Set the variable tuning capacitor to minimum capacity position (plates fully out of mesh).
2. Tune signal generator to 455 Kc. with 400 cycle modulation and connect output between receiver B- and control grid (pin 7) of 12BE6 converter tube through a 0.1 mfd. capacitor.
3. Align I.F. transformers T1 and T2 by aligning first the cores accessible from under the chassis and then the top cores.
4. Keep the output from the generator at its lowest possible value to prevent the AVC from interfering with accurate alignment.

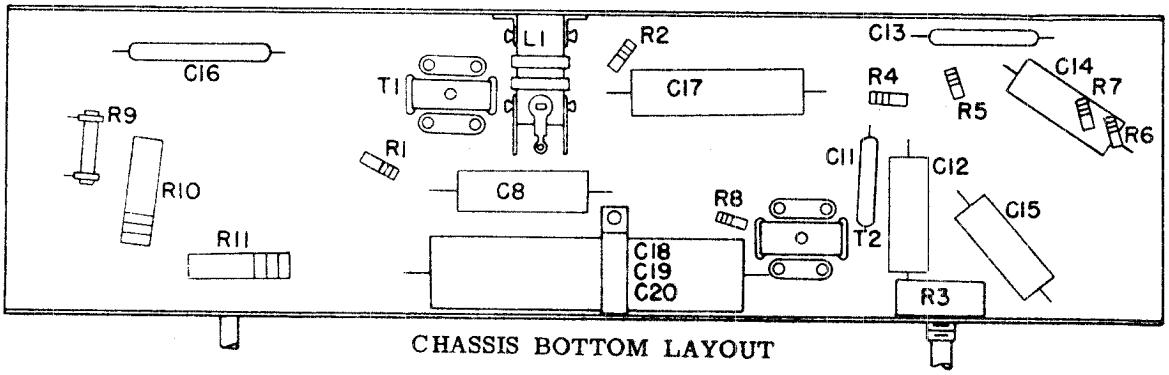
R.F. ALIGNMENT

1. With the variable tuning capacitor fully open and the signal generator connected between receiver B- and control grid (pin 7) of 12BE6 converter tube through a 0.1 mfd. capacitor, tune signal generator to 1650 Kc.
2. Adjust the oscillator trimmer C5 (on front section of variable capacitor) for maximum output.
3. Tune the receiver to 1500 Kc.
4. Connect a Hazeltine Loop to the output of the signal generator to radiate a 1500 Kc. signal into the receiver.
5. Adjust antenna trimmer C3 (on rear section of variable capacitor) for maximum output.

MODELS 540BA, 540HA, 540MA, Ch. 1-253



CHASSIS TOP LAYOUT



CHASSIS BOTTOM LAYOUT

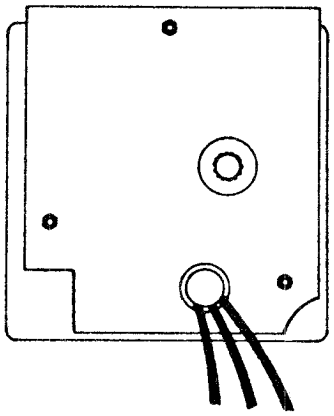


FIGURE A

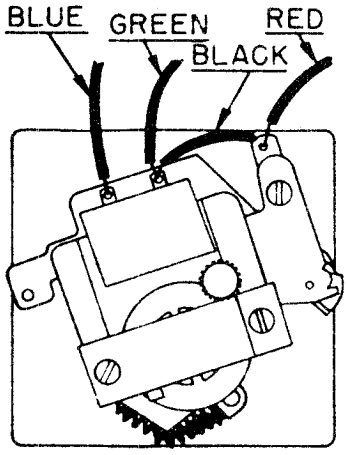


FIGURE B

To take clock movement out of cabinet proceed as follows:

Remove the following:

A - Line cord from power line.

B - Tuning knob, volume control knob, and chassis from cabinet.

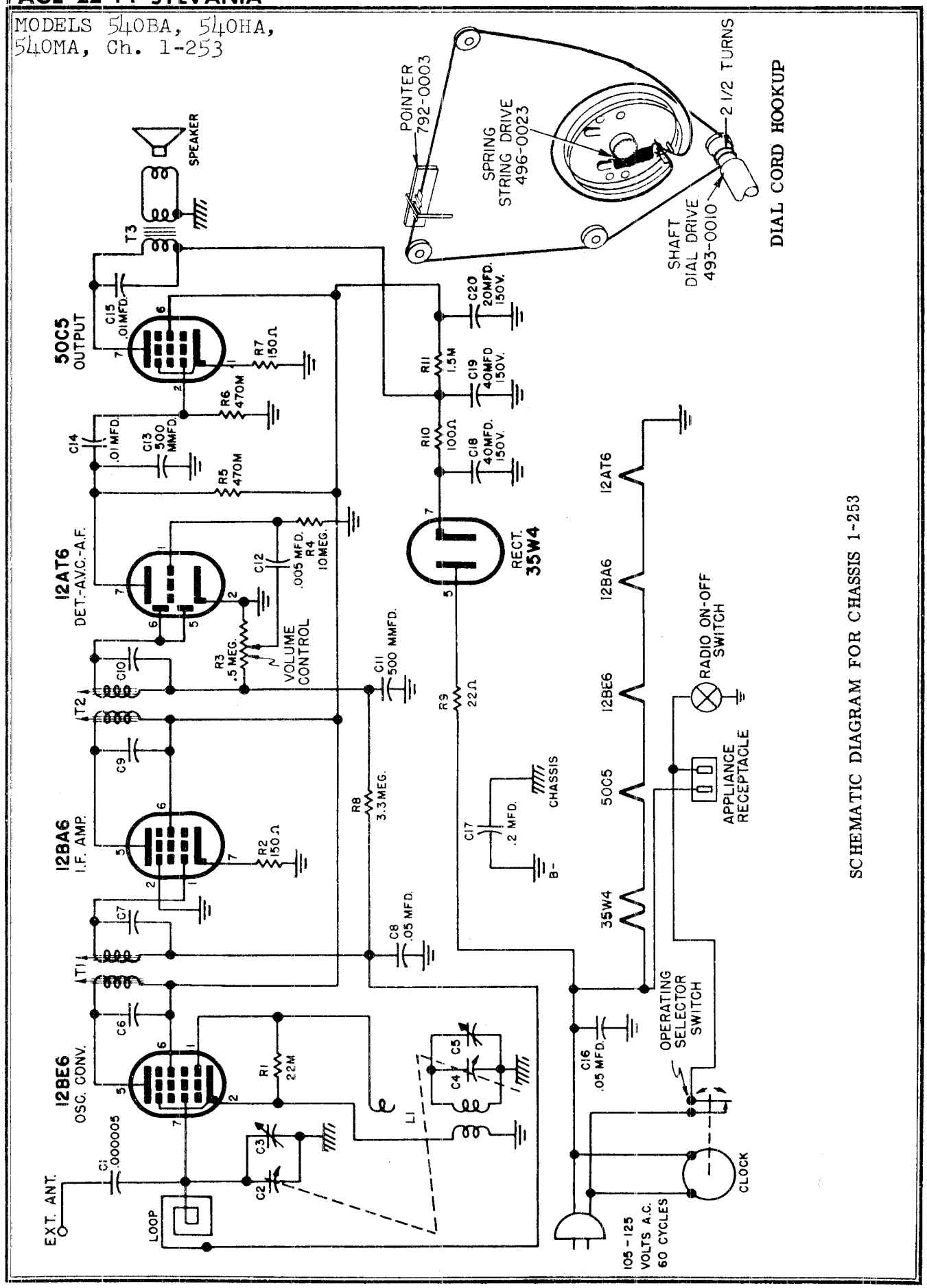
C - Three nuts holding clock clamping shield shown in Figure A above.

D - As this shield is sufficiently pulled back, unsolder red, blue, and green wires shown in Figure B above.

E - Before movement can be withdrawn from the cabinet, it is necessary to have the rock-a-bye control in the full 60 minute position.

F - In shipping a movement to a service station, be certain that it is suitably packed to withstand transportation. Care should be taken to insure that the glass crystal is not subject to strain during shipment.

MODELS 540BA, 540HA,
540MA, Ch. 1-253



SCHEMATIC DIAGRAM FOR CHASSIS 1-253

MODELS 540BA, 540HA, 540MA, Ch. 1-253

REPAIR PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	813-0004	Cabinet - Plastic - Mahogany (Grille Insert not included)
	813-0005	Cabinet - Plastic - Black (Grille Insert not included)
	813-0006	Cabinet - Plastic - Ivory (Grille Insert not included)
C2,C4	172-0004	Capacitor - Variable
C18	161-3010	Capacitor - Electrolytic - 40 Mfd. - 150 V.
C19		40 Mfd. - 150 V.
C20		20 Mfd. - 150 V.
C12	162-0625	Capacitor - Paper - .005 Mfd. - 600 V.
C14,C15	162-0411	Capacitor - Paper - .01 Mfd. - 400 V.
C8	162-0415	Capacitor - Paper - .05 Mfd. - 400 V.
C16	160-0415	Capacitor - Phenolic - .05 Mfd. - 400 V.
C17	162-0402	Capacitor - Paper - .2 Mfd. - 400 V.
C11,C13	163-0500	Capacitor - Mica .0005 Mfd. - 500 V.
L1	113-0018	Coil - Oscillator
R3	153-0012	Control - Volume - 500,000 Ohm
	195-0005	Cord - Line
	717-0001	Glass (Clock Crystal)
	776-0002	Insert - Plastic (Grille - Dial - Cloth Insert)
	740-0015	Knob - Alarm Set
	743-0005	Knob - Operating Selector & Rock-A-Bye Switch
	740-0008	Knob - Volume and Tuning Controls
	582-0007	Loop & Back Cover Assembly
C1		Capacitor - .000005 Mfd.
	714-0004	Metal Bezel (Clock Numerals)
	792-0003	Pointer - Dial
R9	181-0220	Resistor - 22 Ohm - 1/2 W.
R10	183-0101	Resistor - 100 Ohm - 2 W.
R2,R7	181-0151	Resistor - 150 Ohm - 1/2 W.
R11	182-0152	Resistor - 1,500 Ohm - 1 W.
R1	181-0223	Resistor - 22,000 Ohm - 1/2 W.
R5,R6	181-0474	Resistor - 470,000 Ohm - 1/2 W.
R8	181-0335	Resistor - 3.3 Megohm - 1/2 W.
R4	181-0106	Resistor - 10 Megohm - 1/2 W.
	493-0010	Shaft - Dial Drive
	482-0006	Shield - Miniature Tube
	417-0013	Socket - Appliance
	412-0013	Socket - Tube
	539-0401	Speaker (includes Output Transformer)
	496-0023	Spring - String Drive
	571-0006	Switch - Radio
T1,T2	121-0101	Transformer - I.F. - Input & Output
T3	143-0016	Transformer - Output
	623-0016G	Tube - 12AT6
	623-0012G	Tube - 12BA6
	623-0013G	Tube - 12BE6
	634-0002G	Tube - 35W4
	623-0015G	Tube - 50C5

Some cases have been reported where the chassis hold-down bolts plus their washers were longer than the plastic legs. To remedy, remove washers, as required.

MODEL CH749,
Hudson #225908

TECHNICAL SERVICE BULLETIN

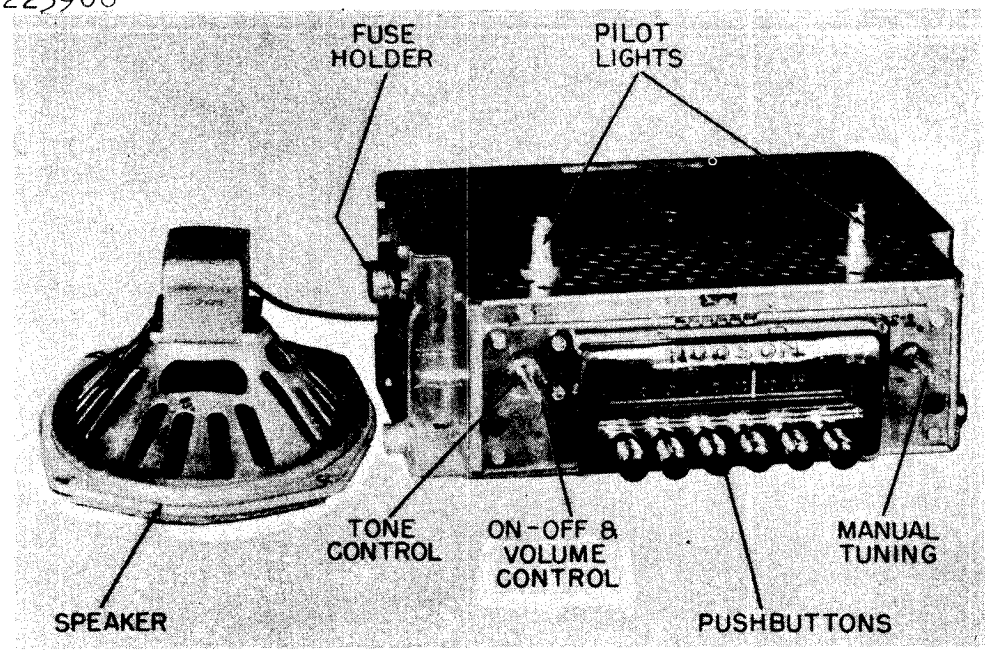


FIG. 1 MODEL 225908

GENERAL

The Hudson model 225908 receiver is a six tube, twin unit, superhetrodyne receiver. The antenna, RF, and oscillator circuits are inductively tuned (manually and push button) by iron cores over a frequency range of 540 to 1600 kilocycles.

The speaker is mounted above the receiver and both units are mounted behind the instrument panel. The on-off, volume and tone controls are on concentric shafts at the left of the receiver. The manual tuning control and trim knob are at the right.

A special compensating capacitor in the oscillator circuit minimizes frequency drift due to normal variations in temperature and car battery voltage.

Sylvania built CH749 Hudson receiver serial numbers start at CH1001 and up.

TUBE COMPLEMENT

6SK7GT	R. F. Amplifier
6SA7GT	Converter
6SK7GT	I. F. Amplifier
6SQ7GT	Detector, AVC & AF Amplifier
5V6GT	Output
6X5GT	Full Wave Rectifier

POWER SUPPLY

The power supply uses a 6X5GT full wave rectifier tube in conjunction with a four prong, full wave primary type vibrator.

ALIGNMENT

Maximum performance depends on accurate alignment of the receiver; therefore, follow these instructions carefully.

CAUTION: Make all alignment adjustments to the receiver with the "A" lead connected to a 6.6 volt negative source and ground the chassis to the positive side of this source. Rotate the volume and tone controls to their maximum clockwise positions. Keep the output from the signal generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment. Use an insulated screw driver, or the prescribed tool, for making all alignment adjustments.

MODEL CH749,
Hudson #225908

IF ALIGNMENT PROCEDURE

1. IF ALIGNMENT AT 265 KILOCYCLES

(a) Remove top and bottom covers from the receiver.

(b) Set the signal generator at 265 kilocycles.

(c) Connect the signal lead of the signal generator through a 0.1 Mfd. capacitor to the 6SA7GT converter grid (pin #8 on the socket). Connect output indicator across speaker voice coil.

(d) Connect the ground lead of the signal generator to the chassis or case.

(e) Position the dial pointer at the high frequency end of the dial.

(f) With core alignment tool 898-0003 adjust the IF cores "A," "B," "C," and "D" in order named for maximum output. (See Parts Layout - Bottom of Chassis, page 5).

Repeat this adjustment until maximum output reading does not change.

2. RF AND OSCILLATOR ALIGNMENT

(a) Connect the signal lead of the signal generator through the dummy antenna, illustrated in Fig. 2 to the antenna connector on the receiver.

(b) Adjust the signal generator to 535 kilocycles.

(c) Rotate the manual tuning control to tune the receiver at 535 kilocycles.

(d) Adjust the oscillator trimmer C9 for maximum response (See Parts Layout - Bottom of Chassis, Page 5).

(e) Adjust the signal generator to 1400 kilocycles.

(f) Rotate the manual tuning control to tune the receiver at 1400 kilocycles.

(g) Adjust the converter trimmer C6 and the antenna trimmer C1 for maximum output (See Parts Layout - Top and Bottom of Chassis, Pages 4 and 5).

(h) If dial calibration is off after making the above adjustments, corrections can be made by turning the eccentric screw at the fulcrum of the dial pointer (See Parts Layout - Top of Chassis, Page 4).

SENSITIVITY CONTROL

Sensitivity control R9 is factory set and should not be changed. If it is necessary for this control to be readjusted, it should be set to 2 volts DC positive on the cathode of the 6SK7GT IF Amplifier tube.

ALIGNMENT AFTER CORE REPLACEMENT

WARNING: The following adjustments are to be made ONLY if a core has been replaced.

(a) Adjust the signal generator to 1675 kilocycles.

(b) Connect the signal lead of the signal generator through the dummy antenna, see Fig. 2, to the antenna connector of the receiver.

(c) Rotate the manual tuning control to stop at 1600 kilocycles (maximum high frequency end of the dial).

(d) Screw the cores completely out of the antenna coil, the converter coil, and the oscillator coil.

(e) Adjust the oscillator trimmer C9 at 1675 kilocycles (see Parts Layout - Bottom of Chassis, Page 5).

(f) Adjust the converter trimmer C6, and the antenna trimmer C1 for maximum output (see Parts Layout - Top of Chassis and Bottom of Chassis).

(g) Replace cores to approximately their

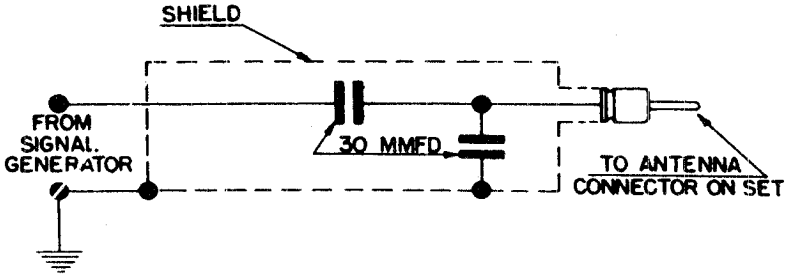


FIG. 2 DUMMY ANTENNA

original position.

(h) Adjust the signal generator to 1400 kilocycles.

(i) Rotate the manual tuning control to position dial pointer at 1400 kilocycles.

(j) Adjust the oscillator core L5 to scale at 1400 kilocycles (see Parts Layout - Top of Chassis, Page 4).

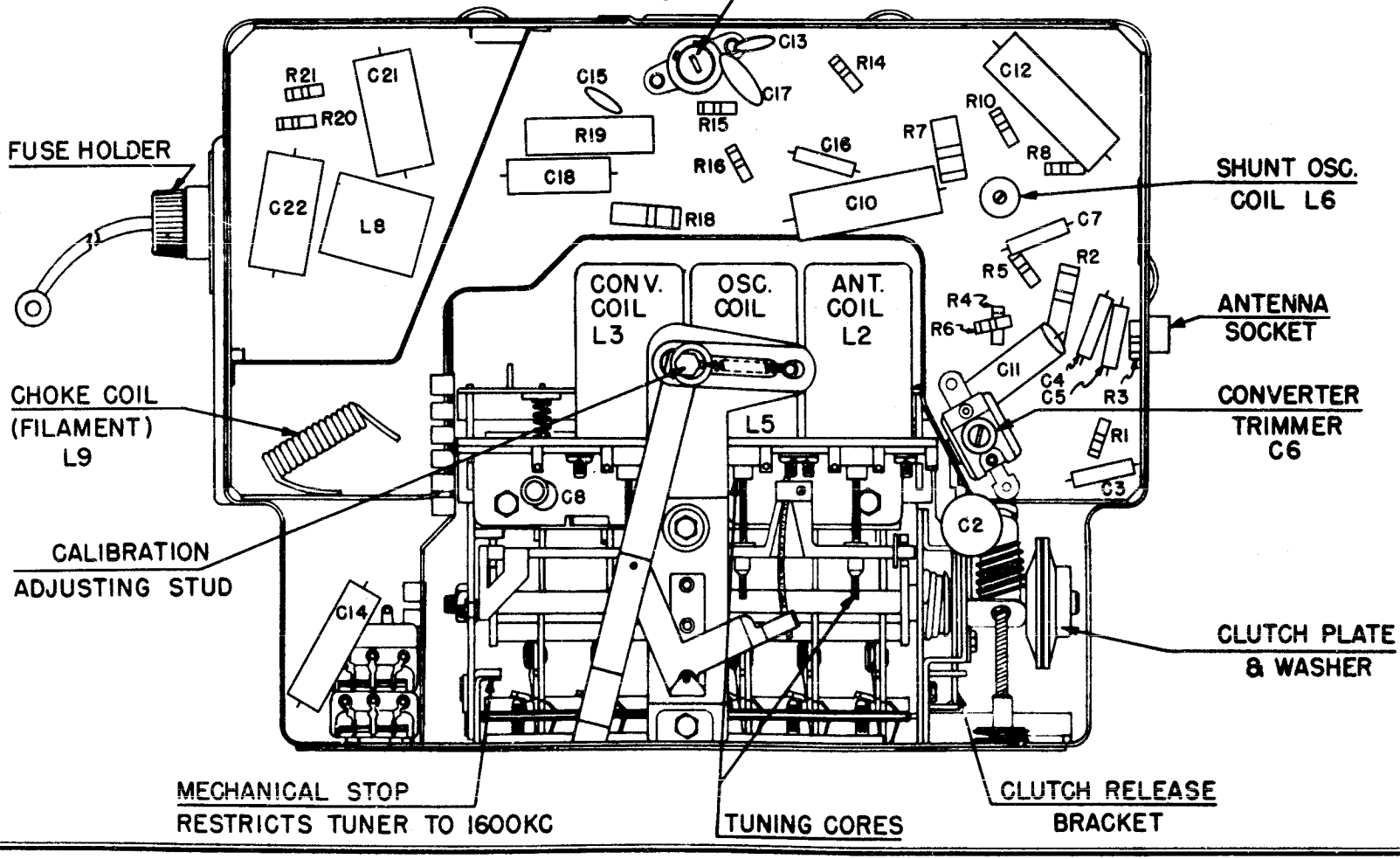
(k) Adjust the antenna core L2 and converter coil L3 for maximum output (see Parts Layout - Top of Chassis, Page 4).

(l) Adjust the signal generator to 600 kilocycles.

(m) "Rock in" shunt oscillator coil L6 for maximum output. This should be done only as a last resort. This is the same as rocking in the padder capacitor on a capacitor tuned receiver.

(n) Check the receiver for calibration and gain. If the receiver is off scale or weak, repeat operations (j), (k) and (l).

FIG. 3 PARTS LAYOUT - TOP OF CHASSIS



MODEL CH749,
Hudson #225908

(o) After alignment is complete, the maximum high frequency tuning range should be checked. If the range is higher or lower than 1605 kilocycles, the lug stop on the tuner unit near the volume control should be bent to limit the frequency coverage to 1605 kilocycles.

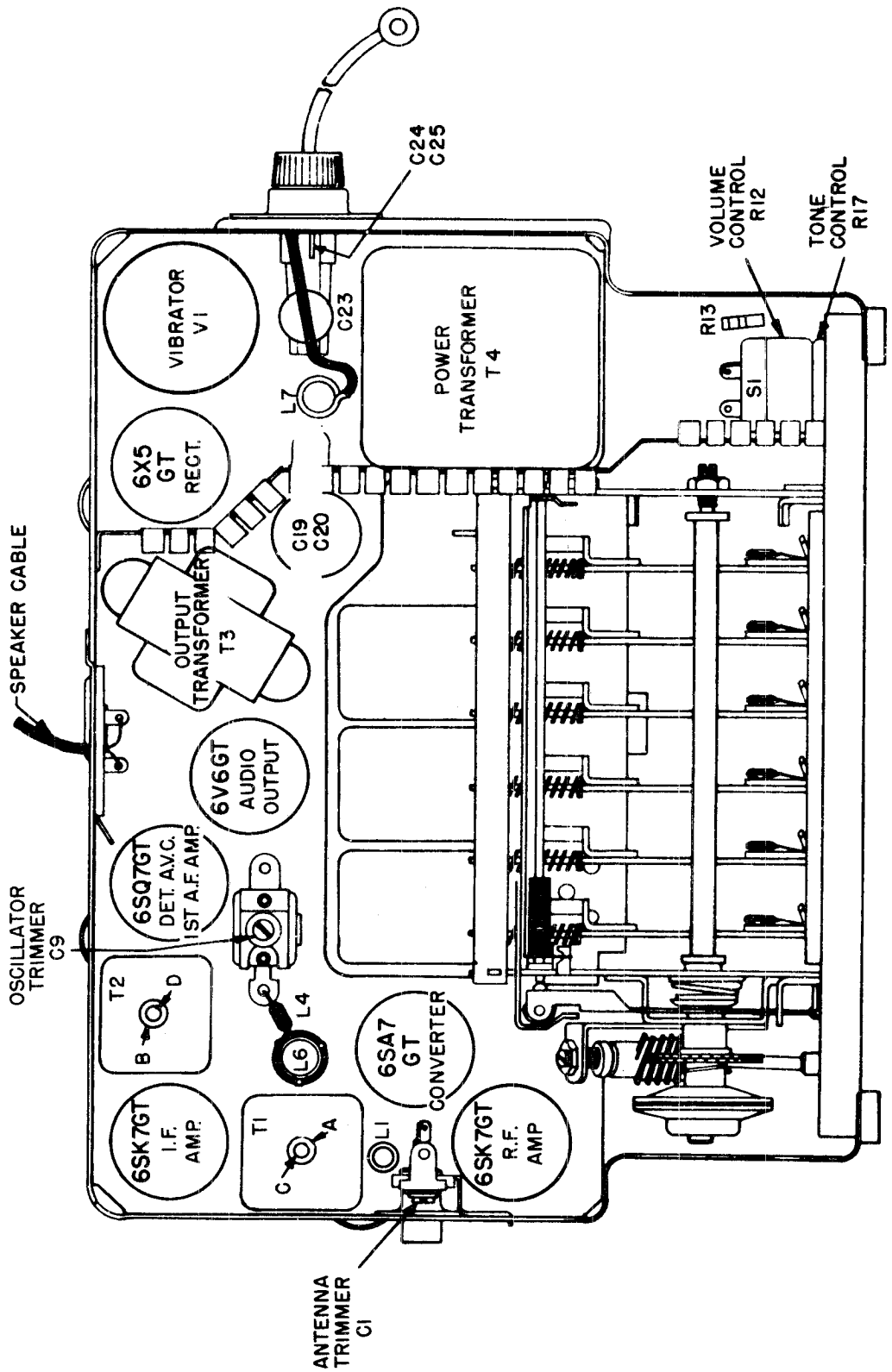
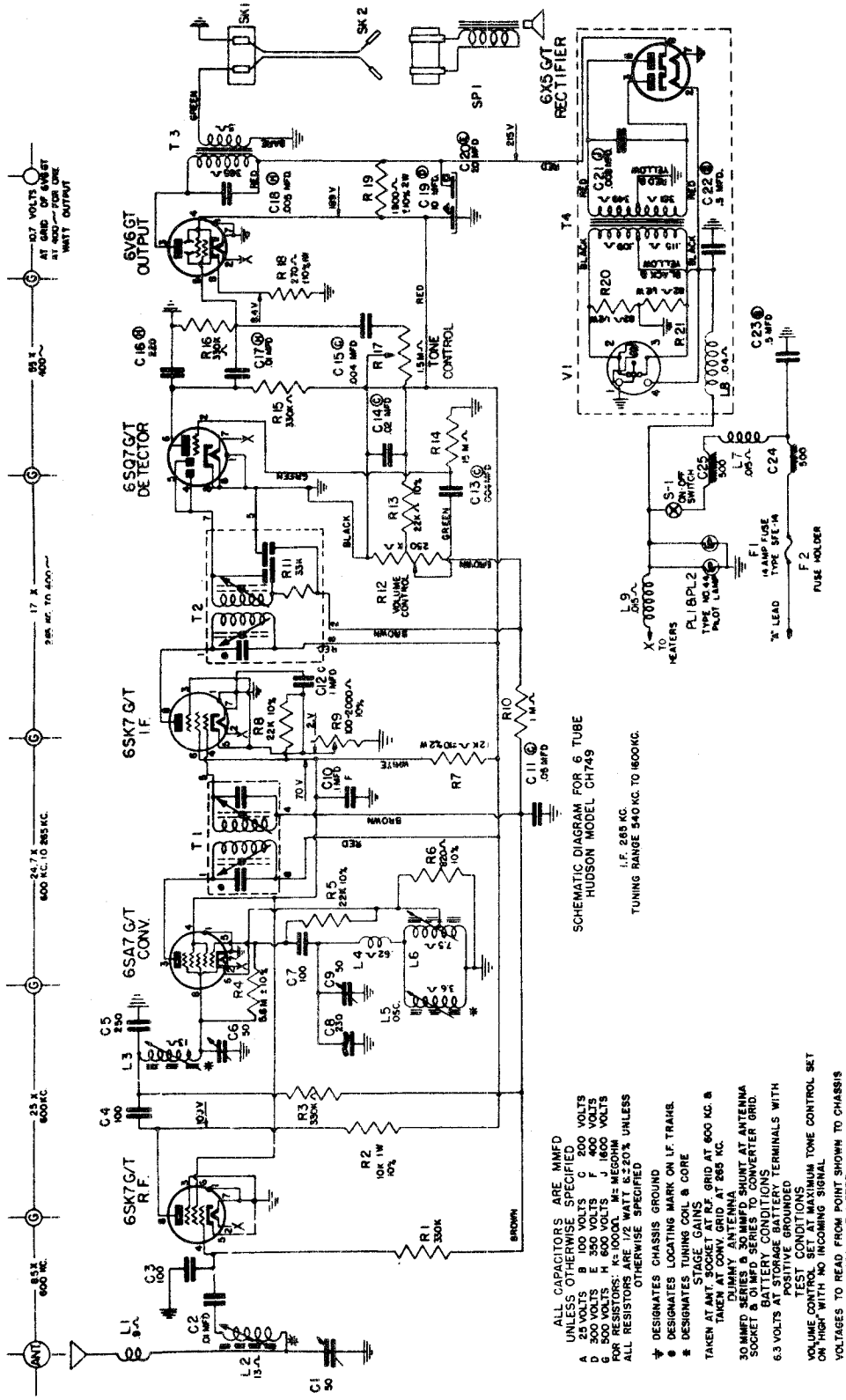


FIG. 4 PARTS LAYOUT - BOTTOM OF CHASSIS

MODEL CH749,
Hudson #225908



SCHEMATIC DIAGRAM FOR 6 TUBE
HUDSON MODEL CH749

I.F. 265 KC.
TUNING RANGE 540 KC. TO 1600 KC.

ALL CAPACITORS ARE MMFD
UNLESS OTHERWISE SPECIFIED
A 25 VOLTS B 100 VOLTS C 200 VOLTS
D 300 VOLTS E 350 VOLTS F 400 VOLTS
G 500 VOLTS H 600 VOLTS J 1600 VOLTS
FOR RESISTORS: K= 1000Ω M= MEGOHM
ALL RESISTORS ARE 1/2 WATT ± 20% UNLESS OTHERWISE SPECIFIED

⏚ DESIGNATES CHASSIS GROUND
● DESIGNATES LOCATING MARK ON I.F. TRANS.
✱ DESIGNATES TUNING COIL & CORE

STAGE GAINS
TAKEN AT ANT. SOCKET AT R.F. GRID AT 600 KC. & TAKEN AT CONV. GRID AT 265 KC.
DUMMY ANTENNA
30 MMFD SERIES & 30 MMFD SHUNT AT ANTENNA SOCKET & .01 MFD SERIES TO CONVERTER GRID.
BATTERY CONDITIONS
6.3 VOLTS AT STORAGE BATTERY TERMINALS WITH POSITIVE GROUNDED
TEST CONDITIONS
VOLUME CONTROL SET AT MAXIMUM TONE CONTROL SET ON HIGH WITH NO INCOMING SIGNAL
VOLTAGES TO READ FROM POINT SHOWN TO CHASSIS WITH 1000 OHM PER VOLT METER
ALL TUBE SOCKETS ARE BOTTOM VIEWS

FIG. 5 SCHEMATIC DIAGRAM - MODEL 225908

PARTS LIST

MODEL CH749,
Hudson #225908

COILS AND CHOKES

SCHEMATIC LOCATION	PRODUCTION PART NO.	SERVICE PART NO.	DESCRIPTION
L9	71630	148-0007	Choke - Filament
L8	71628	147-0007	Choke - Main Hash
L7	71629	147-0001	Choke - Motor Noise
L1	71642	148-0001	Choke - Motor Noise - Antenna
L5	71517	113-0016	Coil - Oscillator
L4	71949	146-0010	Coil - Oscillator Series
L6	71631	116-0002	Coil - Oscillator Shunt
L2, L3	71515	112-0007	Coil - RF
L2, L3, L5	75060	117-0011	Coil Assembly - Tuner Unit

CAPACITORS

C13, C15	71915	166-4000D	Capacitor - Ceramic -	.004 Mfd. - 500 V.
C2, C17	71632	168-0002D	Capacitor - Ceramic -	.01 Mfd. - 500 V.
C4, C7	14140	163-0100	Capacitor - Mica -	.0001 Mfd. - 500 V.
C3	13228	163-0100	Capacitor - Miea -	.0001 Mfd. - 500 V.
C16	71660	163-0220	Capacitor - Mica -	.00022 Mfd. - 500 V.
C5	11691	163-0250	Capacitor - Mica -	.00025 Mfd. - 500 V.
C8	71920	165-0230	Capacitor - Compensating -	.000230 Mfd.
C21	71662	160-16282	Capacitor - Molded Paper -	.0082 Mfd. - 1600 V.
C18	71950	162-0625	Capacitor - Paper -	.005 Mfd. - 600 V.
C14	20987	162-0212	Capacitor - Paper -	.02 Mfd. - 200 V.
C11	71955	162-0215	Capacitor - Paper -	.05 Mfd. - 200 V.
C12	71954	162-0401	Capacitor - Paper -	.1 Mfd. - 200 V.
C10	71953	162-0401	Capacitor - Paper -	.1 Mfd. - 400 V.
C22, C23	71763	169-0001	Capacitor - Paper -	.5 Mfd. - 100 V.
C19, C20	71916	161-2000	Capacitor - Electrolytic	10 Mfd. - 300 V. 20 Mfd. - 350 V.
C1	71917	172-0027	Capacitor - Trimmer - Antenna	
C6	71918	172-0028	Capacitor - Trimmer - Converter	
C9	71919	172-0029	Capacitor - Trimmer - Oscillator	

RESISTORS

R20, R21	BY38201	181-0820	Resistor - insulated -	82 Ohm - 1/2 W.
R6	BY38211	181-0821	Resistor - insulated -	820 Ohm - 1/2 W.
R5, R8, R13	BY32231	181-0223	Resistor - insulated -	22,000 Ohm - 1/2 W.
R11	BY33331	181-0333	Resistor - insulated -	33,000 Ohm - 1/2 W.
R1, R3, R15, R16	BY33342	181-0334	Resistor - insulated -	330,000 Ohm - 1/2 W.
R10	BY31052	181-0105	Resistor - insulated -	1 Megohm - 1/2 W.
R4	BY35651	181-0565	Resistor - insulated -	5.6 Megohm - 1/2 W.
R14	BY31562	181-0156	Resistor - insulated -	15 Megohm - 1/2 W.
R18	ZY32711	182-0271	Resistor - insulated -	270 Ohm - 1 W.
R2	ZY31031	182-0103	Resistor - insulated -	10,000 Ohm - 1 W.
R19	VY31821	183-0182	Resistor - insulated -	1,800 Ohm - 2 W.
R7	VY31231	183-0123	Resistor - insulated -	12,000 Ohm - 2 W.

MISCELLANEOUS

SP1	71964	539-0006	Speaker - 6" x 9" PM
SK2	71926	193-0008	Cable - Speaker
	71640	562-0006	Cable - Battery - Fuse
R12, R17, S1	75752	157-0013	Control - Volume, Tone and On-Off
R9	71645	159-0004	Control - Sensitivity
	71503	192-0002	Core - Perm. Tuner
	71699	416-0002	Socket - Antenna Connector
	71696	412-0016	Socket - Octal - Tube
	71697	413-0003	Socket - Vibrator

MODEL CH749,
Hudson #225908

T1	71702	121-0015	Transformer - 1st I. F.
T2	71703	122-0015	Transformer - 2nd I. F
T3	71938	143-0004	Transformer - Output
T4	71941	141-0012	Transformer - Power
V1	71942-1	511-0001	Vibrator

INSTALLATION & SUPPRESSION

75744	569-0014	Installation Kit Assembly (complete) includes mounting brackets, hardware and volume and tuning knob
75759	561-0008	Cable - Battery - Fuse to Circuit Breaker
71961	569-0004	Capacitor - Generator and Ignition Coil
75152	191-0002	Fuse - 14 Amp. - Type SFE - 14
71962	744-0009	Knob - Tone Control
71963	744-0010	Knob - Trim
75133	749-0012	Knob - Volume and Tuning
75756	496-0050	Spring - Knob Tension
71899	563-0004	Suppressor - Distributor

TUNER ASSEMBLY

71819	333-0008	Clutch Plate & Washer Assembly
71818	333-0007	Clutch Release Bracket & Roller Assembly
71823	333-0006	Gear & Bushing Assembly
71587	331-0003	Lock - Cam
71979	752-0021	Plunger Screw & Knob Assembly
71991	493-0009	Shaft - Drive
71835	496-0045	Spring - Release Bar
71990	313-0015	Unit - Tuner Assembly
71847	554-0015	Washer - "C"
44638	553-0010	Washer - Fiber
71846	553-2008	Washer - Tuning Shaft
71815	484-0005	Worm Gear & Bracket Assembly

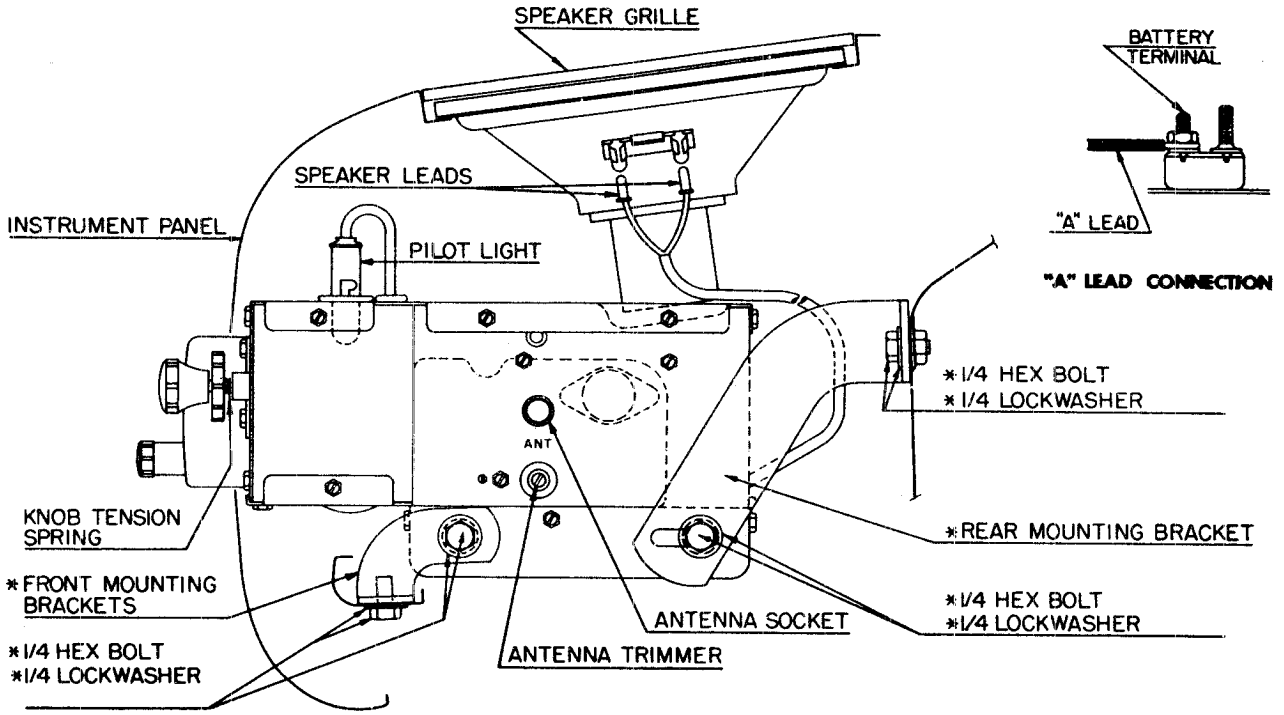
DIAL ASSEMBLY

	71907	711-0020	Escutcheon Assembly (complete)
PL1, PL2	14914	611-0044	Light - Dial (Mazda #44)
	75007	472-0003	Link - Pointer Drag & Stud Assembly
	71929	477-0003	Escutcheon Window Retaining
	75057	791-0013	Pointer & Bracket Assembly
	75063	722-0014	Scale - Dial
	71948	411-0011	Socket - Dial Light & Lead Assembly
	75036	496-0048	Spring - Pointer Tension
	75039	553-2009	Washer - Pointer Tension Spring
	71940	489-0012	Window - Escutcheon

TUBE COMPLEMENT

45238G	622-0001G	6SK7GT - R. F. Amplifier
41332G	622-0002G	6SA7GT - Converter
45238G	622-0001G	6SK7GT - I. F. Amplifier
45239G	622-0003G	6SQ7GT - Detector, AVC & A. F. Amplifier
71226G	622-0004G	6V6GT - Audio Output
71227G	633-0001G	6X5GT - Rectifier

MODEL CH749,
Hudson #225908



*INDICATES PARTS FURNISHED BY HUDSON MOTOR CAR CO.

FIG. 6 RECEIVER INSTALLATION

INSTALLATION

Figure 6 illustrating the installed receiver and its related parts is given here to facilitate removal and reinstallation of the receiver when service or repairs are necessary.

1. Loosen set screws and remove volume control knob, tone control knob, tuning knob, trim knob, and knob tension spring.
2. Remove speaker leads, antenna lead and "A" lead.
3. Remove four speaker mounting screws and speaker grille.
4. Lift speaker out of recess in dash panel.
5. Remove four 1/4" hex bolts and slide receiver to the rear, down and remove.

OPERATING INSTRUCTIONS

VOLUME CONTROL

To turn the receiver on, turn the volume control knob to the right until it clicks and the dial is illuminated. Allow the receiver to reach the operating stage and adjust the volume control knob for the desired volume. To turn the receiver off, rotate the volume control knob to the left until the control clicks.

MANUAL TUNING

To tune the receiver manually it is only necessary to rotate the manual tuning knob (smaller of the two right hand knobs). Tune the receiver to the exact frequency for the best tonal quality. Manual tuning can be done at any time and will not distrub the setting of the push buttons.

MODEL CH749,
Hudson #225908

TONE CONTROL

The tone control knob is located directly behind the volume control knob. Rotating this control to the right or left will change the tone of the receiver. Right hand rotation will emphasize the high notes, left hand rotation emphasizes the bass notes. Turn in either direction for most pleasing tone.

AUTOMATIC TUNING

There are six automatic tuning positions, each of which may be adjusted to a desired station. In order to simplify station identification, it is advisable to set the automatic tuning mechanism in sequence according to frequencies of the stations, beginning with the station broadcasting on the lowest frequency, and progressing to the station broadcasting on the higher frequency. If these positions have not been previously adjusted, proceed as follows:

1. Loosen the first push button (left side of receiver) by turning it counterclockwise with your fingers, not more than two turns.
2. Turn the manual tuning control knob to tune in the desired station. (Carefully tune to the middle of the signal for clearest reception).
3. Push this push button in to its extreme bottom position and then release. Tighten the push button by turning it clockwise (with fingers only). This completes the operation of setting this push button.
4. Repeat the above procedure for each of the five remaining push buttons.

INTERFERENCE SUPPRESSION

There should be no motor noise or interference from the ignition system if the receiver has been installed in the car according to the instructions furnished with it. The interference suppression equipment may be further checked for proper installation by referring to the following instructions and illustration.

IMPORTANT: Use the utmost care in the following operations to insure freedom from motor noise. Be sure that good ground contacts are made between the interference capacitors and the car body. If necessary, clean away paint and dirt with emery paper. Tighten all nuts and bolts securely.

The voltage regulator capacitor 569-0004 should be installed as shown in Fig. 7. Make certain the contacts are clean and the capacitor is attached to the terminal marked A.

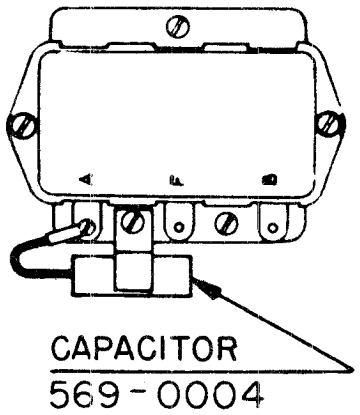


FIG. 7 VOLTAGE REGULATOR

MODEL CH749,
Hudson #225908

The ignition coil capacitor should be installed as shown in Fig. 8. To install, remove the bolt on the left side of the ignition coil and mount the capacitor 569-0004 under this bolt. Connect the capacitor lead to the coil negative terminal marked thus (-).

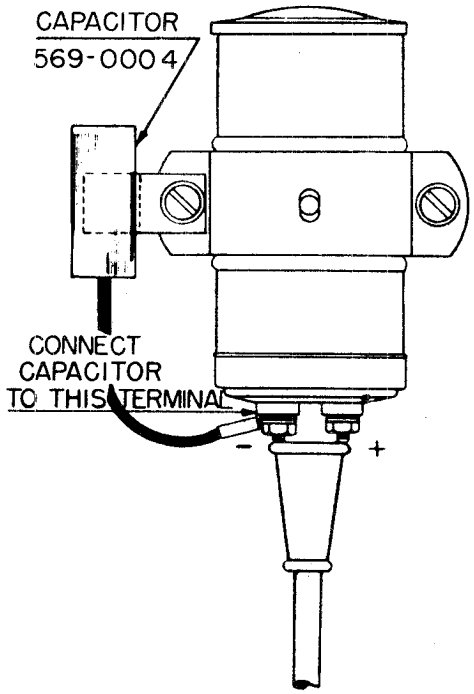


FIG. 8 IGNITION COIL CAPACITOR

The distributor suppressor 563-0004 should be installed as shown in Fig. 9. To insert the distributor suppressor into the high tension line between the ignition coil and the distributor, cut off the high tension wire approximately 1 1/2" above the distributor cap. Cut off an additional one inch from this line and insert the suppressor. Secure the suppressor by screwing the wires into each end. Make certain the capped wire is securely seated in the distributor.

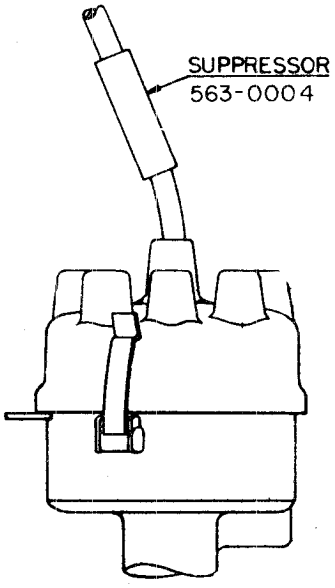


FIG 9 DISTRIBUTOR SUPPRESSOR

11-10-50 2-17

Supplement No. 1

to

Technical Service Bulletin

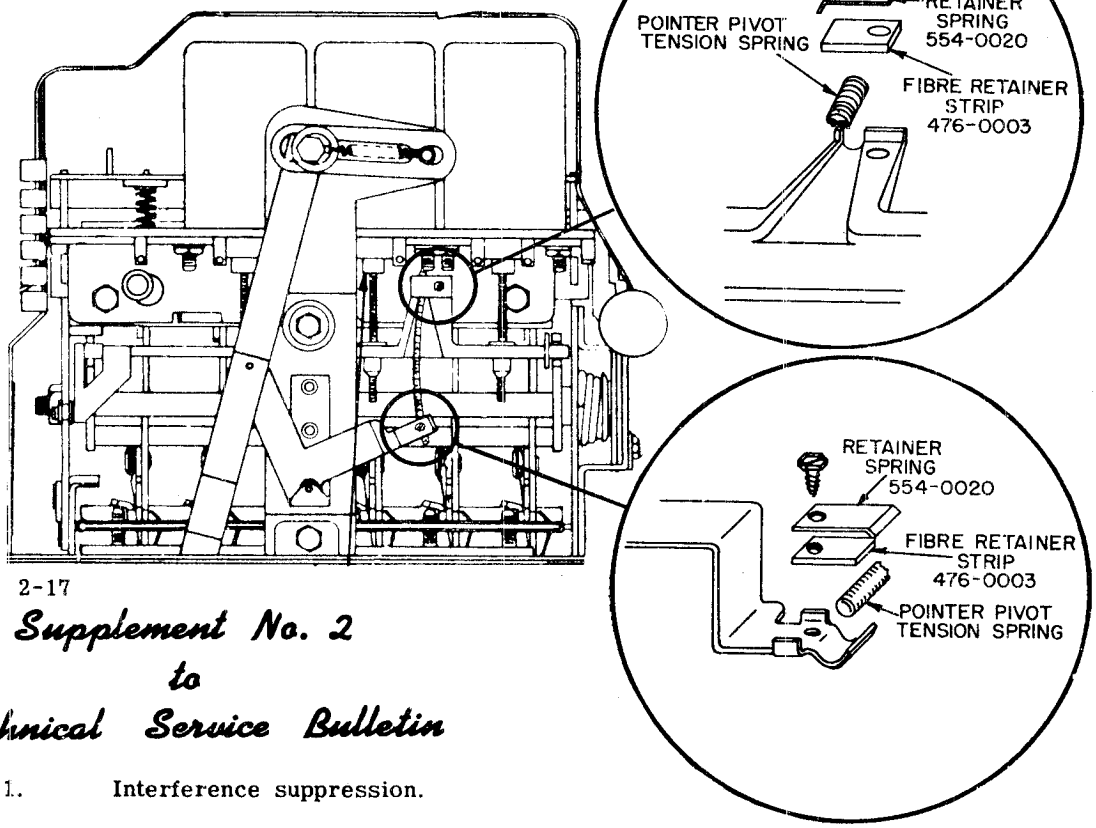
Subject: Pointer Slippage and Binding

In order to prevent pointer slippage and binding due to warping of the two red fibre retainer strips which hold the pointer pivot tension spring in place, metal guard springs have been incorporated in the production of sets with serial numbers CH 17075 (approx.) and up. The guard springs are inserted between the screws which secure the retainer strips, and the retainer strips themselves. These guard springs prevent warping of the retainer strips and consequent pointer slippage. Both the retainer strips and the metal guard springs are available through local Sylvania Parts Distributors.

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
	75866	554-0020	Spring - Metal Guard
	71529	476-0003	Strip - Fibre Retainer

MODEL CH749,
Hudson #225908

BOTTOM VIEW OF TUNER SHOWING RETAINER STRIP



4-16-51 2-17

Supplement No. 2 to Technical Service Bulletin

Item 1. Interference suppression.

All 6 cylinder Hudson cars have a suppressor built into the distributor cap; thus the information given on page 12, for installation of Suppressor 563-0004 applies only to eight cylinder models.

Item 2. The following revisions should be made to the Repair Parts List:

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
		Delete	
	71640	562-0006	Cable - Battery - Fuse
L1	71642	148-0001	Choke - Motor Noise - Antenna
	71907	711-0020	Escutcheon Assembly (complete)
	71929	477-0003	Escutcheon Window Retaining
	75063	722-0014	Scale - Dial
	71991	493-0009	Shaft - Drive
	71990	313-0015	Unit - Tuner Assembly
	71815	484-0005	Worm Gear and Bracket Assembly
		Add	
L1	75955	148-0001	Choke - Motor Noise - Antenna
	75725	722-0018	Dial
	75741	711-0024	Escutcheon
	71640	562-0006	Holder - Fuse
	71929	477-0003	Plate - Escutcheon Window Retaining
	75757	493-0014	Shaft Assembly - Drive
	75730	313-0019	Tuner Unit Assembly - mechanical portion only - includes push buttons, driven clutch disc, worm gear, tuning control shaft
	75523	484-0005	Worm Gear and Bracket assembly

TECHNICAL SERVICE BULLETIN

MODEL OCF751-1,
Ford #1A-18805-D

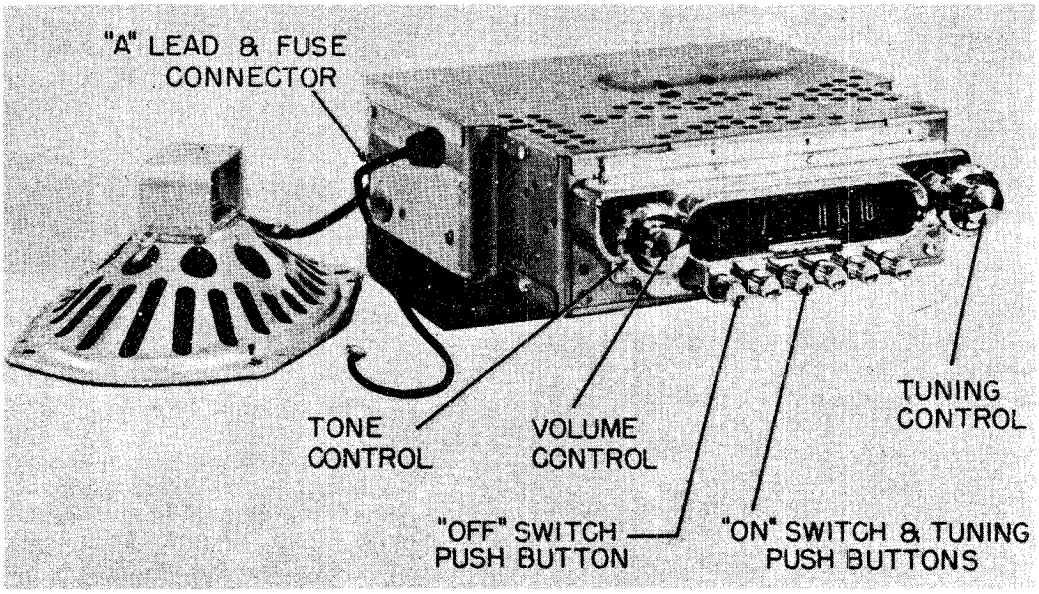


FIG.1 OCF751-1

GENERAL

The Ford model 1A-18805-D receiver is designed for use in the 1951 Ford Station Wagons and cars. If Adapter Kit 1C-18819-A is used, this receiver may be installed in all 1951 Ford Trucks except parcel delivery trucks. The Sylvania serial numbers of the model covered in this bulletin are OCF40, 001 and up.

This receiver is a twin unit, 8 tube superheterodyne with a vibrator power supply and a push pull output stage employing 6V6GT tubes. The antenna, radio frequency and oscillator circuits in this receiver are tuned by means of iron cores both manually and with push buttons, over a range from 540 to 1600 kilocycles.

TUBE COMPLEMENT

6SK7GT	R. F. Amplifier
6SA7GT	Converter
6SK7GT	I. F. Amplifier
6SQ7GT	Det., AVC & 1st A.F. Amplifier
6J5GT	Inverter
6V6GT	Output - Push Pull (2)
6X5GT	Rectifier

POWER SUPPLY

The power supply uses a 4 prong, full wave, non-synchronous vibrator in conjunction with a 6X5GT full wave rectifier tube. The wiring for the power transformer and vibrator, the main hash choke and its by-pass, and the buffer capacitor are mounted in a shielded compartment on the chassis to reduce interference.

ALIGNMENT

Optimum performance depends on accurate alignment of the receiver; therefore, follow these instructions carefully.

PRELIMINARY INSTRUCTIONS

Make all alignment adjustments to the receiver with the "A" lead connected to a 7.2 volt negative source and ground the chassis to the positive side of this source. Rotate the volume control to its maximum clockwise position. Rotate the tone control fully clockwise. Connect the output meter across the speaker voice coil. Keep the output from the signal generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment. Use an insulated screw driver and special alignment tool 898-0003 for making adjustments.

MODEL OCF751-I,
Ford #1A-18805-D

SENSITIVITY CONTROL

The sensitivity control R6 is factory preset and should not be readjusted unless it has been tampered with. If it is definitely determined that readjustment is necessary, set the control to obtain 3.5 volts at the cathode of the I.F. Amplifier (pin #5 of the second 6SK7GT tube).

I F ALIGNMENT

1. Remove the top and bottom covers of the receiver.
2. Set the signal generator to 265 Kc.
3. Connect the signal lead of the signal generator through a .1 Mfd. capacitor to the converter grid (pin #8, 6SA7GT).
4. Adjust the primary and secondary IF cores "A," "B," "C" and "D" in order named for maximum output. Both the primary and secondary of each transformer are adjusted from the top of the transformer using special alignment tool. (See Parts Layout - Bottom of Chassis, Page 3).

Repeat this operation until no further increase in output is obtained.

R F AND OSCILLATOR ALIGNMENT

1. Connect the signal generator leads through a dummy antenna which consists of two, 30 Mmfd. capacitors in a grounded shield, wired so that one is between the antenna lead-in socket of receiver and the signal generator, and the other is shunted from antenna lead to ground.
2. Turn the manual control until the high frequency stop is reached.
3. Set the signal generator to 1625 Kc.
4. Adjust the oscillator trimmer C7, the converter trimmer C6, and the antenna trimmer C1, respectively for maximum response.
5. If dial calibration is off after making above adjustments, corrections can be made by turning eccentric stud of fulcrum of dial pointer.

IRON CORE AND ADJUSTING SPRING ADJUSTMENT OR REPLACEMENT

1. Remove the top cover from the receiver.
2. Remove the escutcheon assembly.
3. Break cement seal and screw the core in or out to the desired position.
4. If the cores are replaced or have been tampered with, the adjustments under coil and core replacement must be made.
5. After all adjustments have been made recement core springs.

CORE ALIGNMENT

CAUTION: The following adjustments are to be made only after a core or coil has been replaced or tampered with.

1. Set signal generator to 1625 Kc.
2. Connect signal generator through a dummy antenna which consists of two 30 Mmfd. capacitors inside a grounded shield so that one is connected directly from antenna socket on receiver to ground while the other capacitor is connected from signal generator to receiver antenna socket.
3. Rotate the manual tuning control to set dial pointer at 1610 Kc. (Maximum high frequency end of dial).
4. Screw the cores completely out of the antenna coil, the converter coil, and the oscillator coil.
5. Adjust the oscillator trimmer C7 at 1625 Kc.
6. Adjust the converter trimmer C6 and the antenna trimmer C1 for maximum output reading.
7. Set the signal generator and the receiver dial to 1410 Kc.
8. Replace the cores to their original position (approximately 11/16" from the end of the coil form.)
9. Adjust the oscillator core L6 to scale at 1410 Kc.
10. Adjust the antenna core L2 and RF core L5 for maximum output reading.
11. Repeat steps 9 and 10 to insure that tracking and calibration are correct.
12. After alignment is complete, the maximum high frequency tuning range should be checked. If the range is greater or less than 1610 Kc., the lug stop near the volume control should be bent to limit the frequency coverage to 1610 Kc.

IMPORTANT: After installing the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum height. Check the antenna trimmer alignment on a weak station at approximately 1410 Kc.

MODEL OCF751-1,
Ford #1A-18805-D

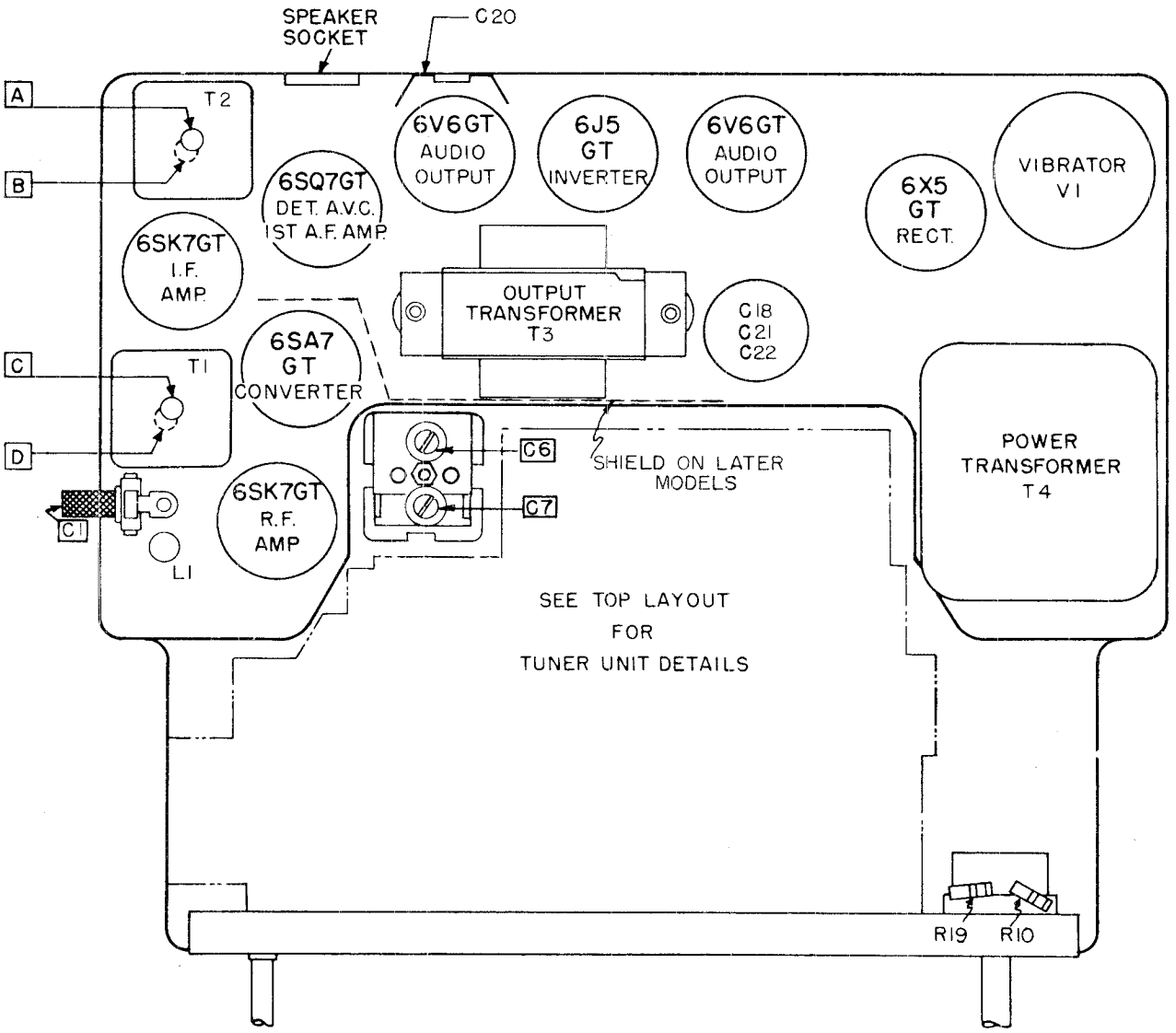


FIG. 2 PARTS LAYOUT - BOTTOM OF CHASSIS

REPAIR PARTS LIST

TUNER UNIT AND PARTS

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
	75900	313-0016	Tuner Unit Assembly - Mechanical portion only (includes clutch plate, push buttons, On-Off switch, worm gear and bracket, tuning control shaft)
	60493	481-0011	Ball - bearing - .125"
	71818	333-0007	Bracket - Clutch release and Roller Assembly

MODEL CCF751-1,
Ford #1A-18805-D

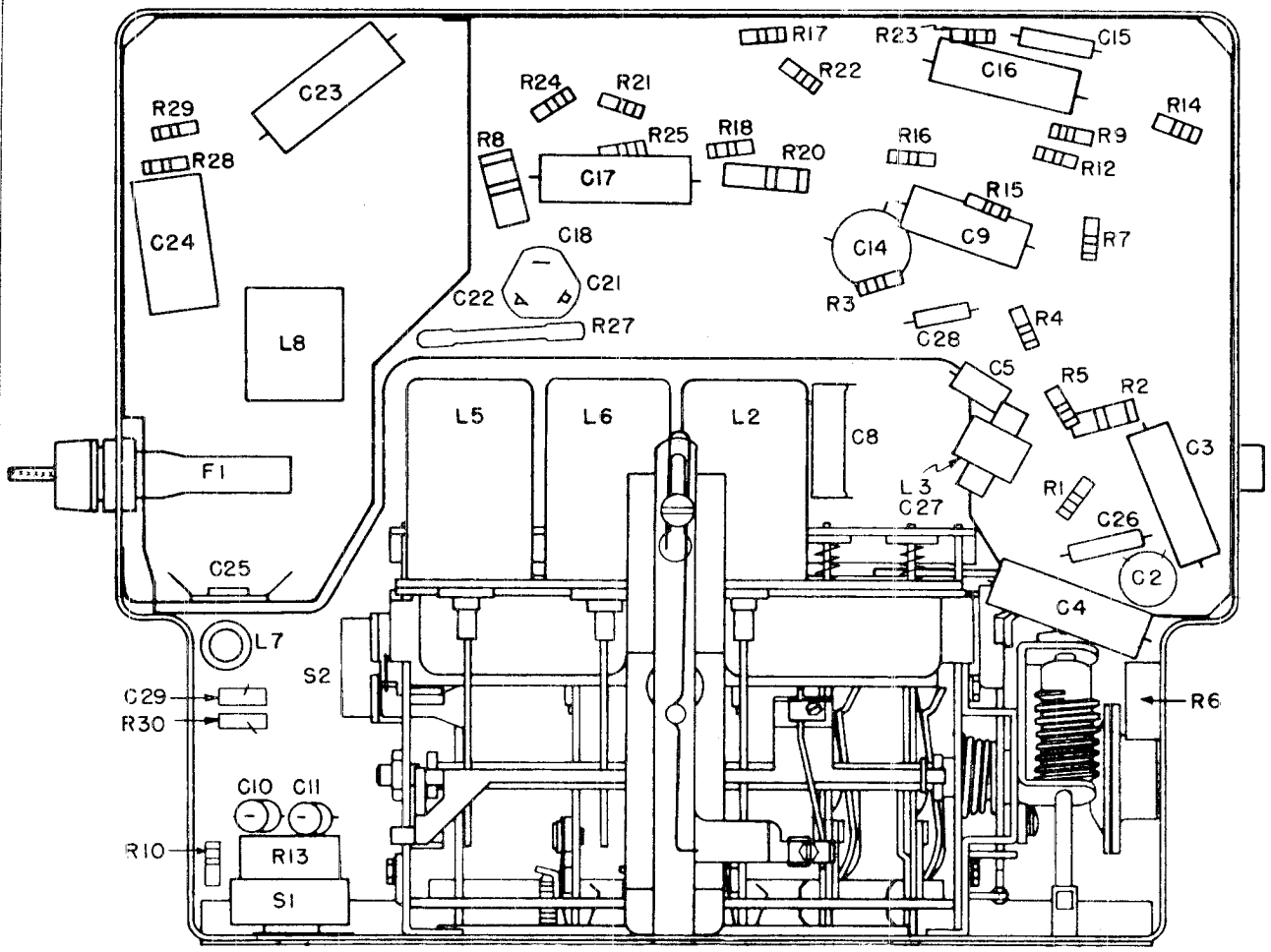


FIG. 3 PARTS LAYOUT - TOP OF CHASSIS

75842	492-0027	Bracket - Pointer Support Assembly
71626	481-0006	Bushing - Tuning Shaft
71627	481-0007	Bushing - Volume Control Shaft
75082	752-0022	Button - Push and Screw Assembly
71650	487-0010	Clip - Dial Window Retaining (L.H.)
71649	487-0009	Clip - Dial Window Retaining (R.H.)
65966	333-0005	Clutch and Disc Assembly - Driven
71503	192-0002	Core & Adjusting Spring Assembly
75094	722-0013	Drum - Tone Shaft and Gear Assembly
71651	711-0019	Escutcheon
75106	485-0002	Filter - Dial Scale
75530	333-0006	Gear - Drive and Bushing Assembly
75009	484-0004	Gear - Tone Assembly
75531	484-0006	Gear - Worm
71723	489-0011	Glass - Dial Window
71652	744-0008	Knob - Control - Tone
71653	741-0004	Knob - Control - Tuning - includes Spring - Knob retaining
71654	742-0002	Knob - Control - Volume - includes Spring - Knob retaining
75797	472-0007	Link - Pointer Drag & Stud Assembly
71587	331-0003	Lock - Cam

MODEL 0CF751-1,
Ford #1A-18805-D

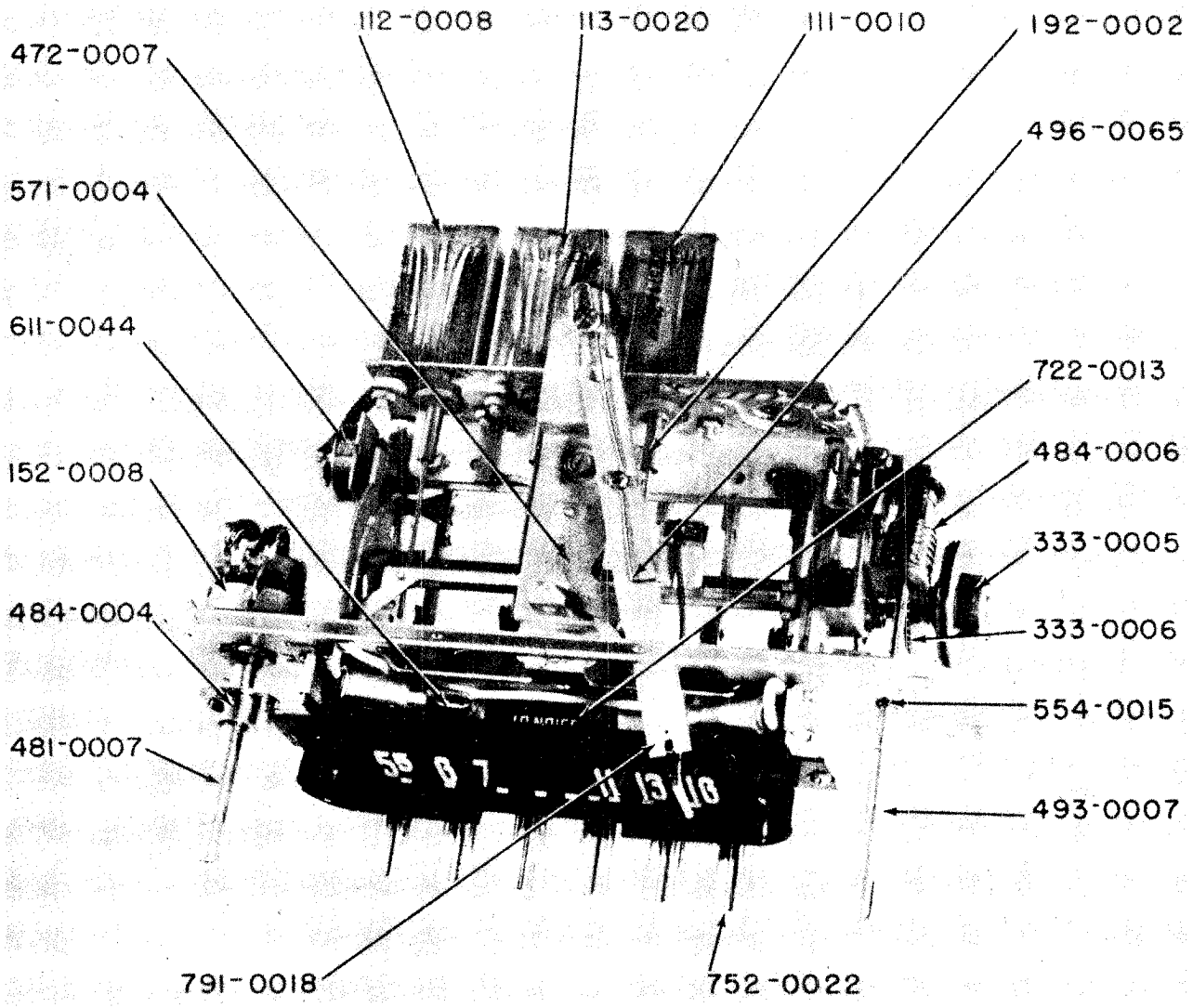


FIG. 4 0CF751 - 1 TUNER

	75031	552-0023	Nut - 3/8 - 32 Hex
		791-0018	Pointer Assembly
	71847	554-0015	Ring - Retaining - Tuning Shaft
	75103	722-0011	Scale - Dial
	65975	551-0017	Screw - Adjusting
	71838	551-0017	Screw - Pivot
	75873	493-0007	Shaft Assembly - Manual Drive
	71701	497-0007	Sleeve - Tuning Shaft
	71700	497-0006	Sleeve - Volume Control Shaft
	75102	411-0009	Socket - Dial Light
	71827	496-0043	Spring - Clutch Release
	71831	496-0046	Spring - Clutch Release Bracket
	75037	496-0065	Spring - Cross Arm Tension
	75793	496-0066	Spring - Pointer Tension
	71529	476-0003	Strip - Fibre Retainer (Pointer Pivot Tension Spring)
S2	71865	571-0004	Switch - On-Off
	71837	553-3000	Washer - Felt
	71180	553-4009	Washer - Shim
	71853	553-5005	Washer - Tension

MODEL OCF751-1,
Ford #1A-18805-D

TUBE COMPLEMENT

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
	45238H	622-0001H	6SK7GT - R.F. Amplifier
	41332H	622-0002H	6SA7GT - Converter
	45238H	622-0001H	6SK7GT - I.F. Amplifier
	45239H	622-0003H	6SQ7GT - Detector - AVC - 1st A.F. Amplifier
	44547H	622-0010H	6J5GT - Inverter
	71226H	622-0004H	6V6GT - Audio Output
	71226H	622-0004H	6V6GT - Audio Output
	71227H	633-0001H	6X5GT - Rectifier

CAPACITORS

C8	75961	165-0230	Capacitor - Ceramic - Temp. Comp. - .00023 Mfd.
C2	71632	168-0002D	Capacitor - Ceramic - .01 Mfd. - 200 V.
	75825 or 71633	161-3005	Capacitor - Electrolytic
C18			20 Mfd. - 25 V.
C21, C22			20 Mfd. - 350 V.
C5	71472	163-0033	Capacitor - Mica - .000033 Mfd. - 500 V.
C15	71660	163-0220	Capacitor - Mica - .00022 Mfd. - 500 V.
C29	20548	163-0250	Capacitor - Mica - .00025 Mfd. - 500 V.
C28	71399	164-0010	Capacitor - Silver Mica - .00001 Mfd. - 500 V.
C26	71661	164-0150	Capacitor - Silver Mica - .00015 Mfd. - 500 V.
C10	75064	160-04215	Capacitor - Molded Paper - .0015 Mfd. - 400 V.
C11, C14	75098	160-02256	Capacitor - Molded Paper - .0056 Mfd. - 200 V.
C23	71662	160-16282	Capacitor - Molded Paper - .0082 Mfd. - 1600 V.
C3	71666	160-02122	Capacitor - Molded Paper - .022 Mfd. - 200 V.
C16, C17	71664	160-06122	Capacitor - Molded Paper - .022 Mfd. - 600 V.
C9	71663	160-0201	Capacitor - Molded Paper - .1 Mfd. - 200 V.
C4	71665	160-0401	Capacitor - Molded Paper - .1 Mfd. - 400 V.
C24	HT71763	169-0001	Capacitor - Paper - .5 Mfd. - 100 V.
C1	71636	172-0026	Capacitor - Trimmer - Antenna
C6, C7	75824	173-0002	Capacitor - Trimmer and Fixed
C20, C25		167-0008	Capacitor - Spark Plate Kit Consists of Silvered mica washer, Shouldered washer, flatwasher, screw, lockwasher-nut

MISCELLANEOUS CHASSIS PARTS

	71639	561-0003	Cable - Battery (Fuse to Ammeter)
F2	75786	562-0007	Holder - Fuse
	71699	416-0002	Socket - Antenna Connector
SK1	71698	414-0001	Socket - Speaker
	71693	412-0016	Socket - Tube - 8 Prong Octal - Molded Bakelite
	66423	413-0005	Socket - Vibrator

MISCELLANEOUS ELECTRICAL PARTS

PL1, PL2	14914	611-0044	Bulb - Dial Light (Mazda #44)
L1	75955	148-0001	Choke - Antenna
L8	71628	147-0007	Choke - Hash - Main
L7	75850	145-0005	Choke - Heater
	75796	117-0012	Coils - Permeability Tuning (includes)
L2		111-0010	Antenna Coil
L5		112-0008	R.F. Coil
L6		113-0020	Oscillator Coil
L3, C27	75918	118-0008	I.F. Trap Coil

MODEL OCF751-1,
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MISCELLANEOUS ELECTRICAL PARTS (continued)

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
R6	71645	159-0004	Control - Sensitivity
R13, S1	71893	152-0008	Control - Volume and Tone Switch
F1	17392	191-0002	Fuse - 14 Amp
SP1	75674-2	539-0001	Speaker - 6" x 9" PM
T1	71702	121-0015	Transformer - 1st I.F.
T2	71703	122-0015	Transformer - 2nd I.F.
T3	75931	143-0012	Transformer - Output
T4	75787	141-0010	Transformer - Power
V1	71712	511-0001	Vibrator

INSTALLATION PARTS

	75938	569-0015	Installation and Suppression Kit (includes)
	71617	492-0014	Bracket - Installation
	75162	567-0005	Capacitor - Fuel Gauge
	71456	564-0002	Capacitor - Generator
	71604	569-0012	Capacitor - Oil Gauge
	75156	569-0004	Capacitor - Voltage Regulator
	71460	568-0003	Collector - Wheel Static
	71610	552-0006	Nut - Hex - 1/4-20
	75663	552-0001	Nut - Wing - 8-32
	75935	563-0006	Suppressor Lead - Distributor
	71615	553-2006	Washer - Flat
	400-14	553-0003	Washer - Lock - 1/4 Split
	71669	552-0020	Nut - Hex - 1/2 - 28
	71414	563-0004	Suppressor-Distributor
	71491	553-1250	Washer - Lock - 1/2 - Int. Tooth

RESISTORS

R16	BY34701	181-0470	Resistor - 47 Ohm - 1/2 W. - insulated
R28, R29	BY38201	181-0820	Resistor - 82 Ohm - 1/2 W. - insulated
R21	BY31521	181-0152	Resistor - 1,500 Ohm - 1/2 W. - insulated
R18	BY32221	181-0222	Resistor - 2,200 Ohm - 1/2 W. - insulated
R4	BY32231	181-0223	Resistor - 22,000 Ohm - 1/2 W. - insulated
R7, R11	BY33331	181-0333	Resistor - 33,000 Ohm - 1/2 W. - insulated
R25	BY33931	181-0393	Resistor - 39,000 Ohm - 1/2 W. - insulated
R17	BY35631	181-0563	Resistor - 56,000 Ohm - 1/2 W. - insulated
R10, R19	BY31041	181-0104	Resistor - 100,000 Ohm - 1/2 W. - insulated
R12	BY32241	181-0224	Resistor - 220,000 Ohm - 1/2 W. - insulated
R3, R22, R23, R24	BY33341	181-0334	Resistor - 330,000 Ohm - 1/2 W. - insulated
R14	BY34741	181-0474	Resistor - 470,000 Ohm - 1/2 W. - insulated
R1, R9	BY31051	181-0105	Resistor - 1.0 Megohm - 1/2 W. - insulated
R5	BY31061	181-0106	Resistor - 10 Megohm - 1/2 W. - insulated
R15	BY31561	181-0156	Resistor - 15 Megohm - 1/2 W. - insulated
R20	ZY33311	182-0331	Resistor - 330 Ohm - 1 W. - insulated
R2	ZY31031	182-0103	Resistor - 10,000 Ohm - 1 W. - insulated
R30	71676	189-0014	Resistor - 5.1 Ohm - 2 W. - W.W.
R27	VY31821	183-0182	Resistor - 1,800 Ohm - 2 W. - insulated
R8	VY31231	183-0123	Resistor - 12,000 Ohm - 2 W. - insulated

MODEL OCF751-1,
Ford #1A-18805-D

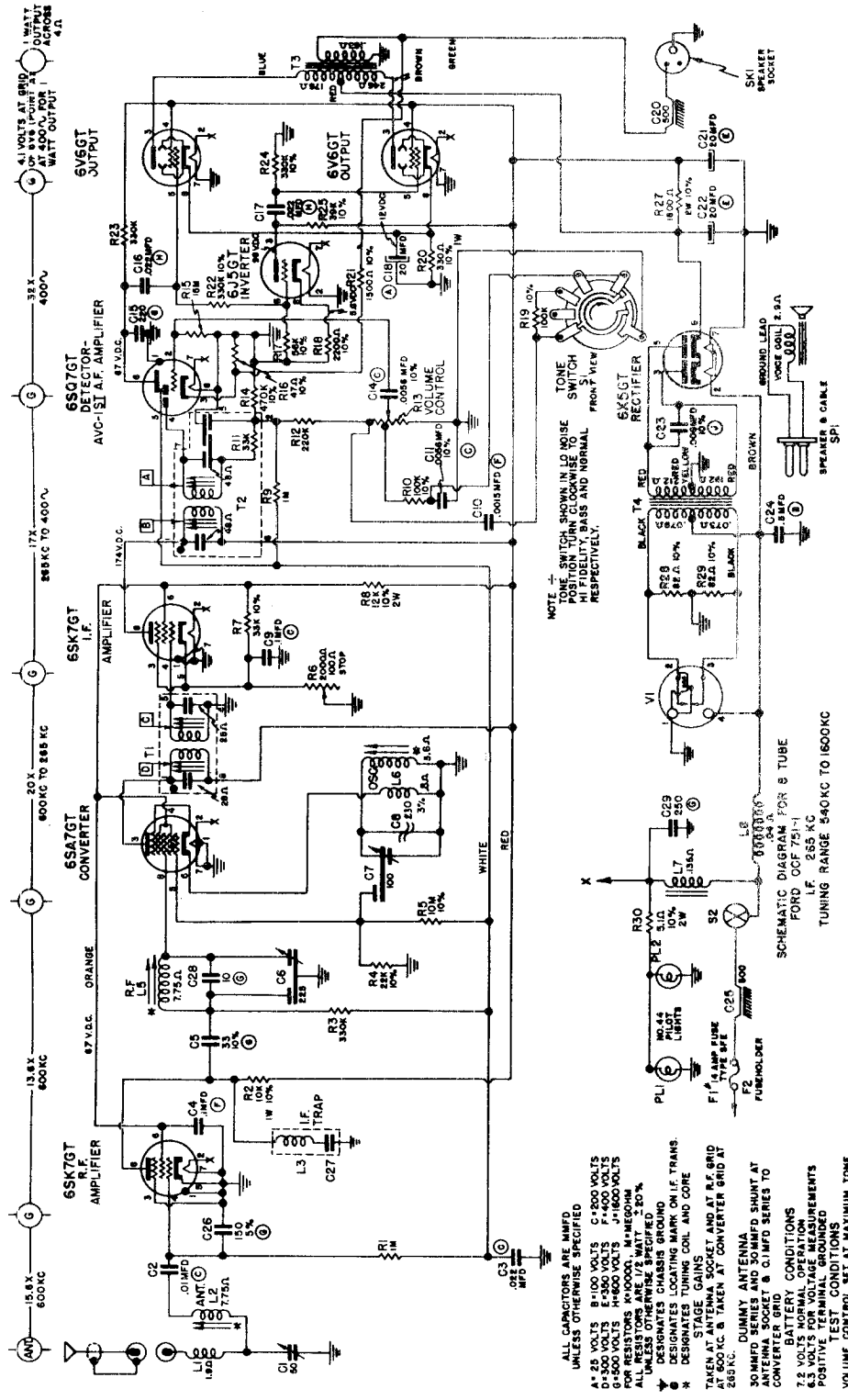

FIG. 5 SCHEMATIC DIAGRAM MODEL OCF751-1

MODEL 0CF751-1,
Ford #1A-18805-D

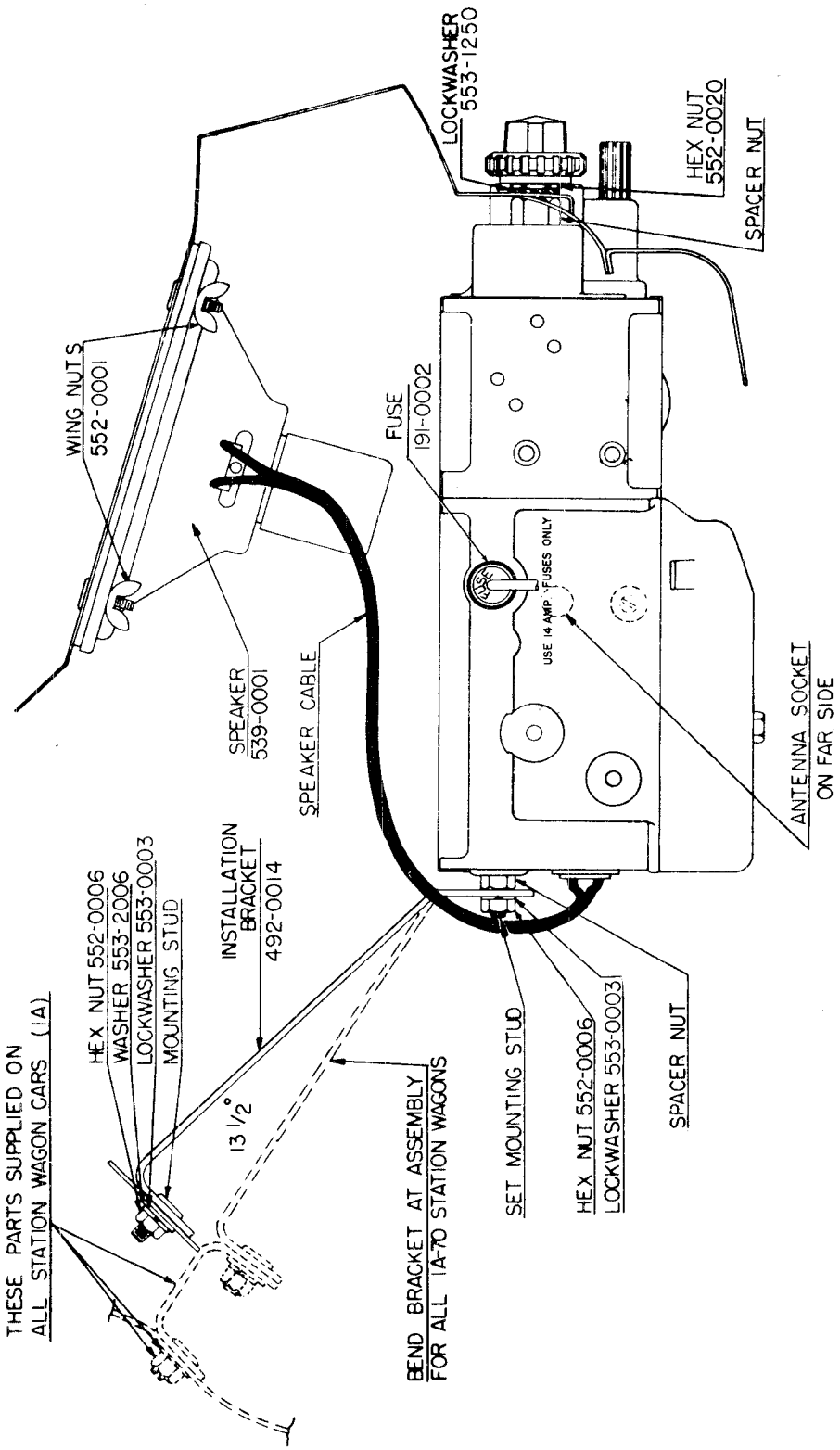

FIG. 6 MODEL 0CF751-1 INSTALLATION

MODEL OCF751-1,
Ford #1A-18805-D

RECEIVER INSTALLATION

Figure 6 illustrates the installed receiver to facilitate removal and reinstallation of the receiver when service is necessary.

TO REMOVE THE RECEIVER FROM THE CAR:

1. Disconnect the "A" lead at the receiver. Remove the speaker plug from the receiver.
2. Remove control knobs, front mounting nuts and lockwashers from the radio control shafts. (See Fig. 6)
3. Disconnect the bottom of the set rear mounting bracket by removing the hex nut and lockwasher from the set rear mounting stud. (See Fig. 6)
4. Remove set by pushing it back and down behind instrument panel.
5. To take the speaker from the Ford car, remove the four wing nuts that hold the speaker to the rear of the instrument panel.

OPERATING INSTRUCTIONS

TO TURN RADIO ON

The radio is connected to the accessory terminal of the ignition switch, therefore, it is necessary to turn the ignition key to the left, if the engine is not running, before turning the radio on. Press any one of the five automatic push-buttons. Allow approximately 20 seconds for the receiver to reach operating temperature.

To turn the receiver off, press the "Off" push-button. (See Fig. 1)

MANUAL TUNING

To operate the manual tuning control simply turn the tuning knob (see Fig. 1). When tuning in a station, be sure to tune to the exact frequency for the best tone quality.

VOLUME CONTROL

Turn the volume control knob for the desired volume.

TONE CONTROL

The tone control knob is located directly behind the volume control knob. Turning this control to the right or left will change the tone of the receiver. This control has four positions and the position to which the control is set is indicated in the window in the center of the dial scale.

AUTOMATIC TUNING

Automatic push button tuning is provided by means of 5 push buttons located directly under the dial scale and to the right of the "Off" push button (see Fig. 1). These five buttons permit the selection of five favorite local stations. When the push buttons have been set to the desired stations it is only necessary to press a push button to turn the set "On" and to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

SETTING THE PUSH BUTTON TUNER

The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency.

The push buttons should be set up during the daytime because at night, distant stations will be heard with the same volume as local stations, making it difficult to identify local stations.

Allow the receiver to operate for at least fifteen minutes before adjusting the push buttons. This will allow each part in the receiver to reach normal operating temperature.

a. Collapse the antenna.

b. Select a station at the low end of the broadcast band and manually tune it in so its signal is heard without distortion.

c. Loosen the second push button from the left side by turning it, with your fingers, counterclockwise one turn.

d. Press the loosened push button in firmly to its extreme position and release. Tighten the push buttons as much as possible by turning clockwise with your fingers.

e. The push button is now set for this station selection. Follow the above procedure for setting each of the four remaining push buttons.

f. Check that the push button setting corresponds to the best manually tuned signal for each station and repeat steps "b" through "e" where necessary.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

INTERFERENCE ELIMINATION

There should be no motor noise or interference from the ignition system if the receiver has been installed in the car according to the instructions furnished with the receiver. The interference suppression equipment may be checked for proper installation by referring to the following instruction and illustrations.

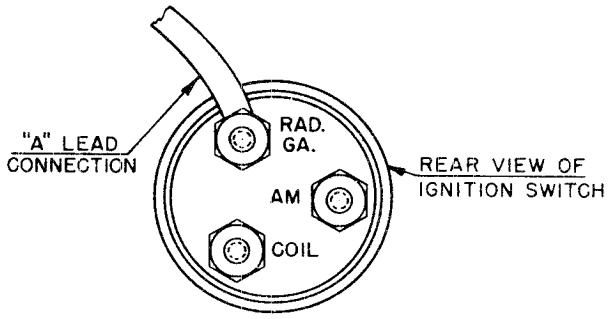

FIG. 7 "A" LEAD CONNECTION

The "A" lead to the receiver should be installed in each car as illustrated in Fig. 7.

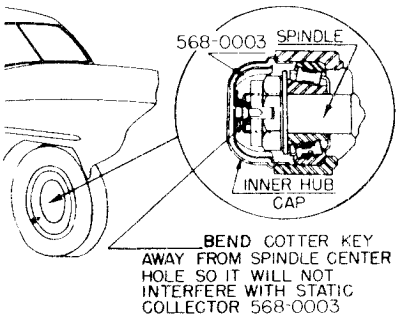

FIG. 8 WHEEL STATIC COLLECTOR

Remove both the outer and the inner hub caps from both front wheels. Clean the inner caps and spindles. Snap static collector springs 568-0003 in inner hub caps.
IMPORTANT: Bend cotter key away from center hole so it will not interfere with static collector. Replace hub caps.

Two types of distributor suppressors are used with the Ford model OCF751-1 receiver. Suppressor 563-0004 was used for receivers with serial numbers up to OCF-51,341-751-1. Suppressor 563-0006 is used for all receivers with serial numbers above this number. Suppressor 563-0004 may be replaced with suppressor lead 563-0006.

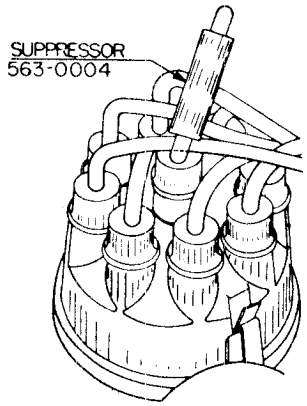

FIG. 9 DISTRIBUTOR SUPPRESSOR 563-0004

To install Suppressor 563-0004 shown in Fig. 9, cut the high tension wire running from the ignition coil to the center hole of the distributor cap, one and one half inches from the coil. Cut one inch from the coil end of the wire. Screw the cut ends of the wire into both ends of Suppressor 563-0004. Replace the wire in the coil.

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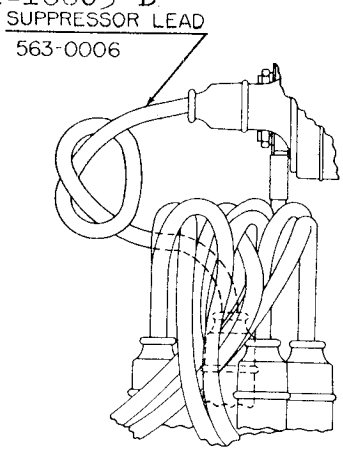

FIG. 10 DISTRIBUTOR SUPPRESSOR LEAD 563-0006

To install Suppressor lead 563-0006, remove the high tension wire that runs between the ignition coil and the center hole of the distributor cap. Thoroughly clean the contacts on the coil and distributor. Make an overhand loop in Suppressor lead 563-0006 as shown in Fig. 10 and insert the lead in place of the high tension wire.

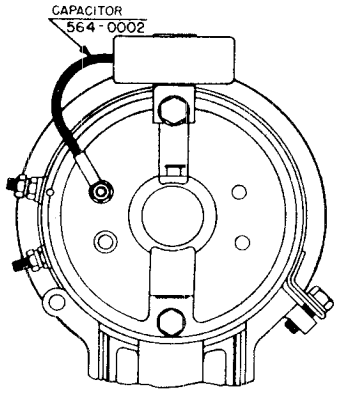

FIG. 11 GENERATOR CAPACITOR

The generator capacitor 564-0002 is installed by loosening (do not remove) the top assembly bolt from the rear end plate of the generator. Mount the capacitor under this bolt and connect the lead to the armature terminal of the generator.

Supplement No. 1

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to

Technical Service Bulletin

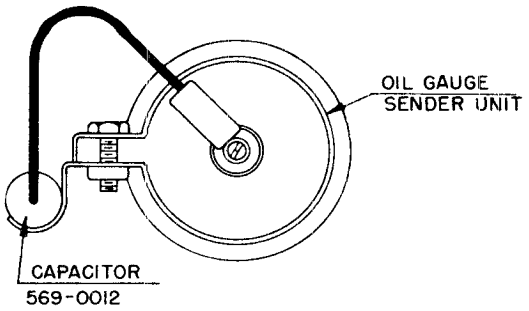


FIG. 12 OIL GAUGE CAPACITOR

Connect capacitor 569-0012 to the oil gauge sender unit as shown.

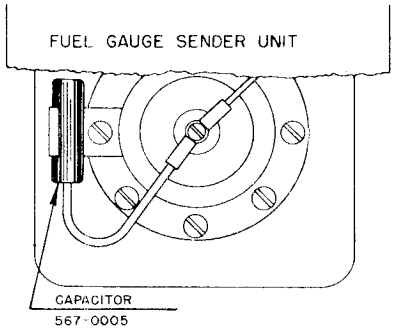


FIG. 13 FUEL GAUGE CAPACITOR

Connect capacitor 567-0005 to the fuel gauge sender unit as shown in Fig. 13 and seal tightly with compound.

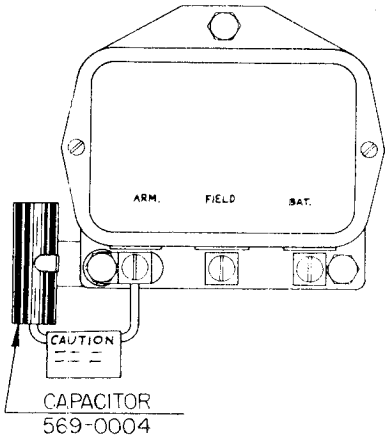


FIG. 14 VOLT. REG. CAPACITOR

Mount capacitor 569-0004 between voltage regulator and dash panel. Connect lead to "ARM" terminal on regulator as shown.

Suppressor Lead 563-0006 was available for production earlier than originally anticipated. As a result, the serial numbers given under "Interference Elimination" in Bulletin 2-19 are changed. Distributor Suppressor 563-0004 is used with receivers having serial numbers up to and including OCF 49, 260 751-1. Receivers with serial numbers above OCF 49, 260 751-1 use Suppressor Lead 563-0006.

MODELS 1CF743, Ford #1A-18805-B; 1CM747, Mercury #1M-18805; 1CH748, Lincoln #1H-18805

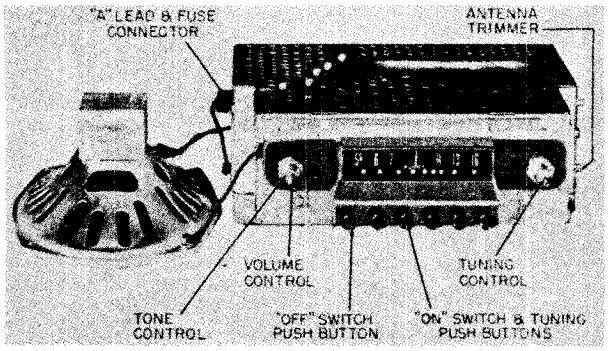
GENERAL

The Ford model 1A-18805-B, Mercury model 1M-18805, and Lincoln model 1H-18805 radio receivers are designed for use in the 1951 Ford, Mercury, and Lincoln cars respectively. The serial numbers covered by this bulletin are: Ford 1CF 1001 and up; Mercury 1CM 1001 and up; and Lincoln 1CH 1001 and up. These receivers are all similar electrically, but differ mechanically, in the appearance of the control knobs, escutcheon and dial assemblies, and method of mounting the receivers and speakers in the cars.

These radios are eight tube, two unit, superhetrodyne receivers with vibrator power supply and full wave rectifier. The antenna, RF, and oscillator circuits are inductively tuned (push button and manual) over a frequency range of 540 to 1600 kilocycles by means of iron cores. A special compensating capacitor in the oscillator circuit minimizes frequency drift due to normal variations in temperature and battery voltage.

TUBE COMPLEMENT

6SK7GT	R. F. Amplifier
6SA7GT	Converter
6SK7GT	I. F. Amplifier
6SQ7GT	Det., AVC, & A. F. Amplifier
6J5GT	Phase Inverter
6V6GT	Output - Push Pull (2)
6X5GT	Rectifier



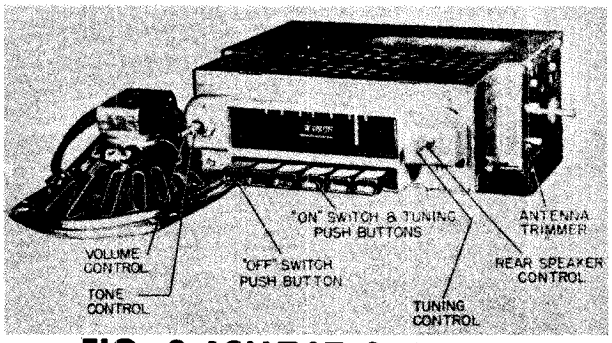


FIG. 2 1CM747 &1CH748

POWER SUPPLY

The power supply uses a 6X5GT full wave rectifier tube in conjunction with a four prong, full wave, non-synchronous vibrator.

ALIGNMENT

Maximum performance depends on accurate alignment of the receiver; therefore, follow these instructions carefully.

PRELIMINARY INSTRUCTIONS

Make all alignment adjustments to the receiver with the "A" lead connected to a 7.2 volt negative source and ground the chassis to the positive side of this source. Rotate the volume control to its maximum clockwise position. Rotate the tone control to the treble position. Connect the output meter across the speaker voice coil. Keep the output from the signal generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment. Use an insulated screw driver and special alignment tool 898-0003 for making adjustments.

SENSITIVITY CONTROL

The sensitivity control R8 is factory preset and should not be readjusted unless the control has been tampered with. If it is definitely determined that readjustment is necessary, set the control to obtain 3.5 volts at the cathode of the IF Amplifier (pin #5 of the second 6SK7GT tube).

I F ALIGNMENT

1. Remove the top and bottom cover of the receiver.
2. Set the signal generator to 265 Kc.
3. Connect the signal lead of the signal generator through a .01 Mfd. capacitor to the converter grid (pin #8, 6SA7GT).
4. Adjust the primary and secondary IF cores "A," "B," "C" and "D" in order named

MODELS 1CF743, Ford #1A-18805-B; 1CM747, Mercury #1M-18805; 1CH748, Lincoln #1M-18805

for maximum output. Both the primary and secondary of each transformer are adjusted from the top of the transformer using special alignment tool. (See Parts Layout - Top of Chassis & Bottom of Chassis,

Repeat this operation until no further increase in output is obtained.

R F AND OSCILLATOR ALIGNMENT

1. Connect the signal generator leads through the dummy antenna illustrated in Fig. 3, to antenna lead-in socket on receiver.
2. Set signal generator to 535 Kc.
3. Rotate the manual tuning control to stop at 535 Kc.
4. Adjust oscillator trimmer C8 for maximum response.
5. Set signal generator to 1300 Kc.
6. Rotate the manual tuning control to stop at 1300 Kc.
7. Adjust the converter trimmer C5 and antenna trimmer C2 for maximum response.
8. If dial calibration is off after making above adjustments, corrections can be made by turning eccentric stud of fulcrum of dial pointer.

IRON CORE AND ADJUSTING SPRING ADJUSTMENT OR REPLACEMENT

1. Remove the top cover from the receiver.
2. Remove the escutcheon assembly.
3. Break cement seal and screw the core in or out to the desired position.
4. If the cores are replaced or have been tampered with, the adjustments under coil and core replacement must be made.
5. After all adjustments have been made recement core springs.

CORE ALIGNMENT

CAUTION: The following adjustments are to be made only after a core or coil has been replaced or tampered with.

1. Set signal generator to 1675 Kc.
2. Connect signal generator leads through dummy antenna illustrated in Fig. 3, to antenna lead in socket of receiver.
3. Rotate the manual tuning control to set dial pointer at 1600 Kc. (Maximum high frequency end of dial).
4. Screw the cores completely out of the antenna coil, the converter coil, and the oscillator coil.
5. Adjust the oscillator trimmer C8 at 1675 Kc.
6. Adjust the converter trimmer C5 and the antenna trimmer C2 for maximum output reading.
7. Set the signal generator and the receiver dial to 1300 Kc.
8. Replace the cores to their original position (approximately 11/16" from the end of the coil form.
9. Adjust the oscillator core L4 to scale at 1300 Kc.
10. Adjust the antenna core L2 and RF core L3 for maximum output reading.
11. Set the signal generator to 600 Kc.
12. "Rock in" the shunt oscillator core L6 for maximum output reading. Note: This is the same as rocking in the padder capacitor in a four gang capacitor receiver.
13. Check receiver at 1300 Kc. for calibration and gain. If the receiver is off scale or weak, repeat operations 9, 10 and 11.
14. After alignment is complete, the maximum high frequency tuning range should be checked. If the range is greater or less than 1605 Kc., the lug stop near the volume control should be bent to limit the frequency coverage to 1605 Kc.

I F TRAP ADJUSTMENT

1. Set the signal generator to 265 Kc.
2. Connect the signal generator leads through the dummy antenna as illustrated in Fig. 3, to antenna lead-in socket on receiver.
3. Rotate the manual tuning control to tune the set to approximately 900 Kc.
4. Connect the output meter across the speaker voice coil and tune the IF trap core T1 with alignment tool 898-0003 for minimum output.
   Note: In certain localities it may be necessary to shift the IF trap adjustment slightly in order to reject the interfering signal from a local station whose broadcasting frequency, or range frequency, is a few kilocycles higher or lower than 265 Kc.

IMPORTANT: After installing the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum. Check the antenna trimmer alignment on a weak station at approximately 1300 Kc.

MODELS 1CF743, Ford #1A-18805-B; 1CM747, Mercury #1M-18805; 1CH748, Lincoln #1H-18805

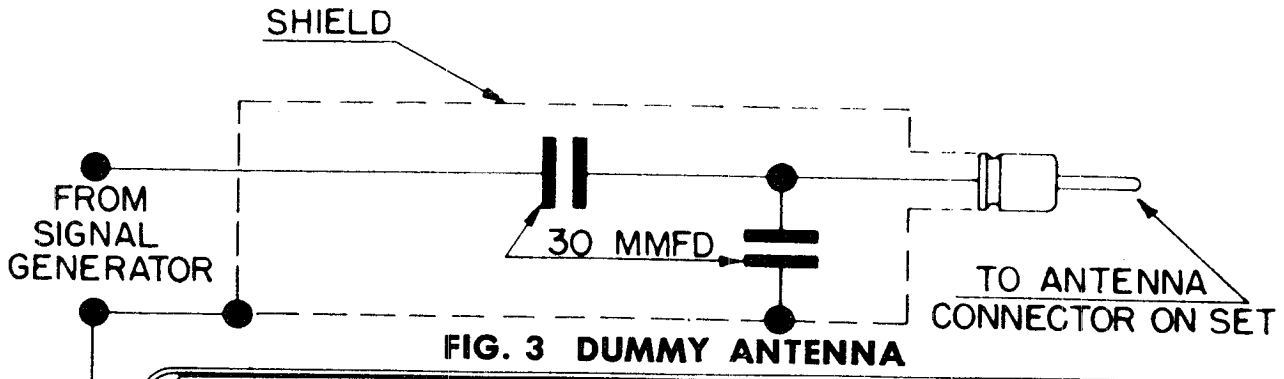


FIG. 3 DUMMY ANTENNA

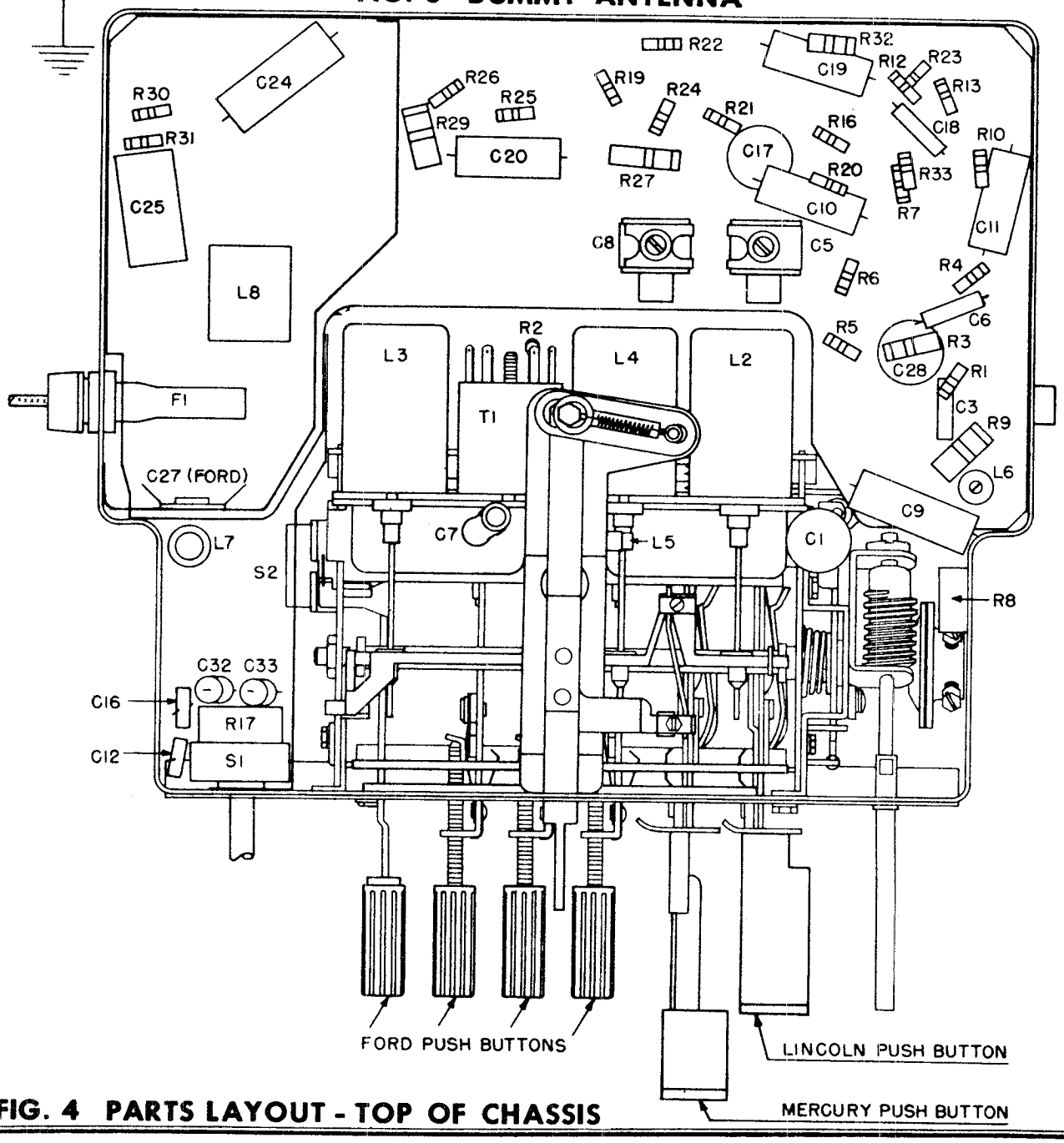


FIG. 4 PARTS LAYOUT - TOP OF CHASSIS

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

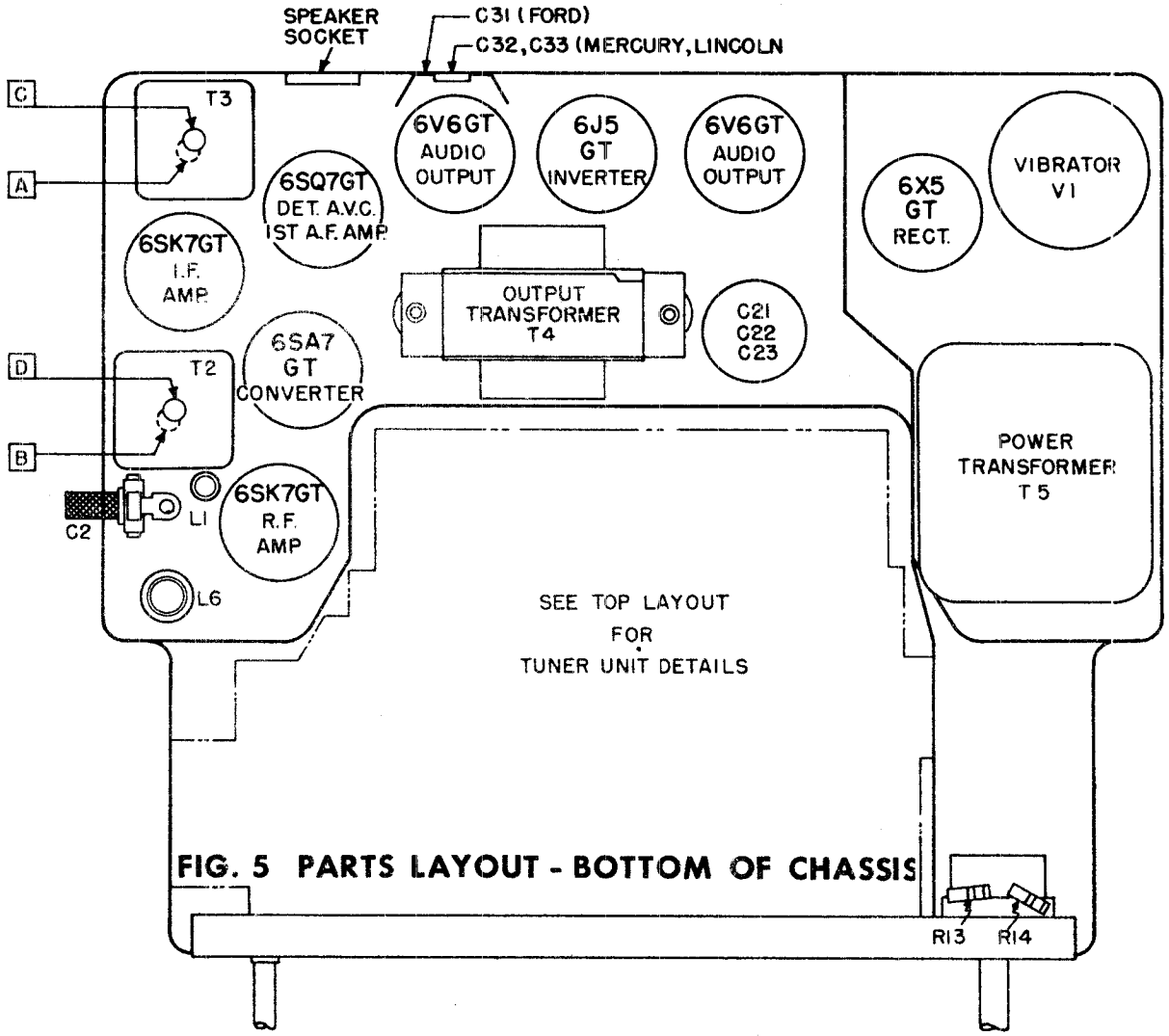


FIG. 5 PARTS LAYOUT - BOTTOM OF CHASSIS

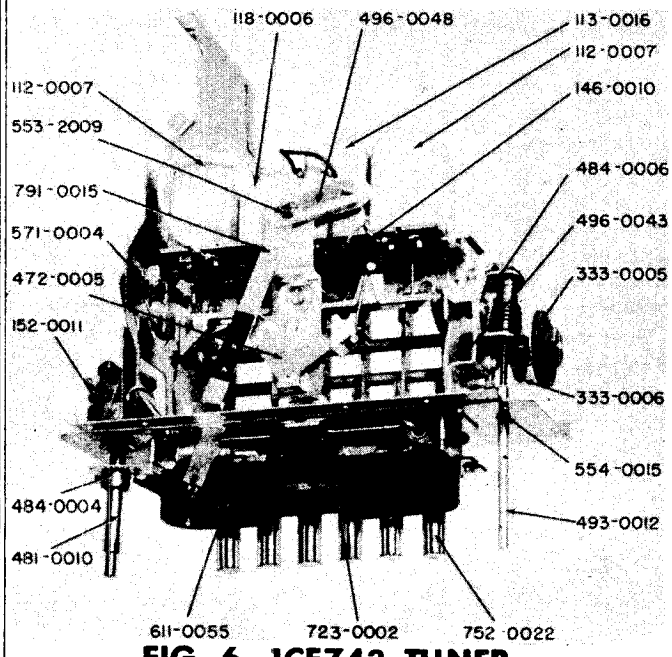


FIG. 6 1CF743 TUNER

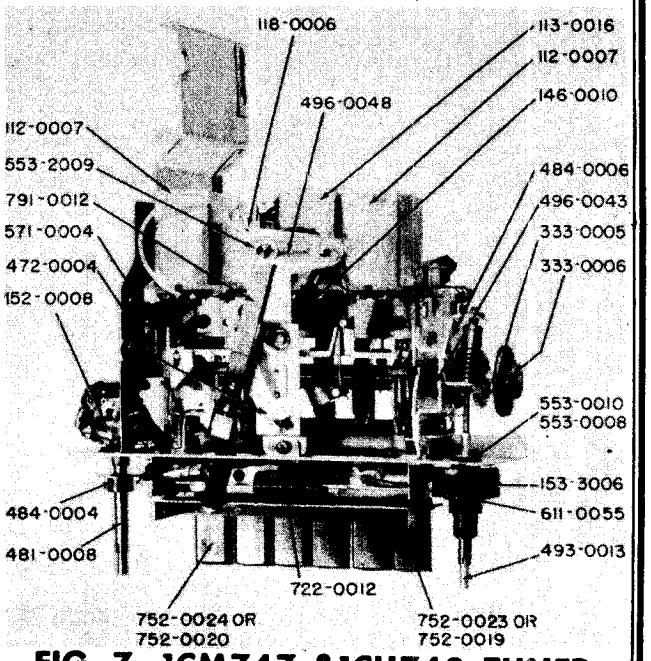


FIG. 7 1CM747 &1CH748 TUNER

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

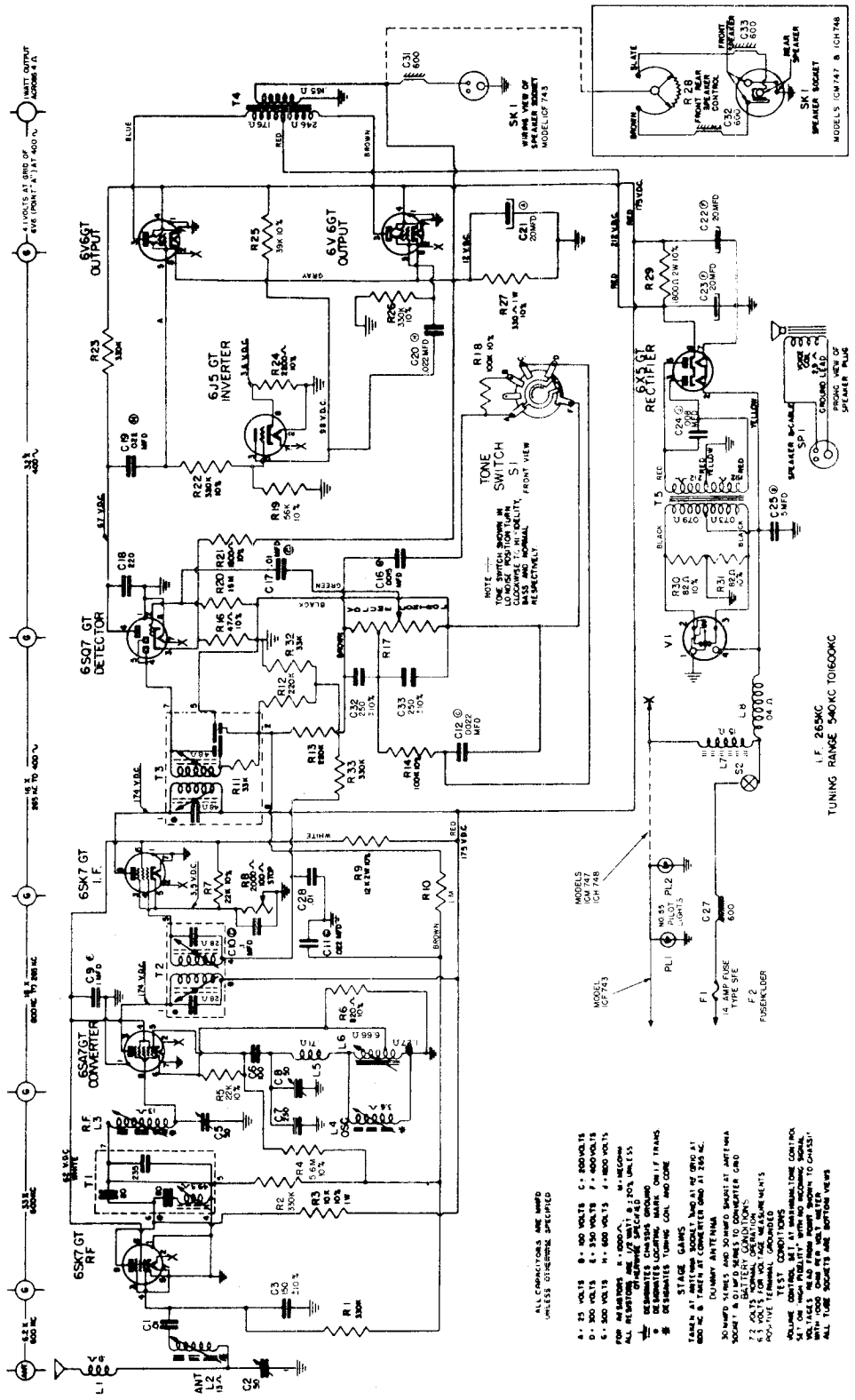


FIG. 8 SCHEMATIC DIAGRAM - MODELS 1CF743 1CM747 & 1CH748

REPAIR PARTS LIST

TUNER UNIT AND PARTS

SCHEMATIC LOCATION	PRODUCTION PART NO.	SERVICE PART NO.	DESCRIPTION
	75600	313-0016	Tuner Unit Assembly - ICF743 - mechanical portion only - includes push buttons, driven clutch disc, on-off switch, worm gear, tuning control shaft
	75720	313-0017	Tuner Unit Assembly - ICM747 - mechanical portion only - includes push buttons, driven clutch disc, on-off switch, worm gear, tuning control shaft
	75680	313-0018	Tuner Unit Assembly - ICH748 - mechanical portion only - includes push buttons, driven clutch disc, on-off switch, worm gear, tuning control shaft
	60493	481-0011	Ball - Bearing .125
	75912	492-0025	Bracket Assembly - Dial Background & Socket (ICF743)
	75687	411-0010	Bracket Assembly - Dial Background & Socket (ICM747 & ICH748)
	75004	492-0024	Bracket & Pointer Assembly
	71818	333-0007	Bracket & Roller Assembly - Clutch Release
	75672	481-0009	Bushing - Tuning Shaft (ICF743)
	71752	481-0005	Bushing - Tuning Shaft (ICM747, ICH748)
	75671	481-0010	Bushing - Volume Shaft (ICF743)
	75082	752-0022	Button - Push - and Screw Assembly (ICF743)
	71890	752-0023	Button - Push (ICM747)
	71892	752-0024	Button - Push - Off (ICM747)
	71597	752-0019	Button - Push (ICH748)
	71598	752-0020	Button - Push - Off (ICH748)
	75675	193-0009	Cable - Speaker control (ICM747, ICH748)
	65986	333-0005	Clutch Disc Assembly
	71503	192-0002	Core - Iron tuning and adjusting spring
	75604	723-0002	Drum - Tone - Shaft and Gear Assembly
	75000	722-0012	Drum - Tone - Shaft and Gear Assembly
	75911	711-0023	Escutcheon & Dial Assembly (ICF743)
	71758	711-0021	Escutcheon (ICM747)
	75157	711-0018	Escutcheon (ICH748)
	75530	333-0006	Gear - Drive - and Bushing Assembly
	75009	484-0004	Gear - Tone
	75042	472-0006	Link - Pointer End
	75593	472-0005	Link & Stud Assembly - Pointer Drag (ICF743)
	75003	472-0004	Link & Stud Asssembly - Pointer Drag (ICM747, ICH748)
	75531	484-0006	Gear - Worm
	71501	552-0027	Nut - Core adjusting
	75031	552-0023	Nut - 3/8-32 - Speaker Control Mounting (ICM747, ICH748)
	71753	552-0008	Nut - 1/2-28 - Special
	71889	753-0002	Plunger Insert - Off Button (ICM747)
	71891	753-0003	Plunger Insert - Push Button (ICM748)
	75605	791-0015	Pointer & Bracket Assembly (ICF743)
	75005	791-0012	Pointer & Bracket Assembly (ICM747, ICH748)
	71847	554-0015	Ring - Drive Shaft Retaining
	75034	727-0003	Scale - Dial (ICM747)
	75049	727-0002	Scale - Dial (ICH748)
	65975	551-0017	Screw - Adjusting
	71838	551-0017	Screw - Pivot
	364-6	551-6300	Screw - Set #8-32 x 3/16 Headless
	75602	493-0012	Shaft - Manual Tuning Assembly (ICF743)
	75678	493-0013	Shaft - Manual Tuning Assembly (ICM747, ICH748)
	75056	497-0008	Sleeve - Tuning Shaft (ICM747, ICH748)
	75044	497-0009	Sleeve - Volume Control Shaft (ICM747, ICH748)
	71827	496-0043	Spring - Clutch Release
	71831	496-0046	Spring - Clutch Release Bracket
	71833	496-0047	Spring - Switch Plunger Return
	75037	496-0065	Spring - Cross Arm Tension
	75038	496-0064	Spring - Cross Arm
	75036	496-0048	Spring - Pointer Tension
	71865	571-0004	Switch - On-Off
	71837	553-3000	Washer - Felt
	71852	553-2011	Washer - Shim
	75039	553-2009	Washer - Special - Pointer Tension Spring
	71853	553-5005	Washer - Tension

TUNER UNIT AND PARTS (continued)

TUBE COMPLEMENT

	45238H	622-0001H	6SK7GT - RF Amplifier
	41332H	622-0002H	6SA7GT - Converter
	45238H	622-0001H	6SK7GT - IF Amplifier
	45239H	622-0003H	6SQ7GT - Detector - AVC - 1st AF Amplifier
	44547H	622-0010H	6J5GT - Inverter
	71226H	622-0004H	6V6GT - Push Pull - Audio Output
	71226H	622-0004H	6V6GT - Push Pull - Audio Output
	71227H	633-0001H	6X5GT - Rectifier

CAPACITORS

C1, C17, C28	71632	168-0002D	Capacitor - Ceramic - .01 Mfd. - 500 V.
C6	14140	163-0100	Capacitor - Mica - .0001 Mfd. - 500 V.
C18	71660	163-0220	Capacitor - Mica - .00022 Mfd. - 500 V.
C32, C33	11691	163-0250	Capacitor - Mica - .00025 Mfd. - 500 V. (ICF743)
C13, C14	11691	163-0250	Capacitor - Mica - .00025 Mfd. - 500 V. (ICM747, ICH748)
C3	71661	164-0150	Capacitor - Silver Mica - .00015 Mfd. - 500 V.
C10	71663	160-0201	Capacitor - Molded Paper - .1 Mfd. - 200 V.
C9	71665	160-0401	Capacitor - Molded Paper - .1 Mfd. - 400 V.
C11	71666	160-02122	Capacitor - Molded Paper - .022 Mfd. - 200 V.
C19, C20	71664	160-06122	Capacitor - Molded Paper - .022 Mfd. - 600 V.
C16	75064	160-04215	Capacitor - Molded Paper - .0015 Mfd. - 400 V.
C12	75065	160-02222	Capacitor - Molded Paper - .0022 Mfd. - 200 V.
C24	71662	160-16282	Capacitor - Molded Paper - .0082 Mfd. - 1600 V.
C25	HT71763	169-0001	Capacitor - Paper - .5 Mfd. - 100 V.
C7	71637	165-0250	Capacitor - Temperature Compensating - .00025 Mfd.
	75825	161-3005	Capacitor - Electrolytic 20 Mfd. - 25 V. 20 Mfd. - 350 V.
C21		167-0008	Capacitor - Kit - Spark Plate (ICF743)
C22, C23			Capacitor - Spark Plate (ICM747, ICH748) consists of silvered mica, shouldered washer, flatwasher - screw, lockwasher - nut
C27, C31			
C27, C32, C33			

MISCELLANEOUS CHASSIS PARTS

SCHEMATIC LOCATION	PRODUCTION PART NO.	SERVICE PART NO.	DESCRIPTION
F2	75786	562-0007	Holder - Fuse
	71639	561-0003	Lead - "A" (ICM747, ICH748)
	75642	561-0007	Lead - "A" (ICF743)
	71699	416-0002	Socket - Antenna Connector
	71693	412-0016	Socket - Tube - 8 Prong Octal - Molded Bakelite - Black
	71696	412-0016	Socket - Tube - 8 Prong Octal - Molded Bakelite - Tan
SK1	71698	414-0001	Socket - Speaker (ICF743)
SK1	71754	414-0005	Socket - Speaker (ICM747, ICH748)
	71697	413-0003	Socket - Vibrator (ICF743)
	66423	413-0005	Socket - Vibrator (ICM747, ICH748)

SCHEMATIC LOCATION	PRODUCTION PART NO.	SERVICE PART NO.	DESCRIPTION
			MISCELLANEOUS ELECTRICAL PARTS
PL1,PL2	15362	611-0055	Bulb - Dial Light (Mazda #55)
	75398	117-0010	Coils - Permeability Tuning (includes)
L2		112-0007	Antenna Coil
L3		112-0007	R. F. Coil
L4		113-0016	Oscillator Coil
L5		146-0010	Oscillator Series Coil
T1		118-0006	I. F. Trap Coil
L6	71631	116-0002	Oscillator Shunt Coil
C2	71636	172-0026	Antenna Trimmer
C8	71634	172-0024	Oscillator Trimmer
C5	71635	172-0025	R. F. Trimmer
	75644	147-0001	Choke
L8	71628	147-0007	Choke - Hash - Main
L7	75850	145-0005	Choke & Core Assembly - Heater
	71630	148-0007	Choke - Motor Noise
L1	71642	148-0001	Choke - Motor Noise - Antenna
R28	71883	153-3006	Control - Dual - Speaker (ICM747, ICH748)
R8	71645	159-0004	Control - Sensitivity
R17, S1	71882	152-0008	Control - Volume and Tone Switch (ICM747, ICH748)
	75614	152-0011	Control - Volume and Tone Switch (ICF743)
F1	17392	191-0002	Fuse - 14 Amp.
	75674	539-0001	Speaker - PM - 6" x 9" (ICF743)
	71733	539-0005	Speaker - PM - 6" x 9" (ICM747, ICH748)
T2	71702	121-0015	Transformer - 1st I. F.
T3	71703	122-0015	Transformer - 2nd I. F.
T4	71705	143-0012	Transformer - Output
T5	75787	141-0010	Transformer - Power
V1	71712	511-0001	Vibrator
			INSTALLATION PARTS - ICF743
	75661	711-0022	Bezel - Control
	71456	564-0002	Capacitor - Generator
	71604	569-0012	Capacitor - Oil Gauge
	75156	569-0004	Capacitor - Voltage Regulator
	75162	567-0005	Capacitor - Fuel Gauge
	75655	741-0005	Knob - Tuning (complete)
	75656	742-0003	Knob - Volume Control (complete)
	75662	744-0012	Knob - Tone Control
	71610	552-0006	Nut - 1/4-20 Hex
			INSTALLATION PARTS - ICF747 (continued)
	71669	552-0020	Nut - 1/2-28 Special
	75663	552-0001	Nut - #8-32 Wing
	75643	492-0022	Bracket - Mounting - Receiver - R. H.
	75648	492-0023	Bracket - Mounting - Receiver - L. H.
	71414	563-0004	Suppressor - Distributor
	71741	553-2007	Washer - Serrated
	75673	553-1014	Washer - Lock - 1/4 - Split
	71460	568-0003	Spring - Wheel Static Grounding
	75657	776-0003	Baffle and Gasket Assembly - Speaker
			INSTALLATION PARTS - ICM747
	71731	492-0017	Bracket - Speaker Mounting
	71737	492-0015	Bracket - Receiver Mounting - L. H.
	71730	492-0016	Bracket - Receiver Mounting - R. H.
	71456	564-0002	Capacitor - Generator
	71604	569-0012	Capacitor - Oil Gauge
	75156	569-0004	Capacitor - Voltage Regulator
	75162	567-0005	Capacitor - Fuel Gauge
	71751	744-0007	Knob - Tone Switch & Speaker Control
	75707	740-0016	Knob - Volume & Tuning
	411-10	552-0007	Nut - #10-32 Hex
	71610	552-0006	Nut - 1/4-20 Hex
	75663	552-0001	Nut - #8-32 Wing
	71669	552-0020	Nut - 1/2-28 - Special
	71414	563-0004	Suppressor - Distributor
	402-8	553-1208	Washer - Lock - #8 - Int. Tooth
	402-10	553-1210	Washer - Lock - #10 - Int. Tooth
	71741	553-2007	Washer - Serrated
	75673	553-1014	Washer - Lock - 1/4 - Split
	71460	568-0003	Spring - Wheel Static Grounding
			INSTALLATION PARTS - ICH748
	71744	492-0019	Bracket - Receiver Mounting
	71745	492-0018	Bracket - Receiver Mounting
	71456	564-0002	Capacitor - Generator
	71457	569-0004A	Capacitor - Ignition Coil
	71604	569-0012	Capacitor - Oil Gauge
	75162	567-0005	Capacitor - Fuel Gauge
	71751	744-0007	Knob - Tone Switch & Speaker Control
	75711	740-0017	Knob - Volume and Tuning
	71610	552-0006	Nut - 1/4-20 Hex
	75663	552-0001	Nut - #8-32 Wing
	71747	559-0003	Screw - #8-1/2 Binder Head Self-Tapping
	71748	551-0007	Screw - 1/4-20 x 1/2 - Hex Head
	71746	193-0007	Spring - Hood Bonding
	71414	563-0004	Suppressor - Distributor
	71741	553-2007	Washer - Serrated
	75613	553-1014	Washer - Lock - 1/4 - Split
	71460	568-0003	Spring - Wheel Static Grounding
			RESISTORS
R16	BY34701	181-0470	Resistor - insulated - 47 Ohm - 1/2 W.
R30, R31	BY38201	181-0820	Resistor - insulated - 82 Ohm - 1/2 W.
R6	BY38211	181-0821	Resistor - insulated - 820 Ohm - 1/2 W.
R21	BY31521	181-0152	Resistor - insulated - 1,500 Ohm - 1/2 W.
R24	BY32221	181-0222	Resistor - insulated - 2,200 Ohm - 1/2 W.
R5, R7	BY32231	181-0223	Resistor - insulated - 22,000 Ohm - 1/2 W.
R11, R32	BY33331	181-0333	Resistor - insulated - 33,000 Ohm - 1/2 W.
R25	BY33931	181-0393	Resistor - insulated - 39,000 Ohm - 1/2 W.
R19	BY35631	181-0563	Resistor - insulated - 56,000 Ohm - 1/2 W.
R14, R18	BY31041	181-0104	Resistor - insulated - 100,000 Ohm - 1/2 W.
R12, R13	BY32241	181-0224	Resistor - insulated - 220,000 Ohm - 1/2 W.
R1, R2, R22, R23, R26, R33	BY33341	181-0334	Resistor - insulated - 330,000 Ohm - 1/2 W.
R10	BY31051	181-0105	Resistor - insulated - 1 Megohm - 1/2 W.
R4	BY35651	181-0565	Resistor - insulated - 5.6 Megohm - 1/2 W.
R20	BY31561	181-0156	Resistor - insulated - 15 Megohm - 1/2 W.
R3	ZY31031	182-0103	Resistor - insulated - 10,000 Ohm - 1 W.
R27	VY33311	183-0331	Resistor - insulated - 330 Ohm - 2 W.
R29	VY31821	181-0182	Resistor - insulated - 1,800 Ohm - 2 W.
R9	VY31231	181-0123	Resistor - insulated - 12,000 Ohm - 2 W.

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

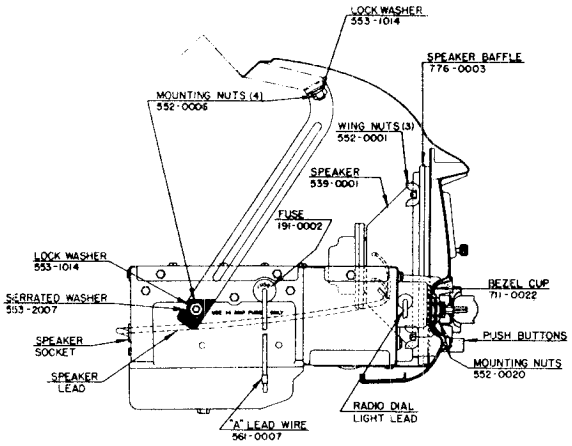


FIG. 9 1CF743 INSTALLATION

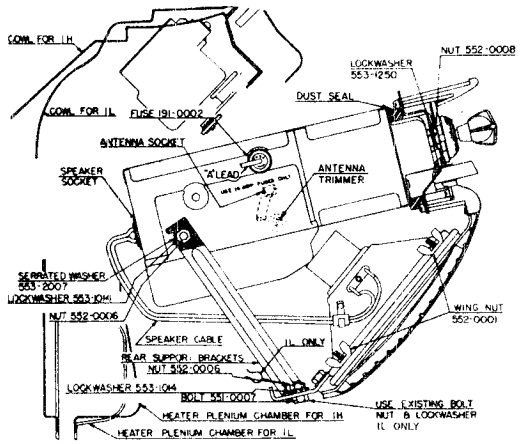


FIG. 11 1CH748 INSTALLATION

RECEIVER INSTALLATION

Figures 9, 10, and 11 illustrate the installed receivers to facilitate removal and reinstallation when service is necessary.

TO REMOVE THE FORD RECEIVER

1. Disconnect the speaker plug, dial light lead, antenna lead, and "A" lead.
2. Remove control knobs, front mounting nuts, and lockwashers from the radio control shafts.
3. Disconnect the receiver from the receiver mounting brackets by removing the hex nut and lockwasher from the receiver mounting stud.
4. Remove receiver by sliding it back and down behind the instrument panel.
5. To remove the speaker, remove the four wing nuts holding the speaker to the instrument panel.

TO REMOVE THE MERCURY RECEIVER

1. Remove the car heater plenum chamber.
2. Disconnect speaker plug, antenna lead, and "A" lead.
3. Loosen the two speaker mounting clamps and remove the speaker.
4. Remove control knobs, front mounting nuts and lockwashers from the radio control shafts.
5. Loosen the nuts holding the receiver to the mounting brackets.
6. Remove receiver by sliding it back and down behind the instrument panel.

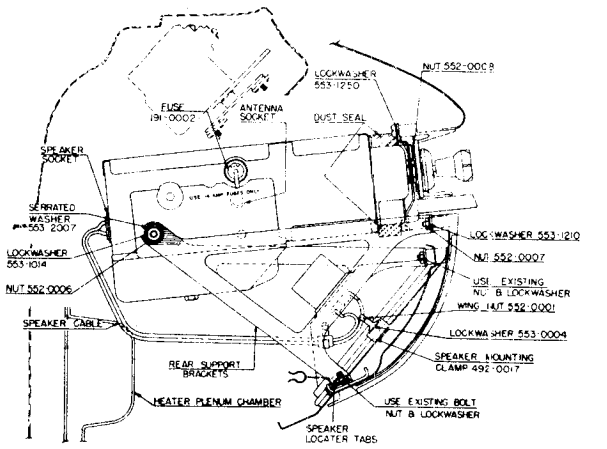


FIG. 10 1CM747 INSTALLATION

TO REMOVE THE LINCOLN RECEIVER

1. Remove the car heater plenum chamber.
2. Disconnect the speaker plug, antenna lead, and "A" lead.
3. Remove control knobs, front mounting nuts and lockwashers from the radio control shafts.
4. Loosen the hex nuts holding the receiver to the mounting brackets.
5. Remove receiver by sliding it back and down behind the instrument panel.
6. To remove the speaker, remove the four wing nuts holding it to the instrument panel.

OPERATING INSTRUCTIONS

TO TURN RADIO ON

The radio is connected to the accessory terminal of the ignition switch, therefore, it is necessary to turn the ignition key to the left, if the engine is not running, before turning the radio on. Press any one of the five automatic push buttons. Allow approximately 20 seconds for the receiver to reach operating temperature.

To turn the receiver off, press the "Off" pushbutton.

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

MANUAL TUNING

To operate the manual tuning control simply turn the tuning knob (see Fig. 1). When tuning in a station, be sure to tune to the exact frequency for the best tone quality.

VOLUME CONTROL

Turn the volume control knob for the desired volume.

TONE CONTROL

The tone control knob is located directly behind the volume control knob. Turning this control to the right or left will change the tone of the receiver. This control has four positions and the position to which the control is set is indicated in the window in the center of the dial scale.

REAR SPEAKER CONTROL

The rear speaker control disc, located behind the tuning control knob on the Mercury and Lincoln receivers, is provided to control an auxiliary rear shelf speaker (available from Mercury-Lincoln dealer).

The speaker socket located on the rear of the receiver case will accommodate both the front speaker and rear speaker. When the rear speaker is plugged into the socket, a switch in the socket connects the rear speaker control into the circuit.

AUTOMATIC TUNING

Automatic push button tuning is provided by means of push buttons located directly under the dial scale and to the right of the "Off" push button (see Fig. 1). These five buttons permit the selection of five favorite local stations. When the push buttons have been set to the desired station it is only necessary to press a push button to turn the set "on" and to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

SETTING THE PUSH BUTTON TUNER

The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency.

The push buttons should be set up during the day since at night distant stations will be heard with the same volume as local stations, making it difficult to identify local stations.

Allow the receiver to operate for at least fifteen minutes before adjusting the push buttons. This will allow each part in the receiver to reach normal operating temperature.

TO SET THE PUSH BUTTONS

1. ICF743 RECEIVER

   a. Collapse the antenna.
   b. Select a station at the low end of the broadcast band and manually tune it in so its signal is heard without distortion.
   c. Loosen the second push button from the left side by turning it counter-clockwise one turn with your fingers.
   d. Press the loosened push button in firmly to its extreme position and release. Tighten the push button as much as possible by turning clockwise with your fingers.
   e. The push button is now set for this station selection. Follow the above procedure for setting each of the four remaining push buttons.
   f. Check that the push button setting corresponds to the best manual tuned signal for each station and repeat steps "b" through "e" where necessary.

2. ICM747 & ICH748 RECEIVERS

   a. Collapse the antenna.
   b. Select a station at the low end of the broadcast band and manually tune it in so its signal is heard without distortion.
   c. Unlock the second push button from the left by pushing the button to the left and pulling it out.
   d. Press the unlocked push button in firmly to its extreme position and release.
   e. The push button is now set for this station selection. Follow the above procedure for setting each of the four remaining push buttons.
   f. Check that the push button setting corresponds to the best manual tuned signal for each station and repeat steps "b" through "e" where necessary.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

INTERFERENCE ELIMINATION

There should be no motor noise or interference from the ignition system if the receiver has been installed in the car according to the instructions furnished with the receiver. The interference suppression equipment may be checked for proper installation by referring to the following instructions and illustrations.

The "A" lead to the receiver should be installed in each car as illustrated in Fig. 12.

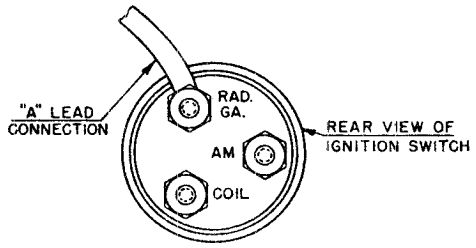


FIG. 12 "A" LEAD CONNECTION

Cut the high tension wire running from the ignition coil to the center hole of the distributor cap, one and one half inches from the coil for the Ford "8", two and one half inches from the coil for the Ford "6", and one and one half inches from the cap for the Mercury and Lincoln. Cut one inch from the coil end of the wire. Screw the cut ends of the wire into both ends of suppressor, 563-0004. Replace the wire in the coil.

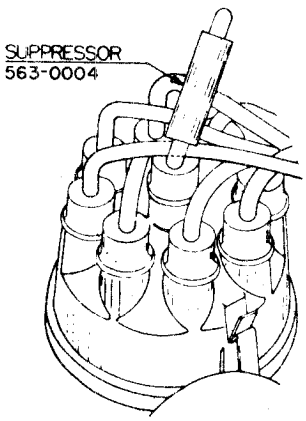


FIG. 13 DISTRIBUTOR SUPPRESSOR

The generator capacitor 564-0002 is installed by loosening (do not remove) the top assembly bolt from the rear end plate of the generator. Mount the capacitor under this bolt and connect the lead to the armature terminal of the generator.

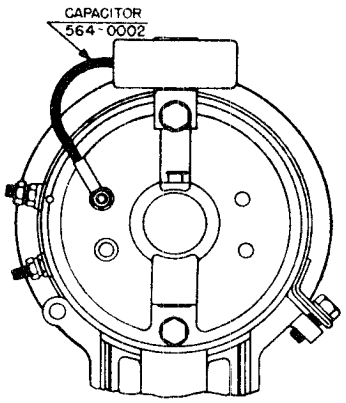


FIG. 14 GENERATOR CAPACITOR

Connect capacitor 569-0012 to the oil pressure gauge unit as shown.

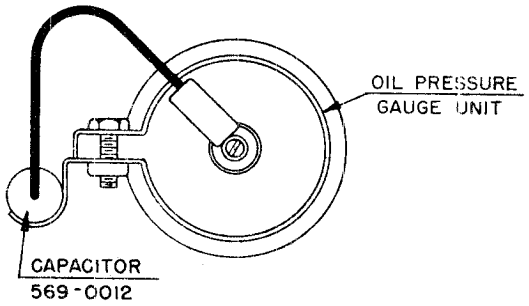


FIG. 15 OIL GAUGE CAPACITOR

Connect capacitor 567-0005 to the fuel gauge unit as shown.

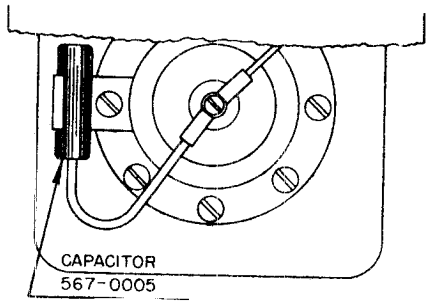


FIG. 16 FUEL GAUGE CAPACITOR

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

Remove both outer and inner hub caps from both front wheels. Clean inner caps and spindles. Snap static collector springs 568-0003 in inner hub caps.
IMPORTANT: Bend cotter key away from center hole so it will not interfere with static collector. Replace hub caps.

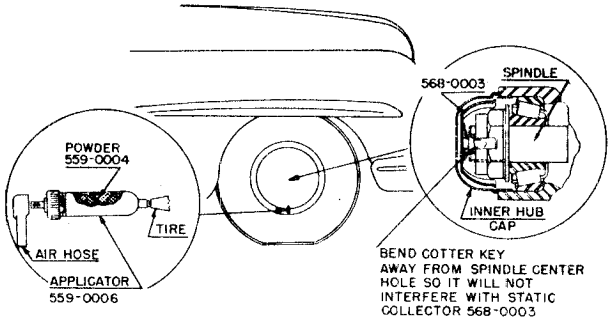


FIG. 17 WHEEL STATIC EQUIPMENT

Install wheel static powder as needed. Available at your Ford, Lincoln or Mercury dealer. Place one package of anti-static powder 559-0004 in applicator 559-0006. Deflate tire to about 10 pounds. Attach applicator to tire as shown. Reinflate tire to normal pressure. Tap applicator gently while reinflating tire to allow all of the powder to be blown into the tube. Inject powder into all five tubes. One injection is good for the life of the tube.

Remove the screw from the hood pad on the cowl and install the hood bonding spring 193-0007.

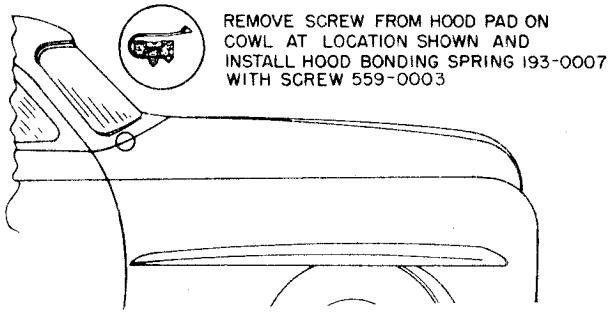


FIG. 18 LINCOLN HOOD BOND

Mount capacitor 569-0004 between voltage regulator and dash panel. Connect lead to "ARM" terminal on regulator as shown.

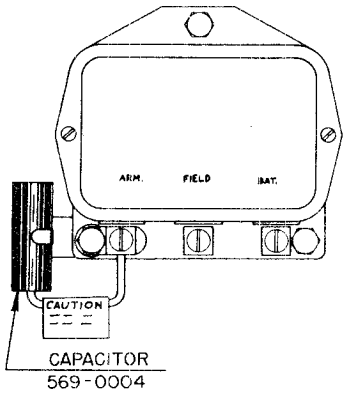


FIG. 19 VOLT. REG. CAPACITOR

Mount capacitor 569-0004A as shown for the 1H or 1L Lincoln. Be sure to connect the lead to the battery terminal of the coil. If the lead is connected to the Distributor terminal the performance of the car engine will be impaired.

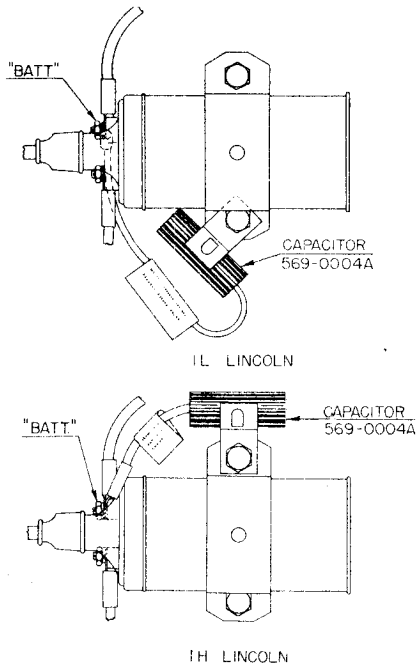


FIG. 20 IGNITION COIL CAPACITOR - LINCOLN

MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

Supplement No. 1

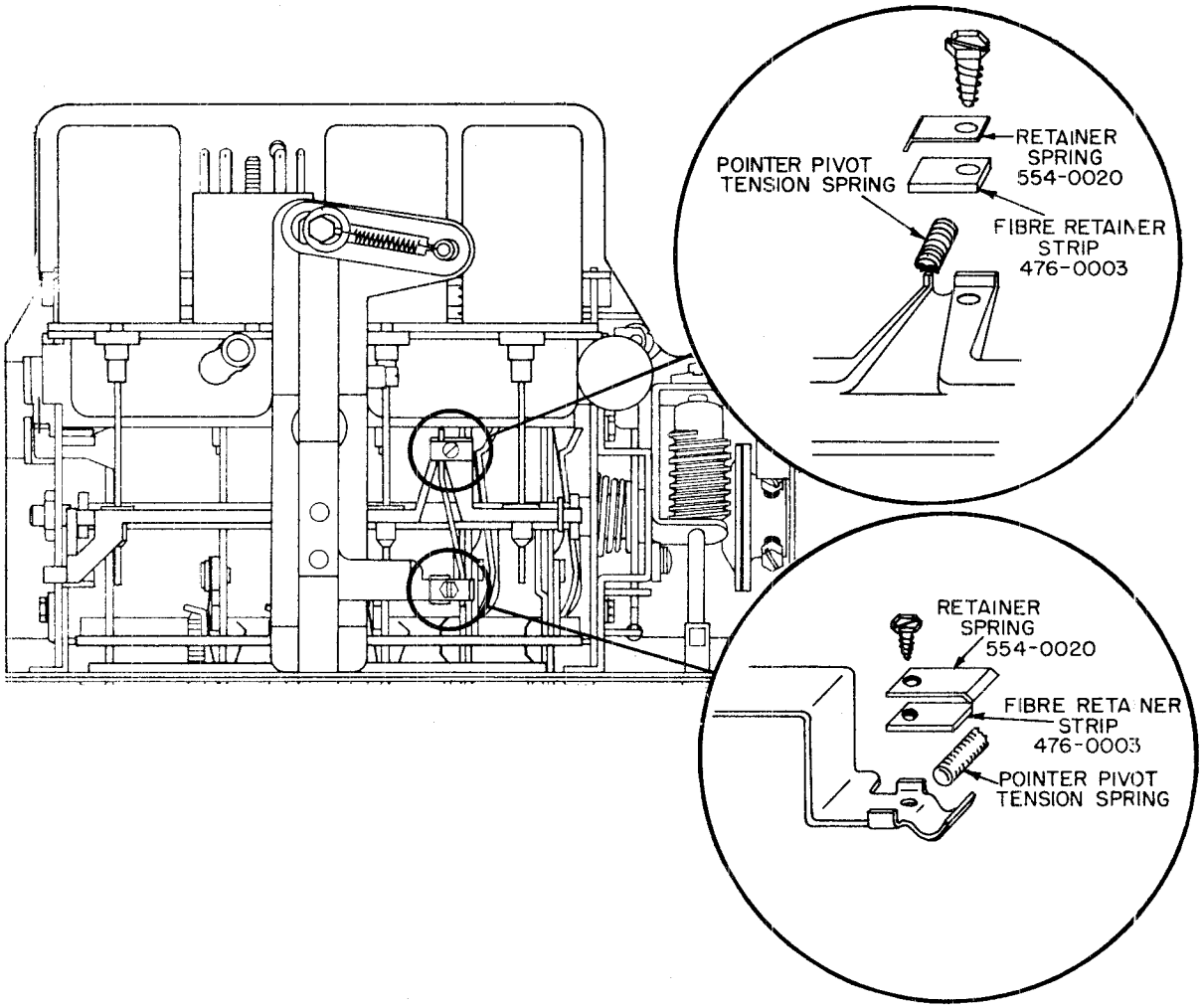
to

Technical Service Bulletin

2-16
11-10-50

Subject: Pointer Slippage and Binding

In order to prevent pointer slippage and binding due to warping of the two red fibre retainer strips which hold the pointer pivot tension spring in place, metal guard springs have been incorporated in the production of sets with the serial numbers which are listed below. The guard springs are inserted between the screws which secure the retainer strips, and the retainer strips themselves. These guard springs prevent warping of the retainer strips and consequent pointer slippage. Both the retainer strips and the metal guard springs are available through local Sylvania Parts Distributors.



Ford	1CF743	Serial 1CF10982 (approx.) and up
Mercury	1CM747	Serial 1CM29771 (approx.) and up
Lincoln	1CH748	Serial 1CH5837 (approx.) and up

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
	75866	554-0020	Spring - Metal Guard
	71529	476-0003	Strip - Fibre Retainer

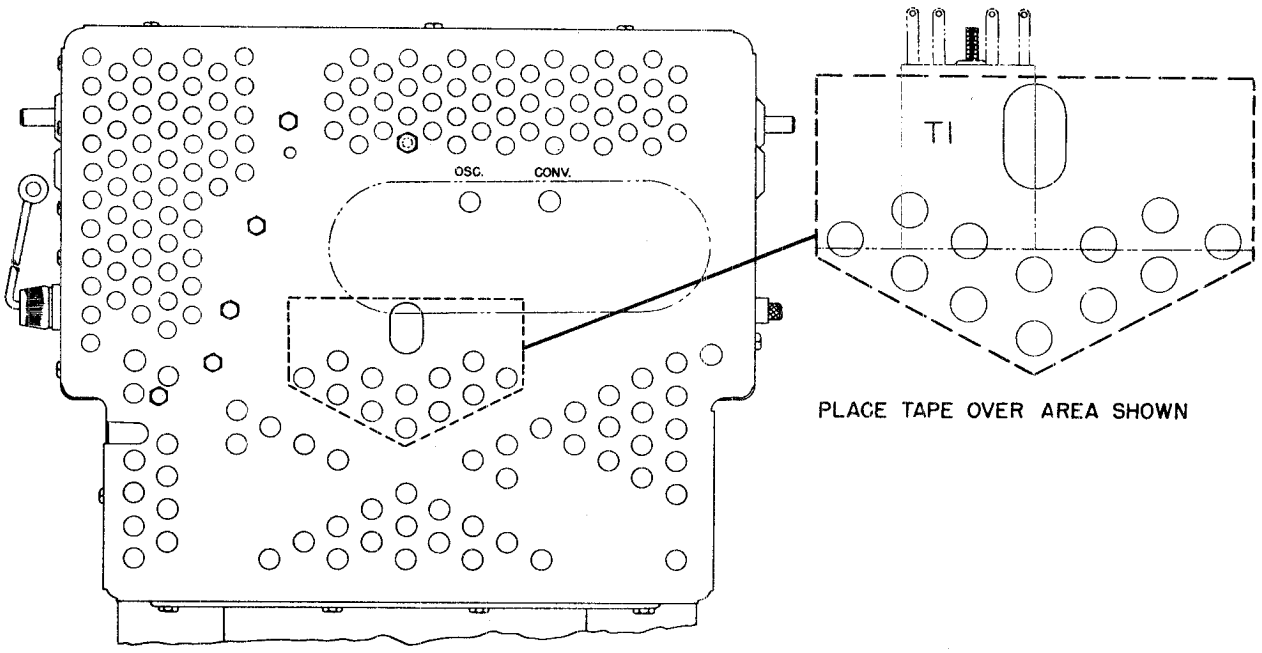
MODELS 1CF743, Ford;
1CM747, Mercury;
1CH748, Lincoln

Supplement No. 2
to
Technical Service Bulletin

2-16
4-16-51

Subject: Water Seepage into Mercury and Lincoln Receivers

In order to prevent seepage of water into Mercury 1CM747 and Lincoln 1CH748 receivers, with consequent damage to the I.F. Trap Coil (T1), a piece of waterproof cellulose tape may be placed over the ventilating holes in the top cover of the receiver directly above the I.F. Trap Coil, as shown in the figure below. In later production of Lincoln and Mercury cars this seepage has been eliminated. A new design replacement I.F. Trap Coil will shortly be available through your local Sylvania Parts Distributor. If the I.F. Trap Coil is replaced by one of the new design, the tape may be removed from the ventilating holes in the receiver top cover.



TOP VIEW OF RECEIVER SHOWING I. F. TRAP COIL

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
T1	76094	118-0009	I. F. Trap Coil

MODELS 1CF743-1, Ford 1A-18805-B; 1CM747-1, Mercury 1M-18805; 1CH748-1, Lincoln 1H-18805

TECHNICAL SERVICE BULLETIN

1-24-51 2-18

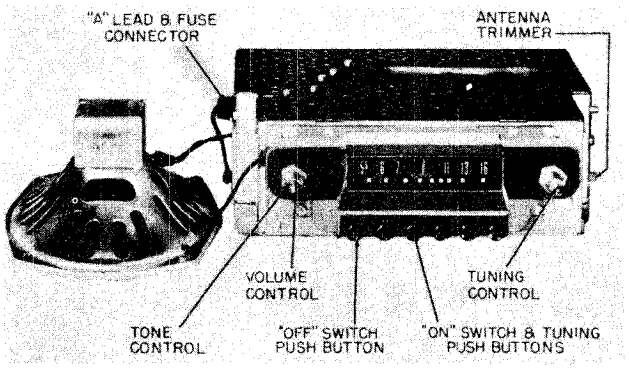


FIG. 1 1CF743-1

GENERAL DESCRIPTION

The Ford model 1A-18805-B, Mercury model 1M-18805, and Lincoln model 1H-18805 radio receivers are designed for use in the 1951 Ford, Mercury and Lincoln cars respectively. The serial numbers covered by this bulletin are: Ford 1CF 28,001, and up; Mercury 1CM 51,001, and up; and Lincoln 1CH 9,501, and up. These differ mechanically, in the appearance of the control knobs, escutcheon and dial assemblies, and method of mounting the receivers and speakers in the cars.

These radios are eight tube, two unit, superhetrodyne receivers with vibrator power supply and full wave rectifier. The antenna, RF, and oscillator circuits are inductively tuned (push button and manual) over a frequency range of 540 to 1610 kilocycles by means of iron cores.

A special compensating capacitor in the oscillator circuit minimizes frequency drift due to normal variations in temperature and battery voltage.

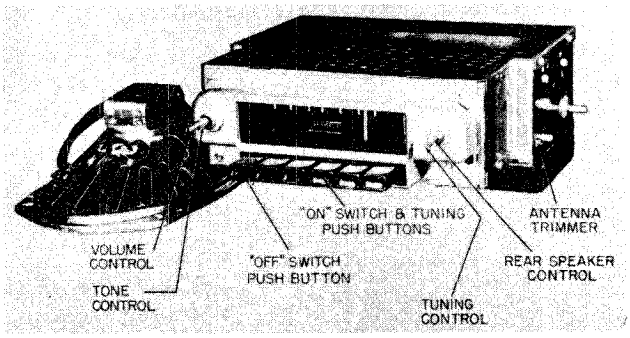


FIG. 2 1CM747-1 & 1CH748-1

TUBE COMPLEMENT

6SK7GT	R. F. Amplifier
6SA7GT	Converter
6SK7GT	I. F. Amplifier
6SQ7GT	Det., AVC, & 1st. A.F. Amplifier
6J5GT	Inverter
6V6GT	Push Pull (2) - Audio Output
6X5GT	Rectifier

POWER SUPPLY

These receivers employ a four prong, full wave, non-synchronous vibrator in conjunction with a 6X5GT full wave rectifier tube. The wiring for the power transformer and vibrator, the main hash choke and its by-pass, and the buffer capacitor are mounted in a shielded compartment on the chassis to reduce interference.

ALIGNMENT

Optimum performance depends on accurate alignment of the receiver; therefore, follow these instructions carefully.

PRELIMINARY INSTRUCTIONS

Make all alignment adjustments to the receiver with the "A" lead connected to a 7.2 volt negative source and ground the chassis to the positive side of this source. Rotate the volume control to its maximum clockwise position. Rotate the tone control to the treble position. Connect the output meter across the speaker voice coil. Keep the output from the signal generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment. Use an insulated screw driver and special alignment tool 898-0003 for making adjustments.

SENSITIVITY CONTROL

The sensitivity control R6 is factory preset and should not be readjusted unless it has been tampered with. If it is definitely determined that readjustment is necessary, set the control to obtain 3.5 volts at the cathode of the I.F. Amplifier (pin #5 of the second 6SK7GT tube).

I F ALIGNMENT

1. Remove the top and bottom covers of the receiver.
2. Set the signal generator to 265 Kc.
3. Connect the signal lead of the signal generator through a .1 Mfd. capacitor to the converter grid (pin #8, 6SA7GT).
4. Adjust the primary and secondary IF cores "A," "B," "C" and "D" in order named for maximum output. Both the primary and secondary of each transformer are adjusted from the top of the transformer using special alignment tool. (See Parts Layout - Bottom of Chassis, Page 3).

Repeat this operation until no further increase in output is obtained.

R F AND OSCILLATOR ALIGNMENT

1. Connect the signal generator leads through a dummy antenna which consists of two, 30 Mmfd. capacitors in a grounded shield, wired so that one is between the antenna lead-in socket of receiver and the signal generator, and the other is shunted from antenna lead to ground.
2. Turn the manual control until the high frequency stop is reached.
3. Set the signal generator to 1625 Kc.
4. Adjust the oscillator trimmer C7, the converter trimmer C6 and the antenna trimmer C1, respectively for maximum response.
5. If dial calibration is off after making above adjustments, corrections can be made by turning eccentric stud of fulcrum of dial pointer.

IRON CORE AND ADJUSTING SPRING

ADJUSTMENT OR REPLACEMENT

1. Remove the top cover from the receiver.
2. Remove the escutcheon assembly.
3. Break cement seal and screw the core in or out to the desired position.
4. If the cores are replaced or have been tampered with, the adjustments under coil and core replacement must be made.
5. After all adjustments have been made recement core springs.

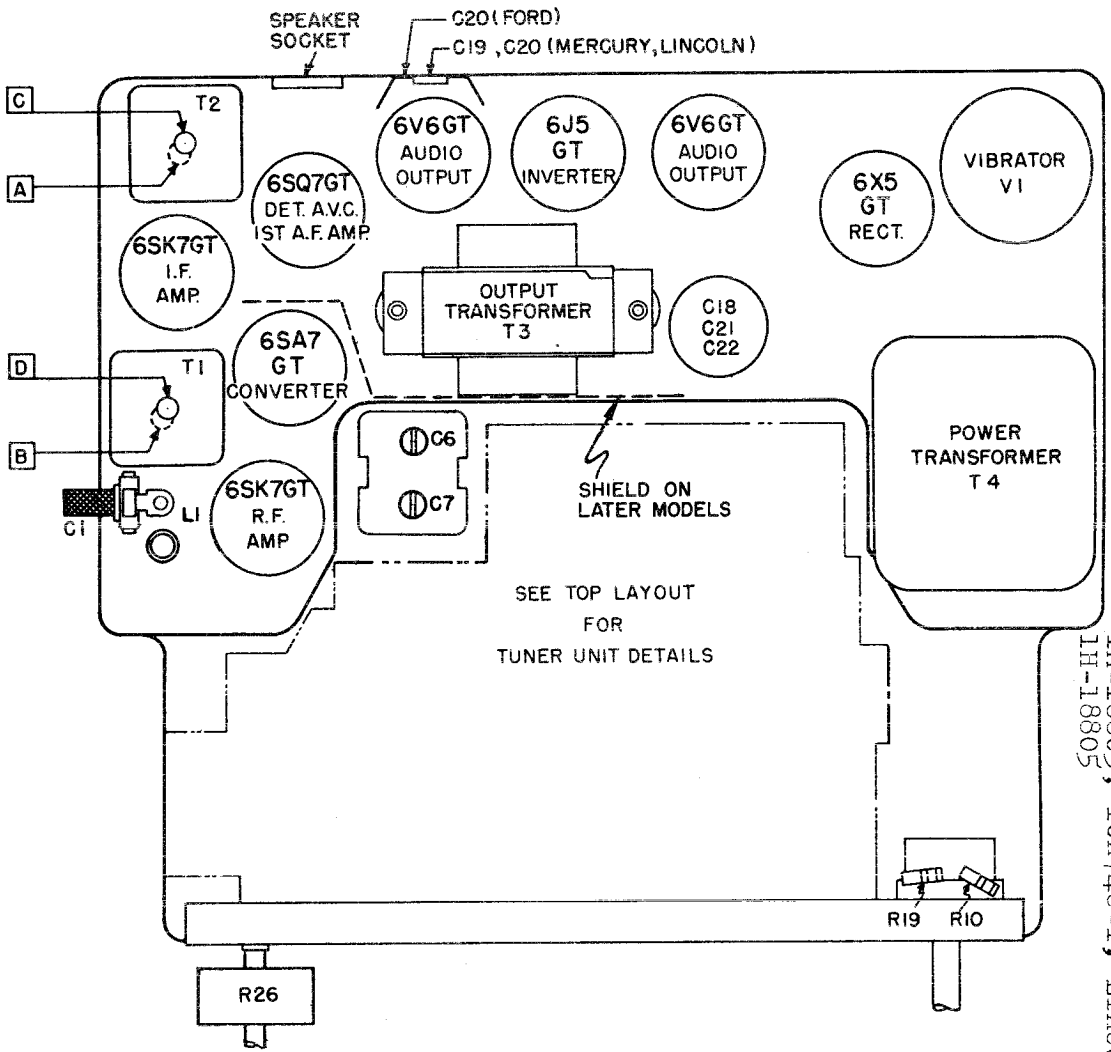


FIG. 3 PARTS LAYOUT - BOTTOM OF CHASSIS

MODELS 1CF743-1, Ford 1A-18805-B; 1CM747-1, Mercury 1M-18805; 1CH748-1, Lincoln 1H-18805

CORE ALIGNMENT

CAUTION: The following adjustments are to be made only if a core or coil has been replaced or tampered with.

1. Set signal generator to 1625 Kc.
2. Connect signal generator to receiver lead-in socket through dummy antenna described above.
3. Rotate the manual tuning control to set dial pointer at 1610 Kc. (Maximum high frequency end of dial).
4. Screw the cores completely out of the antenna coil, the converter coil, and the oscillator coil.
5. Adjust the oscillator trimmer C7 at 1625 Kc.
6. Adjust the converter trimmer C6 and the antenna trimmer C1 for maximum output reading.
7. Set the signal generator and the receiver dial to 1410 Kc.
8. Replace the cores to their original position (approximately 11/16" from the end of the coil form).
9. Adjust the oscillator core L6 to scale at 1410 Kc.
10. Adjust the antenna core L2 and RF core L5 for maximum output reading.
11. Repeat steps 10 and 11 to insure that tracking and calibration are correct.
12. After alignment is complete, the maximum high frequency tuning range should be checked. If the range is greater or less than 1610 Kc., the lug stop near the volume control should be bent to limit the frequency coverage to 1610 Kc.

IMPORTANT: After installing the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum height. Check the antenna trimmer alignment on a weak station at approximately 1410 Kc.

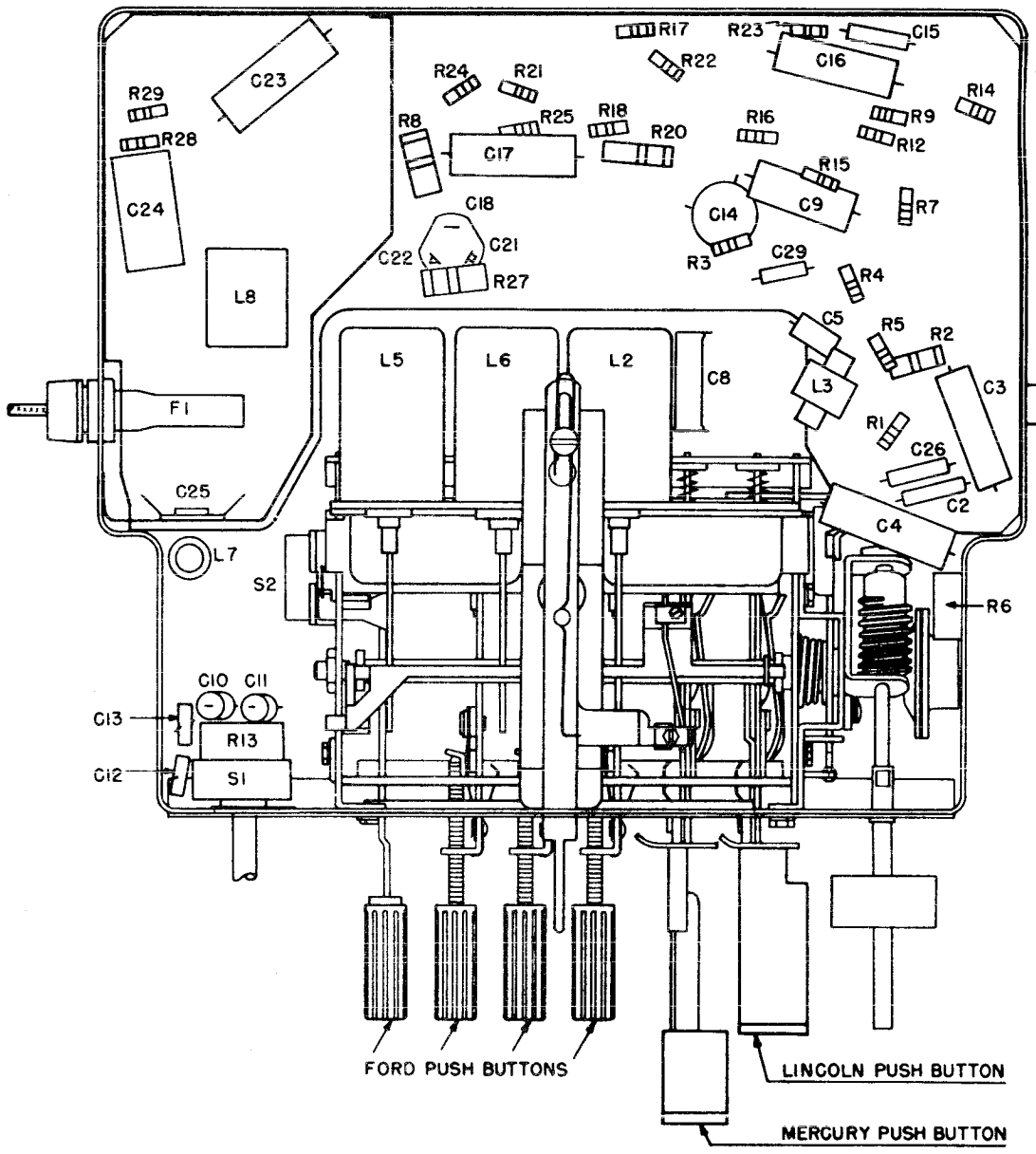
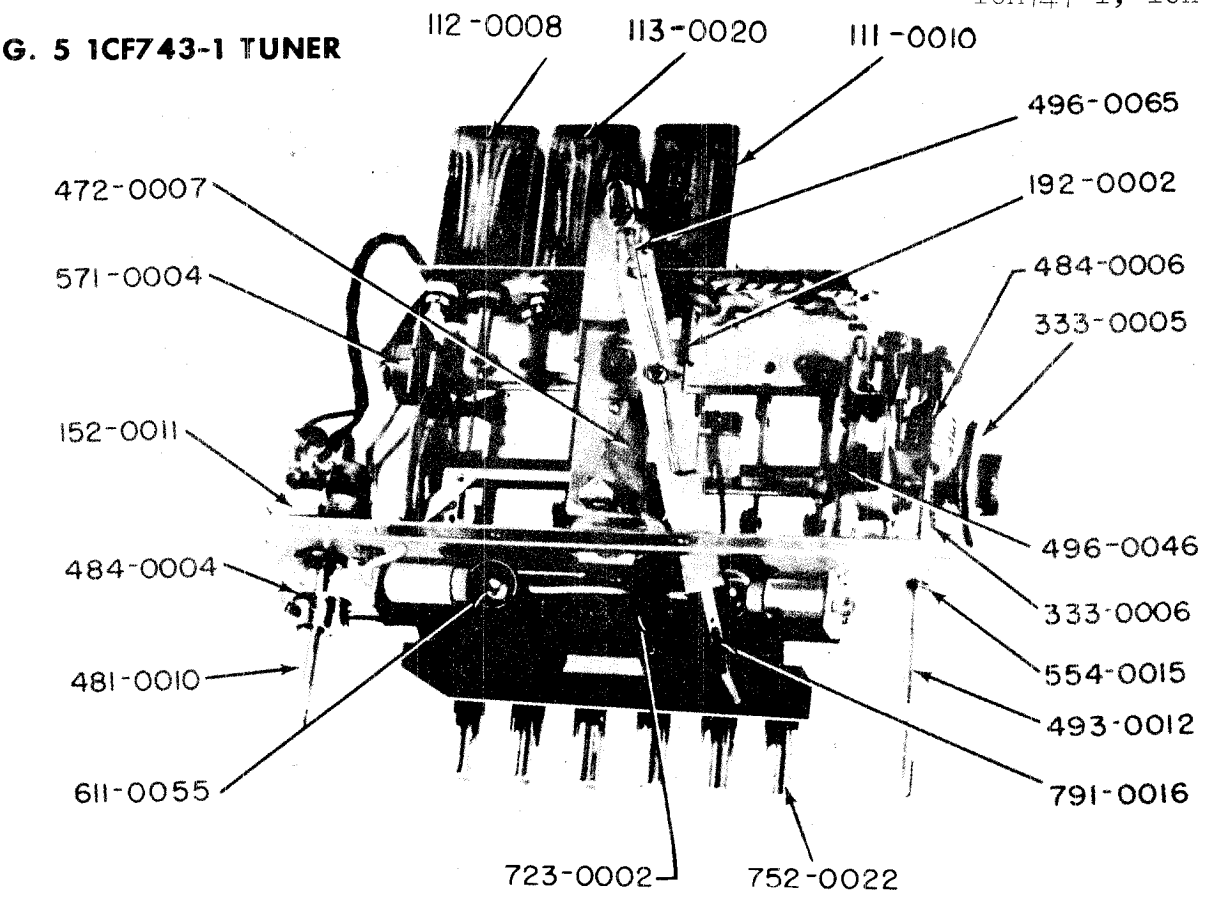


FIG. 4 PARTS LAYOUT - TOP OF CHASSIS

FIG. 5 1CF743-1 TUNER



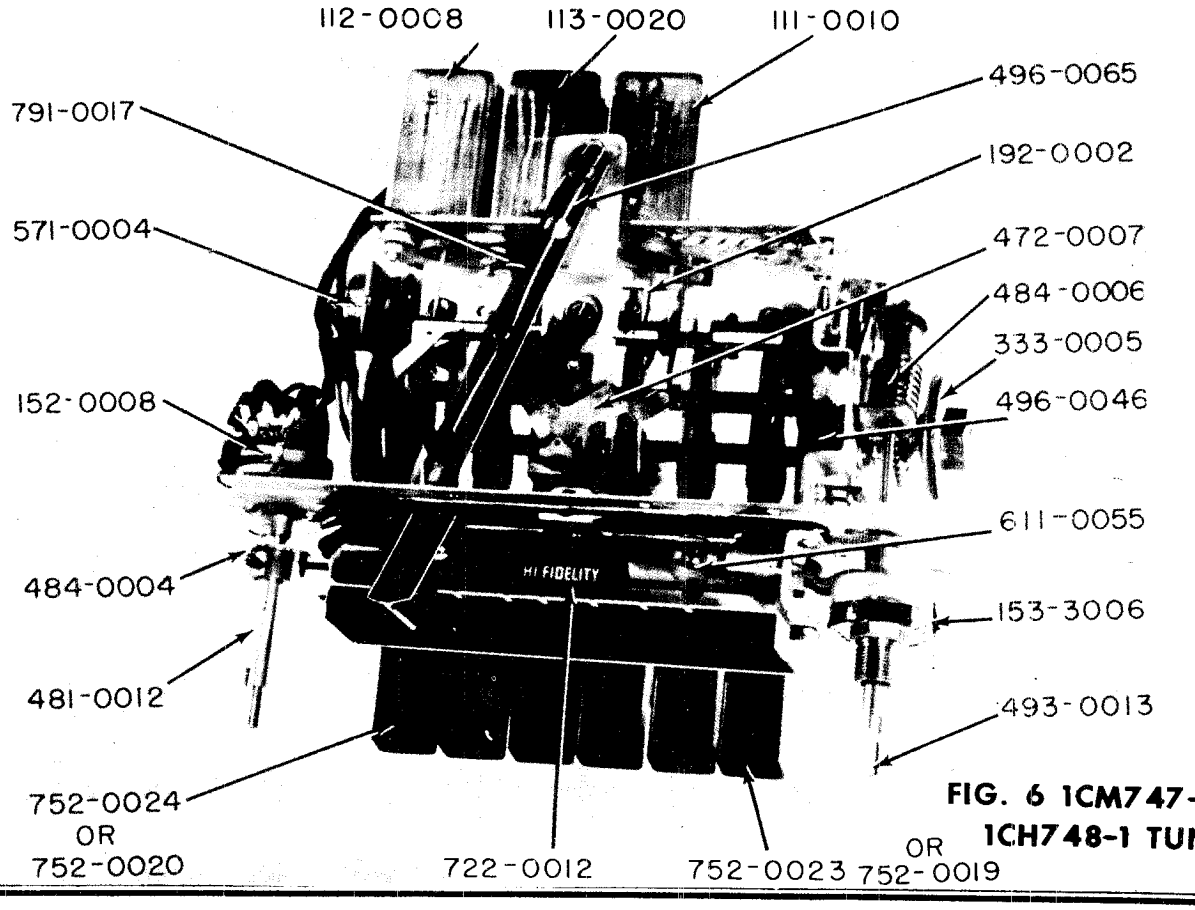
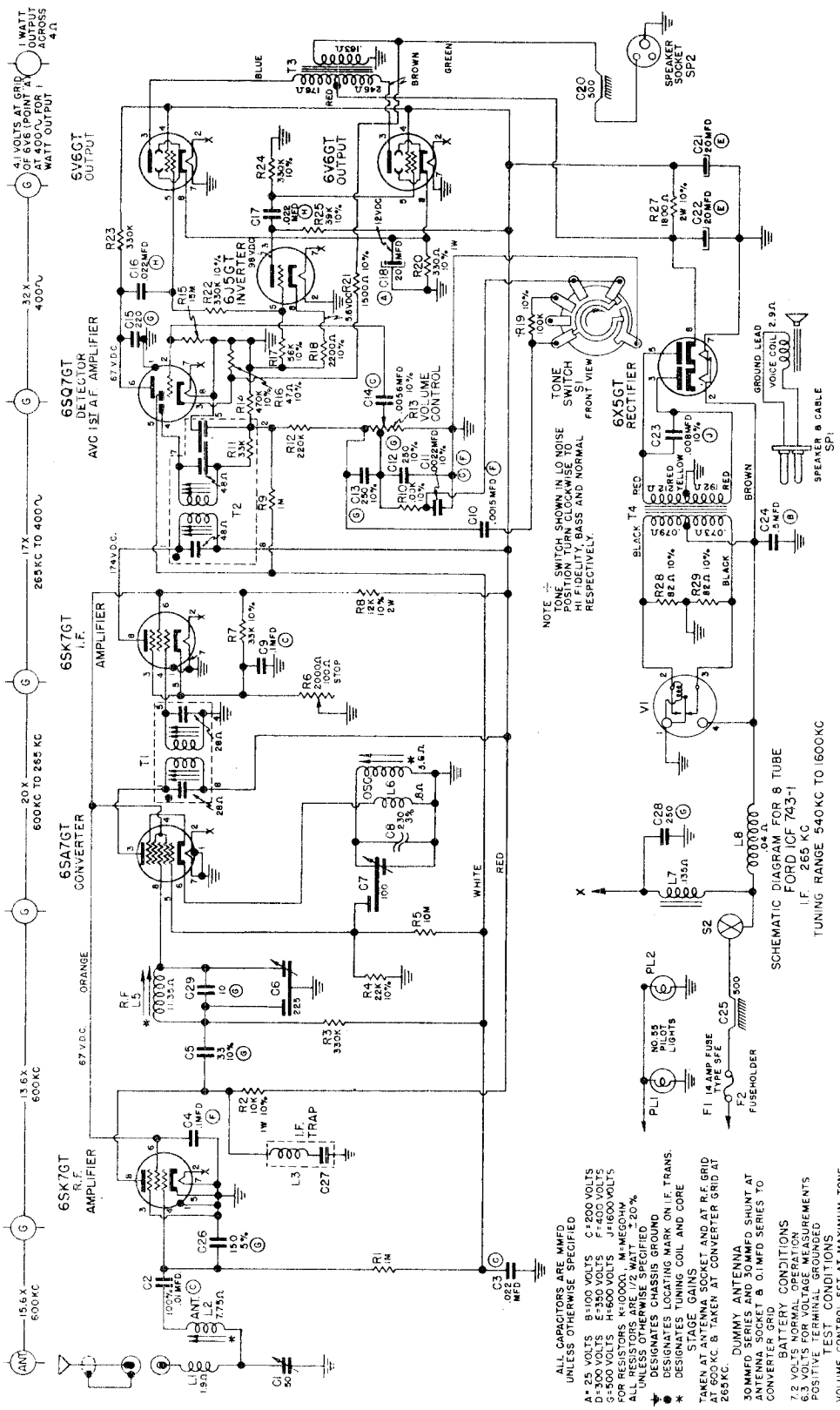
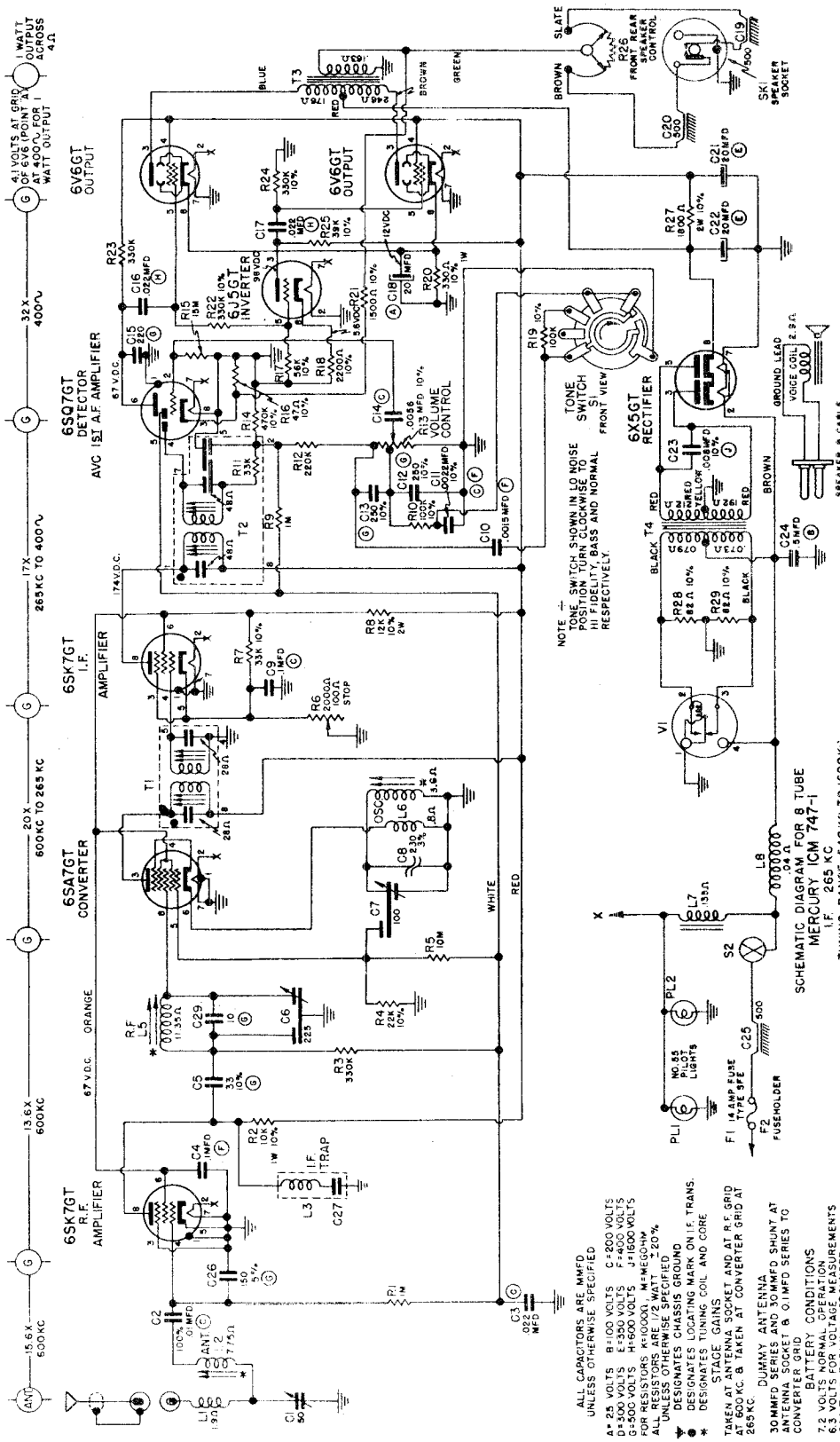


FIG. 6 1CM747-1 & 1CH748-1 TUNER

MODEL 1CF743-1

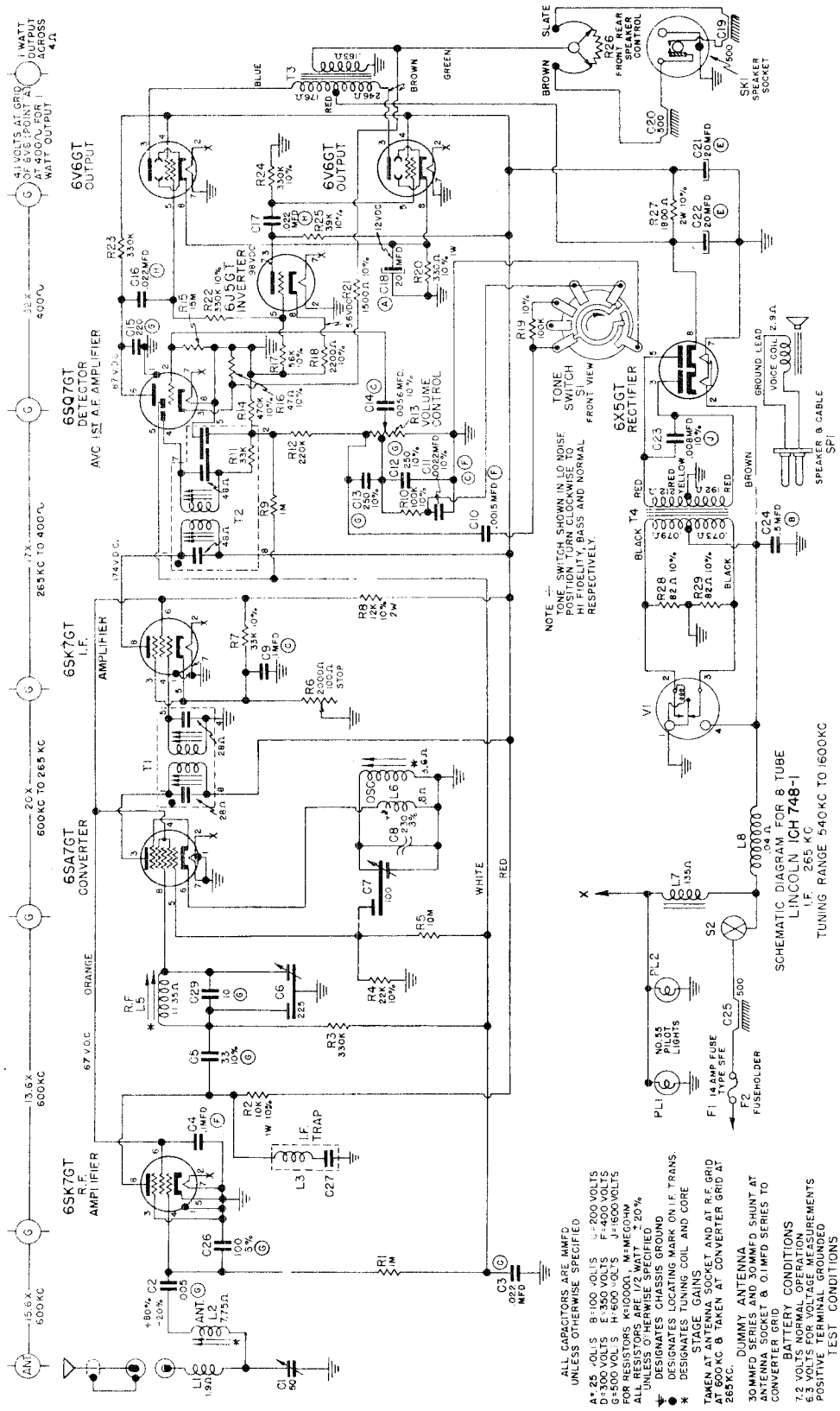


SCHEMATIC DIAGRAM MODEL 1CF743-1



SCHEMATIC DIAGRAM MODEL 1CM747-1

MODEL 1CH748-1



ALL CAPACITORS ARE MMFD UNLESS OTHERWISE SPECIFIED
A=25 VOLTS B=100 VOLTS C=200 VOLTS
D=300 VOLTS E=350 VOLTS F=400 VOLTS
G=500 VOLTS H=600 VOLTS J=1600 VOLTS
FOR RESISTORS K=1000Ω, M=MEGOHM
ALL RESISTORS ARE 1/2 WATT ± 20%
UNLESS OTHERWISE SPECIFIED
⏚ DESIGNATES CHASSIS GROUND
● DESIGNATES LOCATING MARK ON I.F. TRANS.
✱ DESIGNATES TUNING COIL AND CORE

STAGE GAINS
TAKEN AT ANTENNA SOCKET AND AT R.F. GRID AT 600KC & TAKEN AT CONVERTER GRID AT 265KC.

DUMMY ANTENNA
30 MMFD SERIES AND 30 MMFD SHUNT AT ANTENNA SOCKET & 0.1 MFD SERIES TO CONVERTER GRID

BATTERY CONDITIONS
7.2 VOLTS NORMAL OPERATION
6.3 VOLTS FOR VOLTAGE MEASUREMENTS
POSITIVE TERMINAL GROUNDED

TEST CONDITIONS
VOLUME CONTROL SET AT MAXIMUM, TONE CONTROL SET ON "HIGH FIDELITY" WITH NO INCOMING SIGNAL VOLTAGES READ FROM POINT SHOWN TO CHASSIS WITH 1000 OHM PER VOLT METER. ALL TUBE SOCKETS ARE BOTTOM VIEWS

NOTE — TONE SWITCH SHOWN IN LO NOISE POSITION. TURN CLOCKWISE TO HI FIDELITY, BASS AND NORMAL RESPECTIVELY.

SCHEMATIC DIAGRAM FOR 8 TUBE LINCOLN 1CH 748-1 I.F. 265 KC TUNING RANGE 540KC TO 1600KC

SCHEMATIC DIAGRAM MODEL 1CH748-1

REPAIR PARTS LIST

PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
		TUNER UNIT AND PARTS
75590	313-0016	Tuner Unit Assembly - 1CF743-1 - mechanical portion only - includes push buttons,
75585		driven clutch disc, on-off switch, worm gear, tuning control shaft
	313-0017	Tuner Unit Assembly - 1CM747-1 - mechanical portion only - includes push buttons,
75699		driven clutch disc, on-off switch, worm gear, tuning control shaft
	313-0018	Tuner Unit Assembly - 1CH748-1 - mechanical portion only - includes push buttons,
60493		driven clutch disc, on-off switch, worm
75912		gear, tuning control shaft.
	481-0011	Ball - bearing - .125"
75687	492-0025	Bracket Assembly - Dial Background & Socket (1CF743-1)
75798	411-0010	Bracket Assembly - Dial Background & Socket
75842		(1CM747-1, 1CH748-1)
	492-0026	Bracket Assembly - Pointer Support (1CF743-1)
71818	492-0027	Bracket Assembly - Pointer Support (1CM747-1,
75672		1CH748-1)
75817	333-0007	Bracket - Roller Assembly - Clutch Release
	481-0009	Bushing - Tuning Shaft (1CF743-1)
75671	481-0012	Bushing - Volume Control Shaft (1CM747-1,
75082		1CH748-1)
71890	481-0010	Bushing - Volume Control Shaft (1CF743-1)
71892	752-0022	Button - Push - and Screw Assembly (1CF743-1)
71597	752-0023	Button - Push (1CM747-1)
71598	752-0024	Button - Push - Off (1CM747-1)
65966	752-0019	Button - Push (1CH748-1)
71503	752-0020	Button - Push - Off (1CH748-1)
75635	333-0005	Clutch Disc Assembly
75604	192-0002	Core - Iron tuning,and adjusting spring
	722-0017	Dial (1CF743-1)
75000	723-0002	Drum - Tone - Shaft & Gear Assembly (1CF743-1)
75911	722-0012	Drum - Tone - Shaft & Gear Assembly
71749		(1CM747-1, 1CH748-1)
71758	711-0023	Escutcheon & Dial Assembly (1CF743-1)
75530	711-0018	Escutcheon (1CM747-1)
75009	711-0021	Escutcheon (1CH748-1)
71891	333-0006	Gear - Drive & Bushing Assembly
71889	484-0004	Gear - Tone
75797	753-0003	Insert - Push Button - Plain (1CM747-1)
	753-0002	Insert - Push Button - On - Off (1CM747-1)
75531	472-0007	Link & Stud Assembly - Pointer Drag (1CF743-1,
71587		1CM747-1, 1CH748-1)
75031	484-0006	Gear - Worm
71753	331-0003	Lock - Cam (1CF743-1)
75784	552-0023	Nut - 3/8-32 - Control mounting
	552-0008	Nut - 1/2-28 - Mounting
	791-0016	Pointer (1CF743-1)
75803	791-0017	Pointer (1CM747-1, 1CH748-1)

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
	71847	554-0015	Ring - Drive Shaft Retaining
	75034	727-0003	Scale - Dial (1CM747-1)
	75049	727-0002	Scale - Dial (1CH748-1)
	65975	551-0017	Screw - Adjusting
	71838	551-0017	Screw - Pivot
	364-6	551-6300	Screw - Set #8-32 x 3/16 Headless
	75602	493-0012	Shaft - Manual Tuning Assembly (1CF743-1)
	75678	493-0013	Shaft - Manual Tuning Assy. (1CM747-1, 1CH748-1)
	75056	497-0008	Sleeve - Tuning Shaft (1CM747-1, 1CH748-1)
	71827	496-0043	Spring - Clutch Release
	71831	496-0046	Spring - Clutch Release Bracket
	75866	554-0020	Spring - Retainer
	71833	496-0047	Spring - Switch Plunger Return
	75037	496-0065	Spring - Cross Arm Tension
	75793	496-0066	Spring - Pointer Tension
	71529	476-0003	Strip - Fibre Retainer
S2	71865	571-0004	Switch - On-Off
	71837	553-3000	Washer - Felt
	71180	553-4009	Washer - Shim
	71853	553-5005	Washer - Tension
			TUBE COMPLEMENT
	45238H	622-0001H	6SK7GT - R.F. Amplifier
	41332H	622-0002H	6SA7GT - Converter
	45238H	622-0001H	6SK7GT - I.F Amplifier
	45239H	622-0003H	6SQ7GT - Detector - AVC - 1st A.F. Amplifier
	44547H	622-0010H	6J5GT Inverter
	71226H	622-0004H	6V6GT Push Pull - Audio Output
	71226H	622-0004H	6V6GT - Push Pull - Audio Output
	71227H	633 0001H	6X5GT - Rectifier
			CAPACITORS
C2	75973	166-5000D	Capacitor - Ceramic - .005 Mfd. - 450 V. (1CH748-1)
C2	71632	168-0002D	Capacitor - Ceramic - .01 Mfd. - 500 V. (1CF743-1, 1CM747-1)
C21,C22	75825	161-3005	Capacitor - Electrolytic 20 Mfd. - 350 V. 20 Mfd. - 25 V.
C18			
C12,C13	11691	163-0250	Capacitor - Mica - .00025 Mfd. - 500 V.
C28	11691	163-0250	Capacitor - Mica - .00025 Mfd. - 500 V. (1CF743-1)
C15	71660	163-0220	Capacitor - Mica - .00022 Mfd. - 500 V.
C5	71472	163-0033	Capacitor - Mica - .000033 Mfd. - 500 V.
C26	71661	164-0150	Capacitor - Silver Mica - .00015 Mfd. - 500 V. (1CF743-1,1CM747-1)
C26	71757	164-0100	Capacitor - Silver Mica - .0001 Mfd. - 500 V. (1CH748-1)
C29	71399	164-0010	Capacitor - Silver Mica - .00001 Mfd. - 500 V.
C4	71665	160-0401	Capacitor - Molded Paper - .1 Mfd. - 400 V.
C9	71663	160-0201	Capacitor - Molded Paper - .1 Mfd. - 200 V.
C16,C17	71664	160-06122	Capacitor - Molded Paper - .022 Mfd. - 600 V.
C3	71660	160-02122	Capacitor - Molded Paper - .022 Mfd. - 200 V.
C11	75790	160-04222	Capacitor - Molded Paper - .0022 Mfd. - 400 V.
C10	75064	160-04215	Capacitor - Molded Paper - .0015 Mfd. - 400 V.
C14	75098	160-02256	Capacitor - Molded Paper - .0056 Mfd. - 200 V.
C23	71662	160-16282	Capacitor - Molded Paper - .0082 Mfd. - 1600 V.
C24	HT71763	169-0001	Capacitor - Paper - .5 Mfd. - 100 V.

CAPACITORS (continued)

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
C8	75961	165-0230	Capacitor - Temp. Compensating - .00023 Mfd.
C19, C20, C25		167-0008	Capacitor - Kit - Spark Plate
C1	71636	172-0026	Capacitor - Trimmer - Antenna
C6, C7	75824	173-0002	Capacitor - Trimmer & Fixed Capacitor

MISCELLANEOUS CHASSIS PARTS

F2	75786	562-0007	Holder - Fuse
	75642	561-0007	Lead - "A" (1CF743-1)
	71639	561-0003	Lead - "A" (1CM747-1, 1CH748-1)
	71699	416-0002	Socket - Antenna Connector
	71693	412-0016	Socket - Tube - 8 Prong Octal
SP2	71698	414-0001	Socket - Speaker (1CF743-1)
SK1	71754	414-0005	Socket - Speaker (1CM747-1, 1CH748-1)
	66423	413-0005	Socket - Vibrator

MISCELLANEOUS ELECTRICAL PARTS

PL1, PL2	15362	611-0055	Bulb - Dial Light (Mazda #55)
	75796	117-0012	Coils - Permeability tuning (includes)
L2		111-0010	Antenna Coil
L5		112-0008	R. F. Coil
L6		113-0020	Oscillator Coil
L1	75955	148-0001	Choke - Antenna
L8	71628	147-0007	Choke - Hash
L7	75850	145-0005	Choke & Core Assembly - Heater
R26	71883	153-3006	Control - Dual - Speaker (1CM747-1, 1CH748-1)
R6	71645	159-0004	Control - Sensitivity
R13, S1	75804	152-0008	Control - Volume & Tone Switch (1CM747-1, 1CH748-1)
R13, S1	75791	152-0011	Control - Volume & Tone Switch (1CF743-1)
F1	17392	191-0002	Fuse - 14 Amp
SP1	75674	539-0001	Speaker - PM - 6"x9" (1CF743-1)
SP1	71733	539-0005	Speaker - PM - 6"x9" (1CM747-1, 1CH748-1)
T1	71702	121-0015	Transformer - 1st I. F.
T2	71703	122-0015	Transformer - 2nd I. F.
T3	75931	143-0012	Transformer - Output
T4	75787	141-0010	Transformer - Power
L3, C27	75918	118-0008	Trap Coil - I. F.
V1	71712	511-0001	Vibrator

INSTALLATION PARTS 1CF743-1

	75657	776-0003	Baffle and Gasket Assembly - Speaker
	75162	567-0005	Capacitor - Fuel Gauge
	71456	564-0002	Capacitor - Generator
	71604	569-0012	Capacitor - Oil Gauge
	75156	569-0004	Capacitor - Voltage Regulator
	71460	568-0003	Collector - Wheel Static
	75661	711-0022	Cup - Bezel
	75662	744-0012	Knob - Tone Control
	75655	741-0005	Knob - Tuning (Complete)
	75656	742-0003	Knob - Volume Control (Complete)
	71610	552-0006	Nut - 1/4 - 20 Hex.
	71669	552-0020	Nut - 1/2 - 28 - Mounting
	75663	552-0001	Nut - #8-32 - Wing
	75648	492-0023	Support - Mounting - Receiver - L.H.
	75643	492-0022	Support - Mounting - Receiver - R.H.
	71414	563-0004	Suppressor - Distributor
	75935	563-0006	Suppressor Lead - Distributor
	75673	553-1014	Washer - I ock - 1/4 Split
	71741	553-2007	Washer - Serrated

INSTALLATION PARTS - 1CM747-1

71737	492-0015	Bracket - Mounting - Receiver - L.H.
71730	492-0016	Bracket - Mounting - Receiver - R.H.
75162	567-0005	Capacitor - Fuel Gauge
71456	564-0002	Capacitor - Generator
71604	569-0012	Capacitor - Oil Gauge
75156	569-0004	Capacitor - Voltage Regulator
71731	492-0017	Clamp - Speaker Mounting
71460	568-0003	Collector - Wheel Static
71751	744-0007	Knob - Tone Switch & Speaker Control
75707	740-0016	Knob - Volume and Tuning
411-10	552-0007	Nut - #10-32 Hex
71610	552-0006	Nut - 1/4-20 Hex
75663	552-0001	Nut - #8-32 Wing
71753	552-0008	Nut - 1/2-28 - Special
71414	563-0004	Suppressor - Distributor
75935	563-0006	Suppressor Lead - Distributor
402-8	553-1208	Washer - Lock - #8 - Int. Tooth
402-10	553-1210	Washer - Lock #10 - Int. Tooth
71741	553-2007	Washer - Serrated
75673	553-1014	Washer - Lock - 1/4 - Split
71491	553-1250	Washer - Lock - 1/2 - Int. Tooth

INSTALLATION PARTS - 1CH748-1

71744	492-0019	Bracket - Mounting - Receiver - L.H.
71745	492-0018	Bracket - Mounting - Receiver - R.H.
75162	567-0005	Capacitor - Fuel Gauge
71456	564-0002	Capacitor - Generator
71457	569-0004A	Capacitor - Ignition Coil
71604	569-0012	Capacitor - Oil Gauge
71460	568-0003	Collector - Wheel Static
71751	744-0007	Knob - Tone Switch & Speaker Control
75711	740-0017	Knob - Volume & Tuning
71610	552-0006	Nut - 1/4-20 Hex
75663	552-0001	Nut - #8-32 Wing
71753	552-0008	Nut - 1/2-28 Hex
71747	559-0003	Screw - #8-1/2 Binder Head Self-Tapping
71748	551-0007	Bolt - 1/4-20 x 1/2 - Hex Head
71746	193-0007	Spring - Hood Bonding
71414	563-0004	Suppressor - Distributor
75935	563-0006	Suppressor Lead - Distributor
71741	553-2007	Washer - Serrated
75673	553-1014	Washer - Lock - 1/4 - Split
71491	553-1250	Washer - Lock - 1/2 - Int. Tooth

MODELS 1CF743-1, 1CM747-1, 1CH748-1

SCHEMATIC LOCATION	PRODUCTION PART NUMBER	SERVICE PART NUMBER	DESCRIPTION
			RESISTORS
R16	BY34701	181-0470	Resistor - insulated - 47 Ohm - 1/2 W.
R28, R29	BY38201	181-0820	Resistor - insulated - 82 Ohm - 1/2 W.
R21	BY31521	181-0152	Resistor - insulated - 1,500 Ohm - 1/2 W.
R18	BY32221	181-0222	Resistor - insulated - 2,200 Ohm - 1/2 W.
R4	BY32231	181-0223	Resistor - insulated - 22,000 Ohm - 1/2 W.
R7, R11	BY33331	181-0333	Resistor - insulated - 33,000 Ohm - 1/2 W.
R25	BY33931	181-0393	Resistor - insulated - 39,000 Ohm - 1/2 W.
R17	BY35631	181-0563	Resistor - insulated - 56,000 Ohm - 1/2 W.
R10, R19	BY31041	181-0104	Resistor - insulated - 100,000 Ohm - 1/2 W.
R12	BY32242	181-0224	Resistor - insulated - 220,000 Ohm - 1/2 W.
R3, R23	BY33342	181-0334	Resistor - insulated - 330,000 Ohm - 1/2 W.
R22, R24	BY33341	181-0334	Resistor - insulated - 330,000 Ohm - 1/2 W.
R14	BY34741	181-0474	Resistor - insulated - 470,000 Ohm - 1/2 W.
R1, R9	BY31052	181-0105	Resistor - insulated - 1.0 Megohm - 1/2 W.
R5	BY31061	181-0106	Resistor - insulated - 10 Megohm - 1/2 W.
R15	BY31562	181-0156	Resistor - insulated - 15 Megohm - 1/2 W.
R20	ZY33311	182-0331	Resistor - insulated - 330 Ohm - 1 W.
	or	or	
	66041	189-0011	Resistor - insulated - 330 Ohm - 1 W.(W.W.)
R2	ZY31031	182-0103	Resistor - insulated - 10,000 Ohm - 1 W.
R27	VY31821	183-0182	Resistor - insulated - 1,800 Ohm - 2 W.
	or	or	
	71677	189-0002	Resistor - insulated - 1,800 Ohm - 2 W.(W.W.)
R8	VY31231	183-0123	Resistor - insulated - 12,000 Ohm - 2 W.

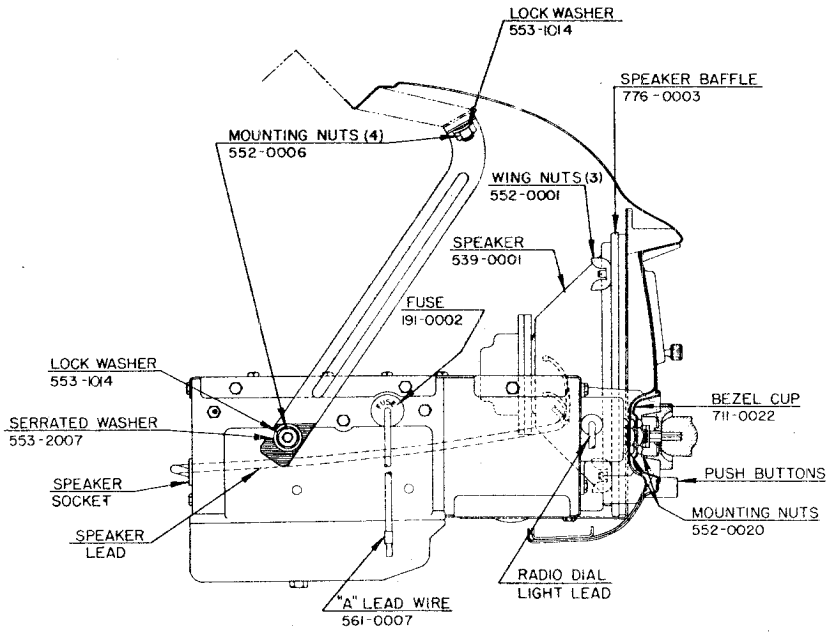


FIG. 7 1CF743-1 INSTALLATION

MODELS 1CF743-1,
1CM747-1, 1CH748-1

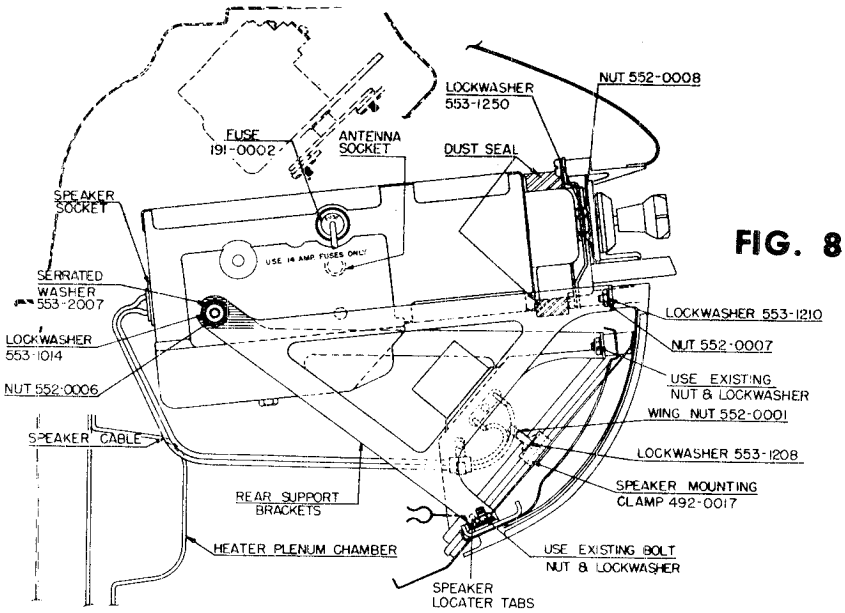


FIG. 8 1CF747-1 INSTALLATION

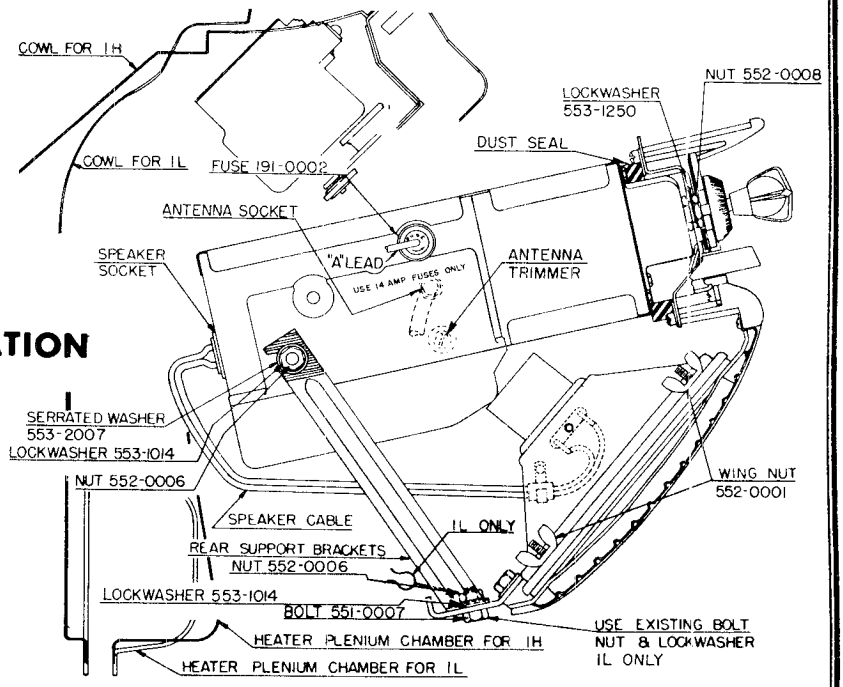


FIG. 9 1CH748-1 INSTALLATION

RECEIVER INSTALLATION

Figures 7, 8 and 9 illustrate the installed receivers to facilitate removal and reinstallation when service is necessary.

TO REMOVE THE FORD RECEIVER

1. Disconnect the speaker plug, dial light lead, antenna lead, and "A" lead.
2. Remove control knobs, front mounting nuts, and lockwashers from the radio control shafts.
3. Disconnect the receiver from the receiver mounting brackets by removing the hex nut and lockwasher from the receiver mounting stud.
4. Remove receiver by sliding it back and down behind the instrument panel.
5. To remove the speaker, remove the four wing nuts holding the speaker to the instrument panel.

TO REMOVE THE MERCURY RECEIVER

1. Remove the car heater plenum chamber.
2. Disconnect speaker plug, antenna lead, and "A" lead.

3. Loosen the two speaker mounting clamps and remove the speaker.
4. Remove control knobs, front mounting nuts and lockwashers from the radio control shafts.
5. Loosen the nuts holding the receiver to the mounting brackets.
6. Remove receiver by sliding it back and down behind the instrument panel.

TO REMOVE THE LINCOLN RECEIVER

1. Remove the car heater plenum chamber.
2. Disconnect the speaker plug, antenna lead, and "A" lead.
3. Remove control knobs, front mounting nuts and lockwashers from the radio control shafts.
4. Loosen the hex nuts holding the receiver to the mounting brackets.
5. Remove receiver by sliding it back and down behind the instrument panel.
6. To remove the speaker, remove the four wing nuts holding it to the instrument panel.

OPERATING INSTRUCTIONS

TO TURN RADIO ON

The radio is connected to the accessory terminal of the ignition switch, therefore, it is necessary to turn the ignition key to the left, if the engine is not running, before turning the radio on. Press any one of the five automatic push buttons. Allow approximately 20 seconds for the receiver to reach operating temperature.

To turn the receiver off, press the "Off" pushbutton.

MANUAL TUNING

To operate the manual tuning control simply turn the tuning knob. When tuning in a station, be sure to tune to the exact frequency for the best tone quality.

VOLUME CONTROL

Turn the volume control knob for the desired volume.

TONE CONTROL

The tone control knob is located directly behind the volume control knob. Turning this control to the right or left will change the tone of the receiver. This control has four positions and the position to which the control is set is indicated in the window in the center of the dial scale.

REAR SPEAKER CONTROL

The rear speaker control disc, located behind the tuning control knob on the Mercury and Lincoln receivers, is provided to control an auxiliary rear shelf speaker (available from Mercury-Lincoln dealer).

The speaker socket located on the rear of the receiver case will accommodate both the front speaker and rear speaker. When the rear speaker is plugged into the socket, a switch in the socket connects the rear speaker control into the circuit.

AUTOMATIC TUNING

Automatic push button tuning is provided by means of push buttons located directly under the dial scale and to the right of the "Off" push button (see Fig. 1). These five buttons permit the selection of five favorite local stations. When the push buttons have been set to the desired station it is only necessary to press a push button to turn the set "on" and to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

SETTING THE PUSH BUTTON TUNER

The five push buttons may be adjusted to any of the desired stations. In order to simplify the identification of these stations, it is advisable to set the push buttons in sequence according to their frequencies, beginning with the station broadcasting on the lowest frequency and progressing to the station broadcasting on the highest frequency.

The push buttons should be set up during the day since at night distant stations will be heard with the same volume as local stations, making it difficult to identify local stations.

Allow the receiver to operate for at least fifteen minutes before adjusting the push buttons. This will allow each part in the receiver to reach normal operating temperature.

MODELS 1CF743-1,
1CM747-1, 1CH748-1

TO SET THE PUSH BUTTONS

1. 1CF743 RECEIVER
   a. Collapse the antenna.
   b. Select a station at the low end of the broadcast band and manually tune it in so its signal is heard without distortion.
   c. Loosen the second push button from the left side by turning it counterclockwise one turn with your fingers.
   d. Press the loosened push button in firmly to its extreme position and release. Tighten the push button as much as possible by turning clockwise with your fingers.
   e. The push button is now set for this station selection. Follow the above procedure for setting each of the four remaining push buttons.
   f. Check that the push button setting corresponds to the best manual tuned signal for each station and repeat steps "b" through "e" where necessary.

2. 1CM747 & 1CH748 RECEIVERS
   a. Collapse the antenna.
   b. Select a station at the low end of the broadcast band and manually tune it in so its signal is heard without distortion.
   c. Unlock the second push button from the left by pushing the button to the left and pulling it out.
   d. Press the unlocked push button in firmly to its extreme position and release.
   e. The push button is now set for this station selection. Follow the above procedure for setting each of the four remaining push buttons.
   f. Check that the push button setting corresponds to the best manual tuned signal for each station and repeat steps "b" through "e" where necessary.

When the five push buttons have been set to the desired stations, return the antenna to the lowest position necessary for good reception. It is only necessary to press a push button to receive the station for which the adjustment was made. The dial pointer will automatically indicate the frequency of the selected station.

INTERFERENCE ELIMINATION

There should be no motor noise or interference from the ignition system if the receiver has been installed in the car according to the instructions furnished with the receiver. The interference suppression equipment may be checked for proper installation by referring to the following instructions and illustrations.

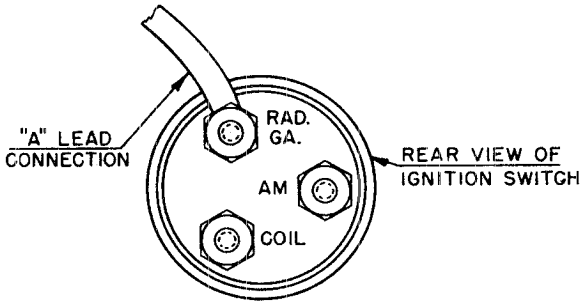


FIG. 10 "A" LEAD CONNECTION

The "A" lead to the receiver should be installed in each car as illustrated in Fig. 10.

Two types of distributor suppressors are used with the Ford (743-1), Mercury (747-1) and Lincoln (748-1) receivers. Suppressor 563-0004 was used for Ford receivers with serial numbers up to 1CF 60,757 743-1 (approx.), Mercury receivers with serial numbers up to 1CM 103,500 747-1(approx.) and Lincoln receivers with serial numbers up to 1CH 15,500 748-1 (approx.). All Ford, Lincoln and Mercury receivers with serial numbers above those listed use suppressor lead 563-0006.

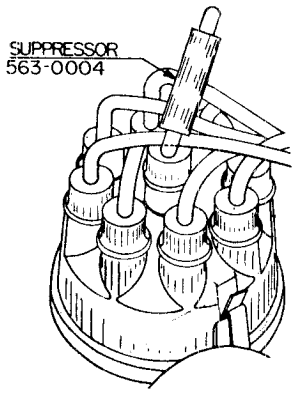


FIG. 11 DISTRIBUTOR SUPPRESSOR 563-0004

To install suppressor 563-0004 shown in Fig. 11, cut the high tension wire running from the ignition coil to the center hole of the distributor cap one and one half inches from the coil for the Ford "8", two and one half inches from the cap for the Mercury and Lincoln. Cut one inch from the coil end of the wire. Screw the cut ends of the wire into both ends of suppressor 563-0004. Replace the wire in the coil.

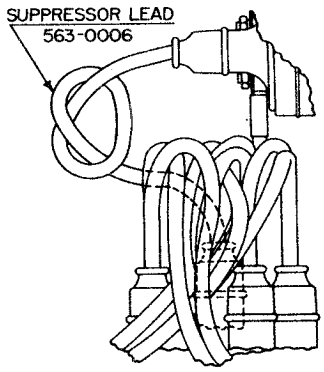


FIG. 12 DISTRIBUTOR SUPPRESSOR LEAD 563-0006

To install suppressor lead 563-0006, remove the high tension wire that runs between the ignition coil and the center hole of the distributor cap on the Ford, Lincoln and Mercury cars. Thoroughly clean the contacts on the coil and distributor. Make an overhand loop in suppressor lead 563-0006 as shown in Fig. 12 and insert the lead in place of the high tension wire.

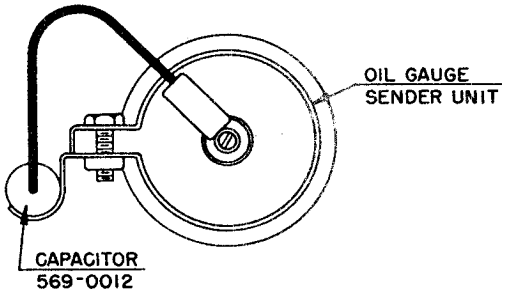


FIG. 13 OIL GAUGE CAPACITOR

Connect capacitor 569-0012 to the oil gauge sender unit as shown.

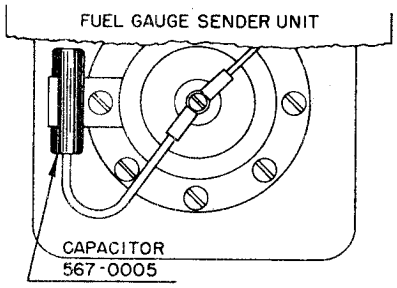


FIG. 14 FUEL GAUGE CAPACITOR

Connect capacitor 567-0005 to the fuel gauge sender unit as shown in Fig. 14 and seal tightly with compound.

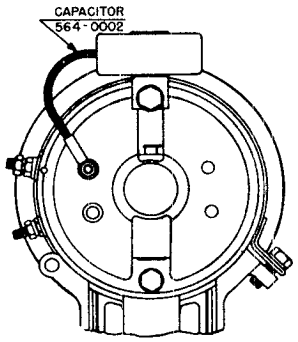


FIG. 15 GENERATOR CAPACITOR

The generator capacitor 564-0002 is installed by loosening (do not remove) the top assembly bolt from the rear end plate of the generator. Mount the capacitor under this bolt and connect the lead to the armature terminal of the generator.

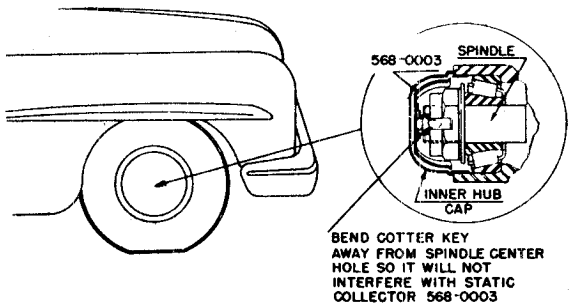


FIG. 16 WHEEL STATIC COLLECTOR

Remove both outer and inner hub caps from both front wheels. Clean inner caps and spindles. Snap static collector springs 568-0003 in inner hub caps.

IMPORTANT: Bend cotter key away from center hole so it will not interfere with static collector. Replace hub caps.

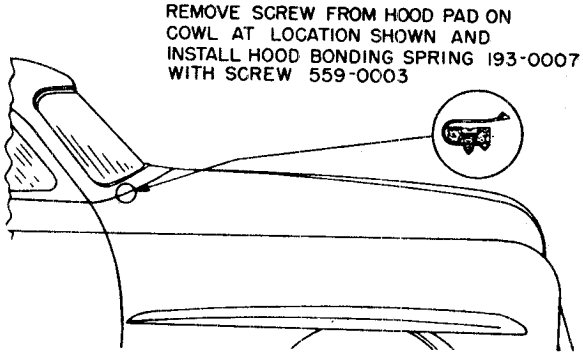


FIG. 17 LINCOLN HOOD BOND

MODELS 1CF743-1,
1CM747-1, 1CH748-1

Remove the screw from the hood pad on the cowl and install the hood bonding spring 193-0007.

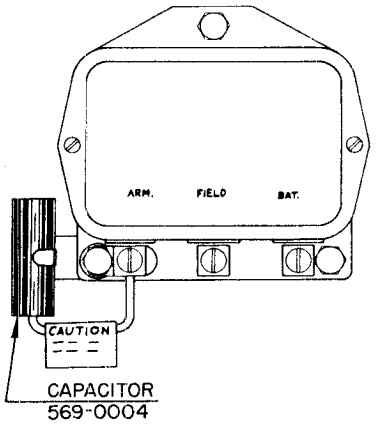


FIG. 18 VOLT. REG. CAPACITOR

Mount capacitor 569-0004 between voltage regulator and dash panel. Connect lead to "ARM" terminal on regulator as shown.

Mount capacitor 569-0004A as shown for the 1H or 1L Lincoln. Be sure to connect the lead to the battery terminal of the coil. If the lead is connected to the Distributor terminal the performance of the car engine will be impaired.

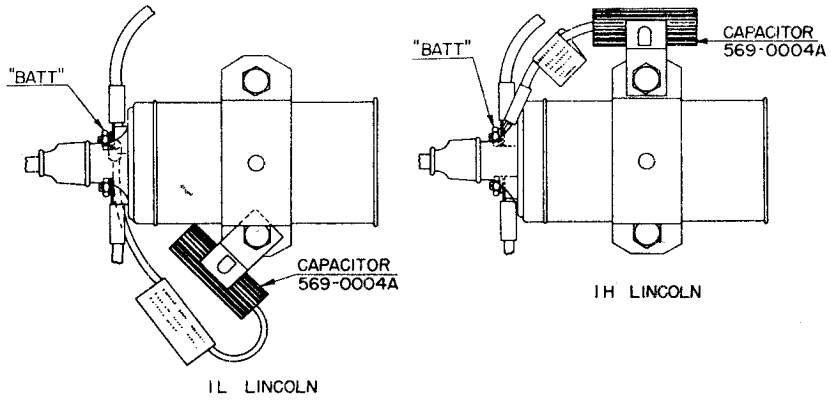


FIG. 19 IGNITION COIL CAPACITOR - LINCOLN

Supplement No. 1

to

Technical Service Bulletin

Suppressor Lead 563-0006 was available for production earlier than originally anticipated. As a result, the serial numbers given under "Interference Elimination" in Bulletin 2-18 are changed. Distributor Suppressor 563-0004 is used with receivers having the following serial numbers:

Ford (743-1) receivers with serial numbers up to and including 1CF 49,221 743-1
Mercury (747-1) receivers with serial numbers up to and including 1CM 86,501 747-1
Lincoln (748-1) receivers with serial numbers up to and including 1CH 17,865 748-1

Receivers with serial numbers higher than those listed above use Suppressor Lead 563-0006.

MODEL 100170, 1951
Kaiser-Frazer

GENERAL

MOUNTING—All 1951 Kaiser Cars.

TUBES—Seven, Plus Rectifier.

SPEAKER—6"x 9" Elliptical, Permanent Magnet.

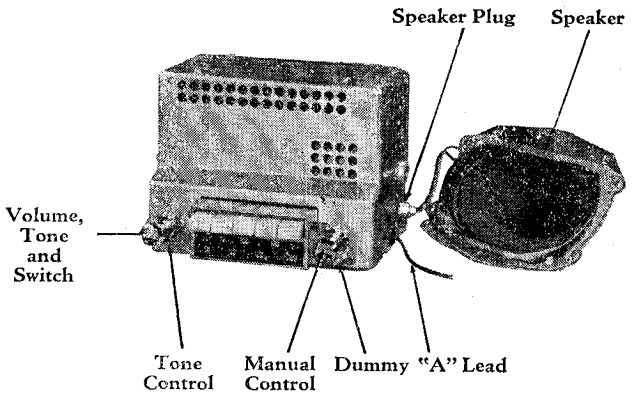
TUNING—Manual and 5 Push Button Mechanical.

ANTENNA TRIMMER COMPENSATION — For Antennas Between 0.000060 - 0.000095 Mfd.

TUNING RANGE—550-1600 KC.

PUSHBUTTON SET-UP

Pull button to the left and out. Tune in desired station manually. Push button in as far as it will go.



MODEL 100170

ALIGNMENT PROCEDURE

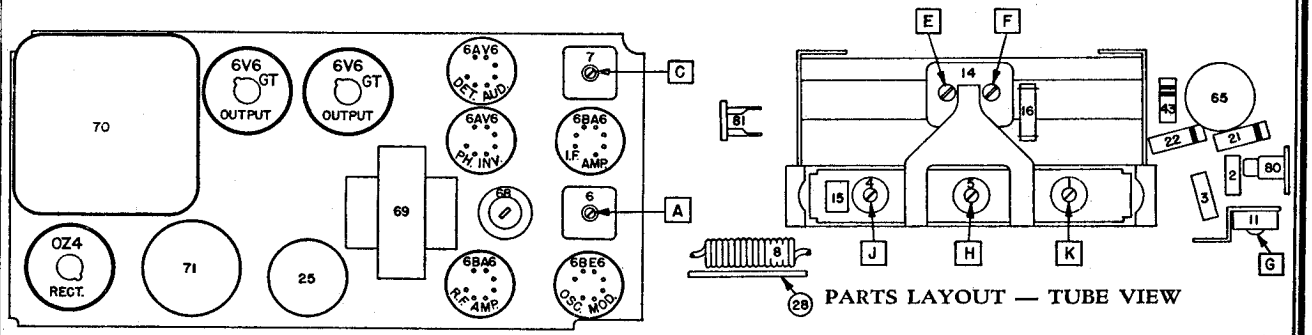
Output Meter Connections	Across Voice Coil
Generator Ground	Receiver Chassis
Dummy Antenna	In Series With Generator
Volume Control Position	Maximum Volume
Tone Control Position	Treble
Generator Output	Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect to	Signal Generator Frequency	Tune Receiver To	Adjust in Sequence for Max. Output
1	0.1 Mfd.	6BE6 Grid (Pin #7)	260 KC	High Freq. Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Gen. Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Gen. Signal	L**

*Before making this adjustment check the mechanical setting of the oscillator core "H." The slotted end of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form). If adjustment is necessary be sure to first dissolve the glyptal seal on the core studs. Core adjustments are made from the mounting end of the coil form with an insulated screwdriver, and core studs should be resealed with glyptal or household cement after alignment.

**"L" is the pointer adjustment screw on the pointer connecting link (see tuner drawing). Adjust so pointer reads 1000 KC.

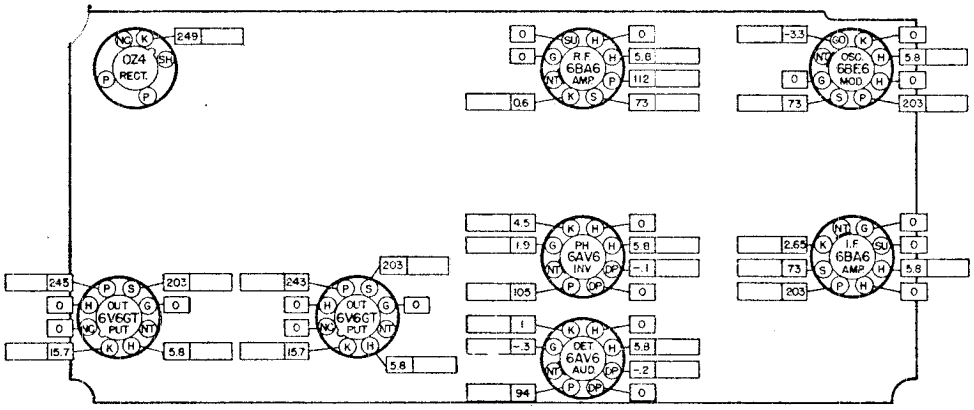
With the radio installed and the car antenna plugged in adjust antenna trimmer "G" (see sticker on case) for maximum volume with the radio tuned to a weak station from 600 to 1000 KC.

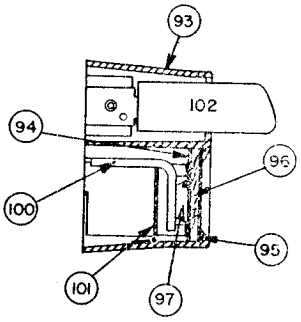


PARTS LAYOUT — TUBE VIEW

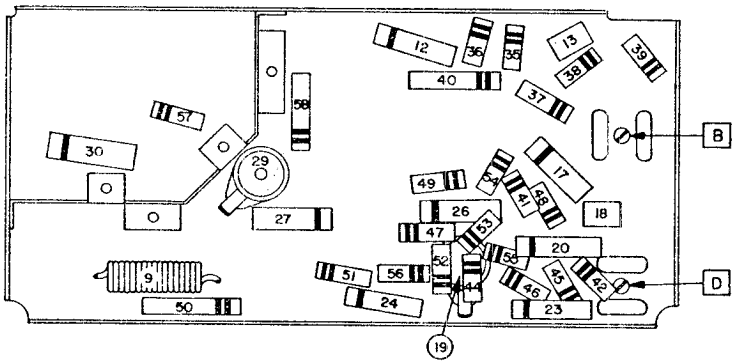
MODEL 100170,
1951 Kaiser-
Frazer

TUBE SOCKET VOLTAGE CHART

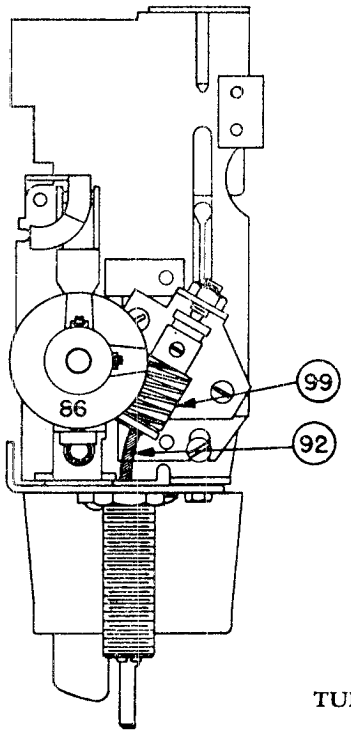


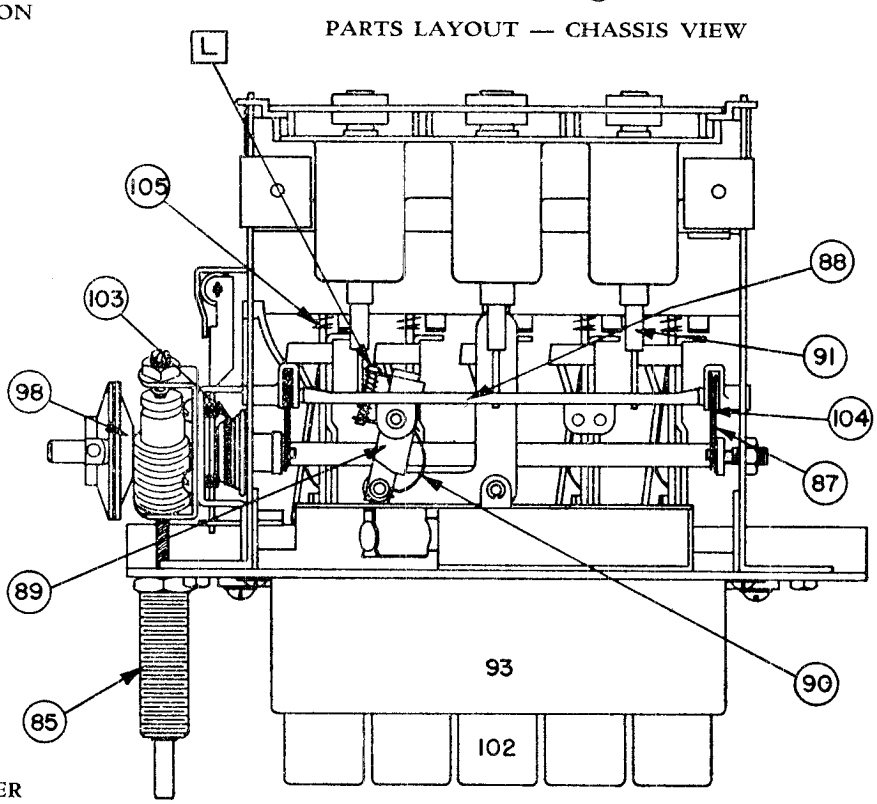


ESCUTCHEON CROSS SECTION



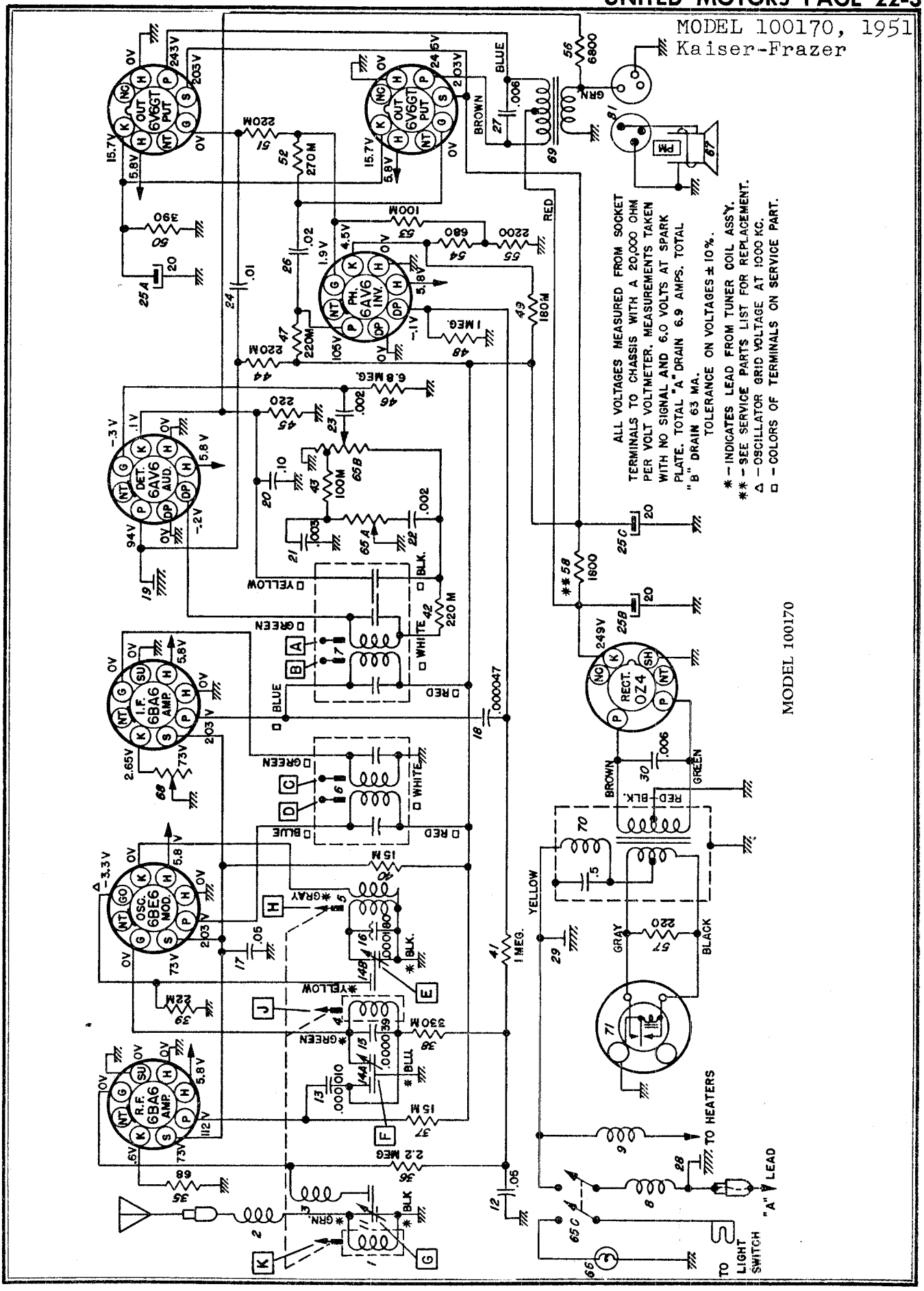
PARTS LAYOUT — CHASSIS VIEW





TUNER

MODEL 100170, 1951
Kaiser-Frazer



MODEL 100170, 1951
Kaiser-Frazer

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7258914	7258914	Antenna
2	7255738	7255738	Antenna Series Choke
3	7240251	7240251	Antenna Spark Choke
4	7258914	7258914	R.F.
5	7258911	7258911	Oscillator
6	7258188	1218725	1st I.F.
7	7258198	1218726	2nd I.F.
8	7260510	1217846	"A" Spark Choke
9	7260511	1217846	Hash Choke
			Condensers
11	7259597	7259597	Antenna Trimmer
12	7236842	E 503	.05 mfd 200 V Tubular
13	1219293	G 100	.000010 mfd Molded
14	7242454	7242454	Dual Trimmer
15	7258223	G 390	.000039 mfd Molded
16	7257424	7257424	.000180 mfd Compensating
17	7258125	E-503	.05 mfd 400 V Tubular
18	7258602	G 470	.000047 mfd Molded
19	1217848	1217848	Chassis Plate Condenser
20	7238789	E 104	.1 mfd 400 V Tubular
21	7257699	E 302	.003 mfd 600 V Tubular
22	7237836	E 202	.002 mfd 600 V Tubular
23	7237836	E 202	.002 mfd 600 V Tubular
24	1209309	E 103	.01 mfd 400 V Tubular
25	7240724	M 908	Electrolytic
25A			20 mfd 25 V
25B			20 mfd 400 V
25C			20 mfd 400 V
26	7258124	E 203	.02 mfd 400 V Tubular
27	1219084	H 602	.006 mfd 800 V Tubular
28	1219822	1219822	Spark Plate
29	1217848	1217848	Chassis Plate
30	7240906	H 602	.006 mfd 1600 V Tubular
			Resistors
35	1215558	1215558	68 Ohms ½W Insulated
36	12111147	A 225	2.2 Megohms ½W Insulated
37	7237595	B 153	15,000 ohms 1W Insulated
38	7240732	A 334	330,000 ohms ½W Insulated
39	1211192	A223	22,000 ohms ½W Insulated
40	7233653	C 153	15,000 ohms 2W Insulated
41	7238873	A 105	1 Megohm ½W Insulated
42	1214555	A 224	220,000 ohms ½W Insulated
43	1213270	A 104	100,000 ohms ½W Insulated
44	1214555	A 224	220,000 ohms ½W Insulated
45	7237835	A 221	220 ohms ½W Insulated
46	7241937	A 685	6.8 Megohms ½W Insulated
47	1214555	A 224	220,000 ohms ½W Insulated
48	7238873	A 105	1 Megohm ½W Insulated
49	1215560	1215560	180,000 ohms ½W Insulated
50	1219690	1219690	390 ohms 2W Wire Wound
51	1214555	A 224	220,000 ohms ½W Insulated
52	1214556	A 274	270,000 ohms ½W Insulated
53	1213270	A 104	100,000 ohms ½W Insulated
54	1214543	A 681	680 ohms ½W Insulated
55	1214545	A 222	2200 ohms ½W Insulated
56	1213483	1213483	6800 ohms ½W Insulated
57	1219738	B 221	220 ohms 1W Insulated
58	1214573	B 562 + C 272	1800 ohms 2W Wire Wound (Replace with 5600 ohm 1W and 2700 ohm 2W in parallel).

MODEL 100170, 1951
Kaiser-Frazer

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
		Tubes	
	1217690	5252	6BA6
	1217691	5253	6BE6
	1218506	5262	6AV6
	1211924	5003	0Z4
	1213793	5241	6V6GT
		Miscellaneous Electrical	
	7260564	7260328	"A" Lead and Fuse Holder (Male)
65	7260674	7260674	Control - Volume, Tone and Switch
65A			Tone Control
65B			Volume Control
65C			Switch
66	187189	44	Dial Light
67	7260563	7260563	Speaker, PM
68	7260545	7260545	Sensitivity Control
69	7260531	7260531	Transformer - Output
70	7259614	6060	Transformer - Power
71	7239124	8542	Vibrator
		MECHANICAL PARTS	
		Chassis	
	1219760	1219760	Plug - Speaker
80	7256742	7256742	Socket - Antenna
	7260565	1219758	Socket - Dial Light
	7258073	7258073	Socket - 7-Pin Miniature Tube
	7236279	7236279	Socket - Octal Tube
81	7258498	7258498	Socket - Speaker
	7239125	7239125	Socket - Vibrator
		Tuner	
	147481	147481	Ball Bearings (10)
85	7260507	7260507	Bushing - Manual Drive
86	7258072	7258072	Clutch Disc - Driven
87	7258203	7258203	Connecting Link - Core Bar
88	7258211	7258211	Core Guide Bar Assembly
89	7256271	7256271	Connecting Link - Pointer
90	7255992	7255992	Spring - Pointer Connecting Link
91	7258468	7258468	Core - Iron Tuning
92	7260560	7260560	Drive Shaft - Manual
93	7260579	7260579	Escutcheon Assy.
94	7260509	7260509	Dial Backplate
95	7260514	7260514	Dial Gasket
96	7260524	7260524	Dial Glass
97	7257718	7257718	Dial Retainer
98	7256495	7256495	Gear and Bushing - Clutch
99	7256705	7256705	Gear and Bracket - Worm
100	7260558	7260558	Pointer Assembly
	1219759	1219759	Pointer Tip Package
101	7260517	7260517	Pointer Backplate
102	1219757	1219757	Push Button and Slide Assy.
103	7258756	7258756	Spring - Clutch
104	7257415	7257415	Spring - Core Bar Connecting Link
105	7255984	7255984	Spring - Slide Return
		INSTALLATION PARTS	
	7260585	7260585	"A" Lead and Fuse Holder
	7260781	7260781	Condenser - Ammeter
	1911095	6030	Condenser - Generator
	1912900	6030	Condenser - Ignition Coil
	1912900	6030	Condenser - Voltage Regulator
	7260586	7260586	Hood Ground Clip
	7260559	7260559	Knob - Control
	7260535	7260535	Knob - Dummy
	7260537	7260537	Knob - Tone Control
	7260534	7260534	Mounting Bracket - Left Hand
	7260533	7260533	Mounting Bracket - Right Hand
	7260512	7260512	Mounting Bracket - Front
	7260835	7260835	Suppressor - Distributor
	7260659	7260659	Trim Plate

MODEL 100205,
1951 Henry J

GENERAL

MOUNTING—All 1951 Henry J cars.

TUBES—Five, plus rectifier.

SPEAKER—6" x 9" Elliptical, Permanent Magnet.

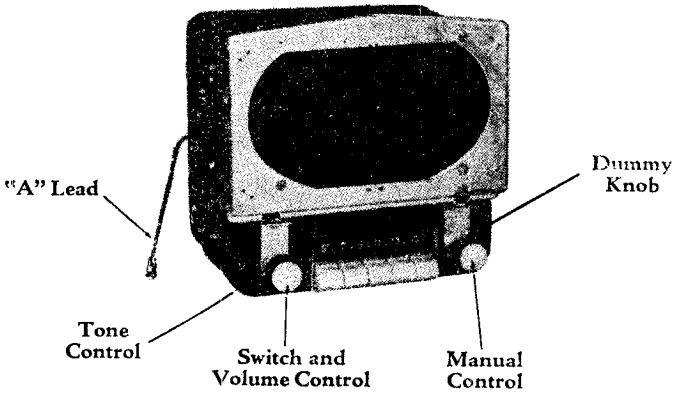
TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000058 - 0.000090 Mfd.

TUNING RANGE—550-1600 KC.

PUSH BUTTON SET-UP PROCEDURE

Pull Push Button right and out. Tune in desired station manually. Push button all the way in.



MODEL 100205

ALIGNMENT PROCEDURE

Output Meter Connections ..... Across Voice Coil

Generator Return ..... To Receiver Chassis

Dummy Antenna ..... In Series With Generator

Volume Control Position ..... Maximum Volume

Tone Control Position ..... Treble

Generator Output ..... Minimum for Readable Indication

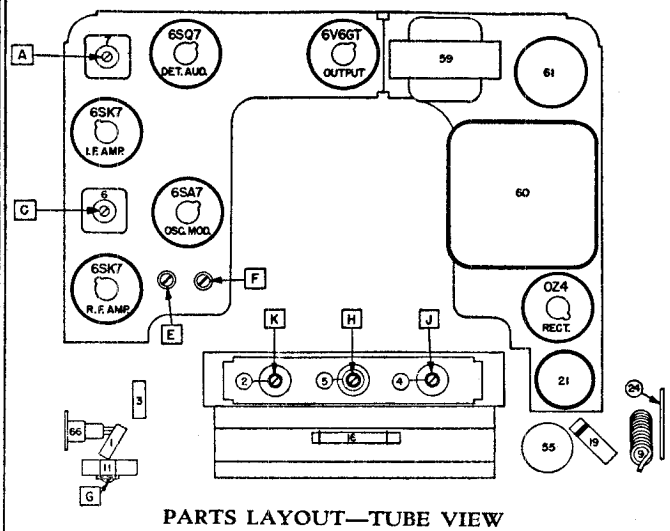
Steps	Series Condenser or Dummy Antenna	Connect Signal Generator to	Signal Generator Frequency	Tune Receiver to	Adjust in Sequence for Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Frequency Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1100 KC	Signal Generator Signal	L**

*Before making this adjustment check mechanical setting of oscillator core "H." The rear of the core should be $1\frac{53}{64}$" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) If adjustment is necessary, first dissolve the glyptal seal on the core studs. Core adjustments should be made with an insulated screw driver, and core studs should be cemented in place with glyptal or household cement after alignment.

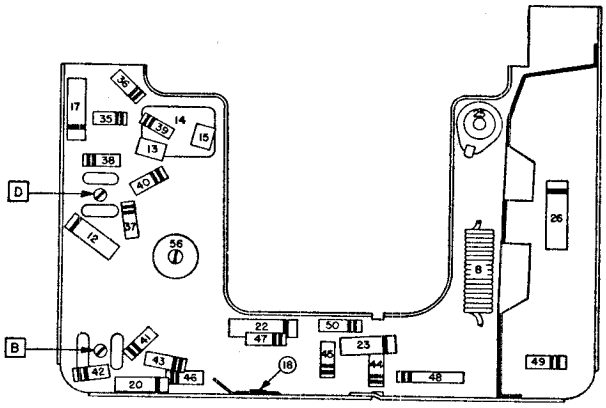
**L is the pointer adjustment screw which is on the connecting link, between the pointer assembly and core guide bar (See tuner Dwg.) It should be adjusted so that when looking directly at the dial the pointer is on the 1100 KC mark. This setting is to give the correct relationship between the pointer and the dial when the radio is installed in a car.

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station between 600 and 1000 KC (see sticker on case).

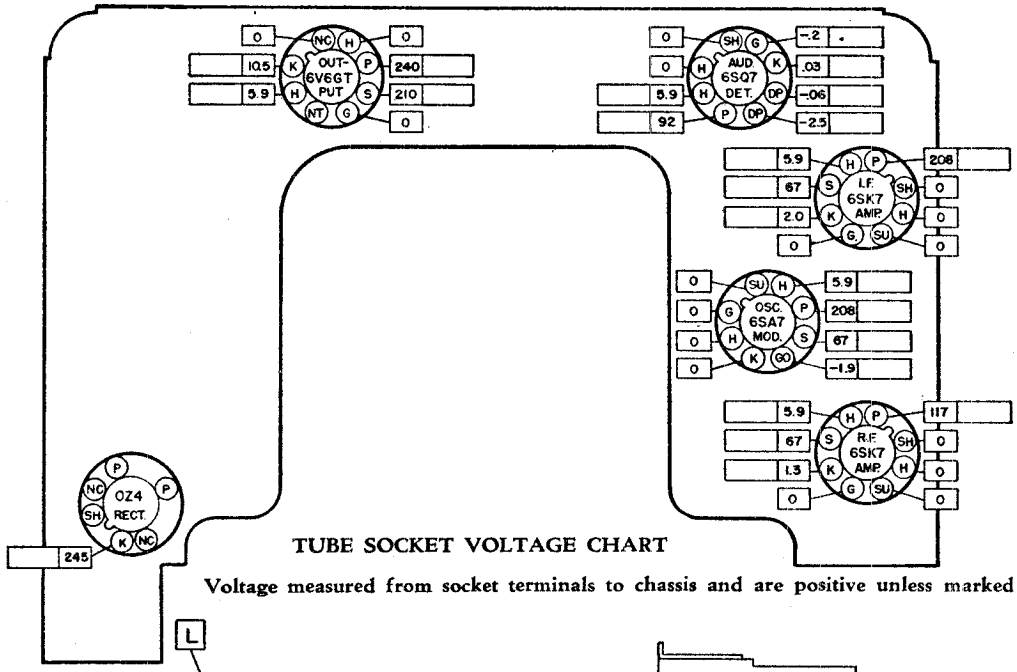
MODEL 100205,
1951 Henry J



PARTS LAYOUT—TUBE VIEW

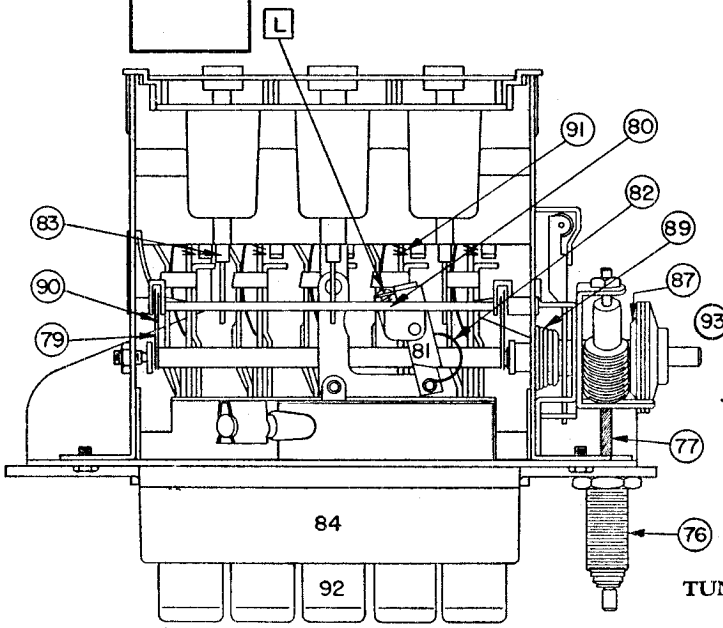


PARTS LAYOUT—CHASSIS VIEW

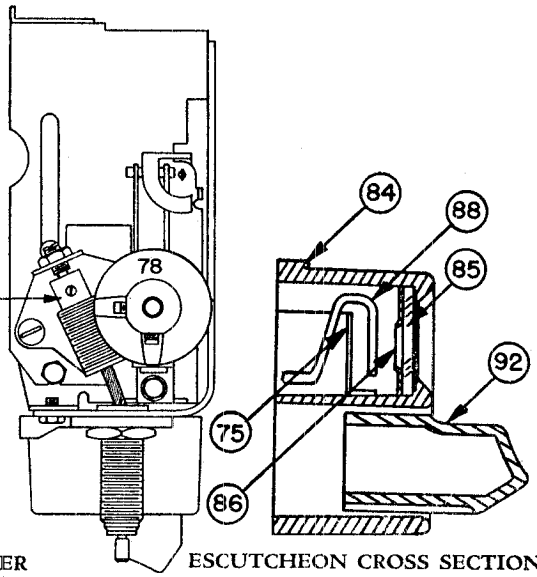


TUBE SOCKET VOLTAGE CHART

Voltage measured from socket terminals to chassis and are positive unless marked otherwise.

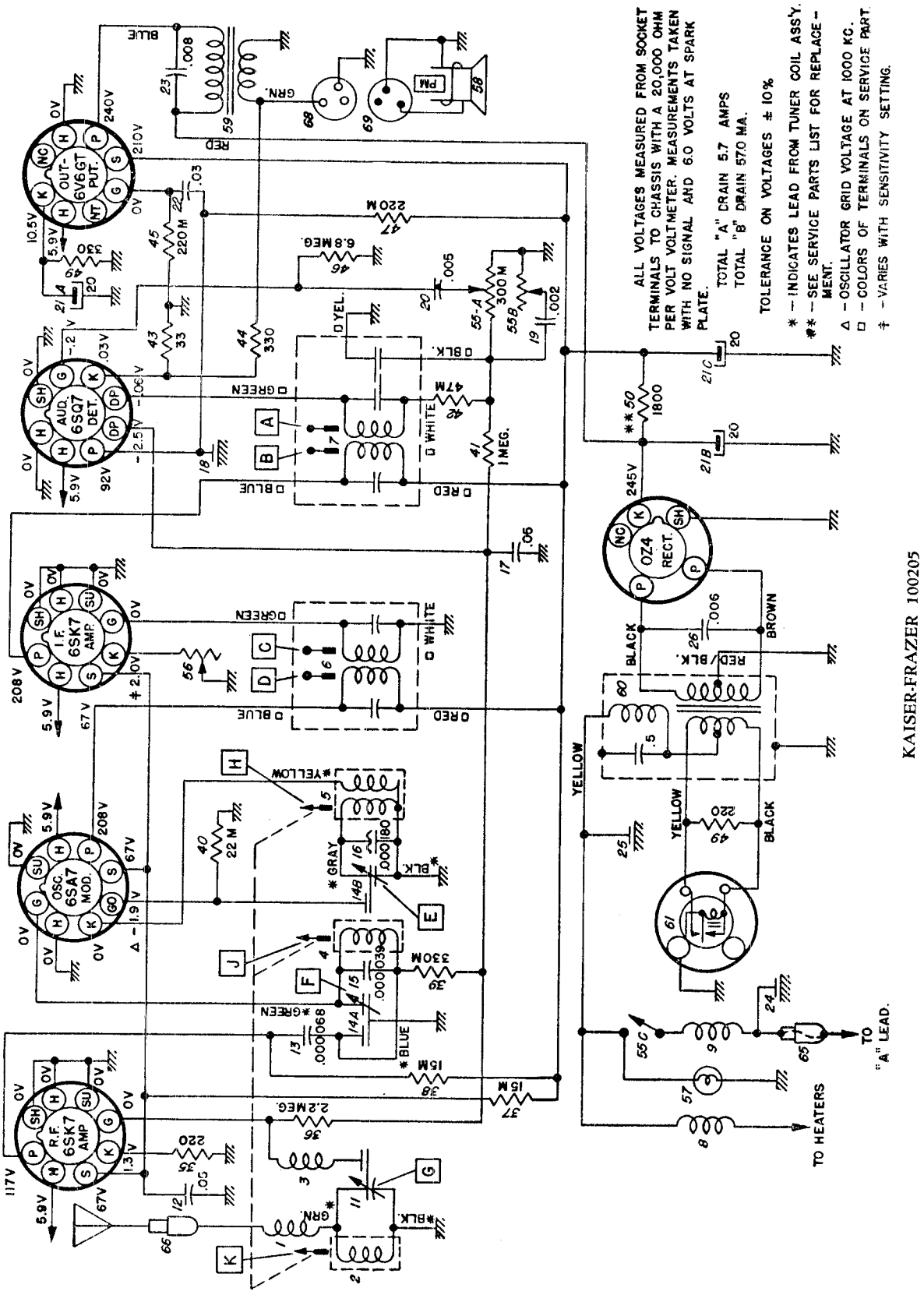


TUNER



ESCUTCHEON CROSS SECTION

MODEL 100205,
1951 Henry J



MODEL 100205,
1951 Henry J

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7255738	7255738	Ant. Series Choke
2	7258914	7258914	Antenna
3	7240251	7240251	Ant. Spark Choke
4	7258914	7258914	R. F.
5	7259687	7259687	Oscillator
6	7258188	1218725	1st I.F.
7	7258198	1218726	2nd I.F.
8	7255912	7241708	Hash Choke
9	7241118	1217846	"A" Spark Choke
			Condensers
11	7257959	7257959	Antenna Trimmer
12	7258125	E 503	.05 Mfd. 400 V. Tubular
13	1219550	G 680	.000068 mfd. Mica
14	7242454	7242454	Dual Trimmer
14A			R.F. Section
14B			Oscillator Section
15	7258221	G 390	.000039 mfd. Mica
16	7257424	7257424	.000180 mfd. Compensating
17	7236842	E 503	.05 mfd. 200 V Tubular
18	1217848	1217848	Chassis Plate Condenser
19	1219632	E 202	.002 mfd. 600V Tubular
20	7230767	E 502	.005 mfd. 600V Tubular
21	7240724	M 908	Electrolytic
21A			20 mfd. 25V
21B			20 mfd. 400V
21C			20 mfd. 400V
22	7242448	E 303	.03 mfd. 400V Tubular
23	1219594	H 802	.008 mfd. 800V Tubular
24	1219825	1219825	Spark Plate Condenser
25	1217848	1217848	Chassis Plate Condenser
26	7240906	H 602	.006 mfd. 1600 V Tubular
			Resistors
35	7237835	A 221	220 ohms ½W Insulated
36	1211147	A 225	2.2 megohms ½W Insulated
37	1219678	C 153	15,000 ohms 2W Insulated
38	1211091	B 153	15,000 ohms 1W Insulated
39	7240732	A 334	330,000 ohms ½W Insulated
40	1211192	A 223	22,000 ohms ½W Insulated
41	7238873	A 105	1 megohm ½W Insulated
42	7240731	A 473	47,000 ohms ½W Insulated
43	1214538	A 330	33 ohms ½W Insulated
44	1213224	A 331	330 ohms ½W Insulated
45	1213479	A 224	220,000 ohms ½W Insulated
46	7241937	A 685	6.8 megohms ½W Insulated
47	1213479	A 224	220,000 ohms ½W Insulated
48	7233773	C 331	330 ohms 1W Wire Wound
49	1219738	B 221	220 ohms 1W Insulated
50	1214573	C 272 or B 562	1800 ohms 2W Wire Wound (Replace with 2700 ohm, 2W and 5600 ohm, 1W in parallel.)
			Tubes
	7237751	5229	6SK7
	7237752	5222	6SA7
	1214293	5232	6SQ7GT
	1213793	5241	6V6GT
	1211924	5003	0Z4

MODEL 100205,
1951 Henry J

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			MISCELLANEOUS ELECTRICAL PARTS
55	7260651	7260651	Control - Volume, Tone & Switch
55A			Volume Control
55B			Tone Control
55C			Switch
56	7242204	7242204	Control - Sensitivity
57	187189	44	Lamp - Dial Light
58	7260819	7260819	Speaker 6 x 9 Elliptical P. M.
59	7260712	7260712	Transformer - Output
60	7259375	7255881	Transformer - Power
61	7239124	8542	Vibrator
			MECHANICAL PARTS
			Chassis
65	7260133	7260328	"A" Lead & Fuse Holder Assy. (Male)
66	7256742	7256742	Connector - Antenna
67	1219758	1219758	Socket - Dial Light
	7236279	7236279	Socket - Octal
	7239125	7239125	Socket - Vibrator
			Tuner
75	7257722	7257722	Backplate - Pointer
	147481	147481	Ball Bearing Pkg. (10)
76	7260635	7260635	Bushing & Drive Shaft Assembly
77	7260636	7260636	Manual Drive Shaft Assembly
78	7258072	7258072	Clutch Disc - Driven
79	7258203	7258203	Connecting Link - Core Bar
80	7258210	7258210	Core Guide Bar - Parallel
81	7256271	7256271	Conn. Link - Pointer Adj.
82	7255992	7255992	Spring - Conn. Link - Pointer
83	7258468	7258468	Core Assy. - Powdered Iron
84	7260643	7260643	Escutcheon Assy.
85	7260653	7260653	Dial Glass
86	7257719	7257719	Mask Plate
	7257718	7257718	Spring - Dial Retainer
87	7256495	7256495	Gear & Bushing - Clutch
88	7257742	7257742	Pointer Assy.
	1219120	1219120	Pointer Tip Package
89	7258756	7258756	Spring - Clutch
90	7257415	7257415	Spring - Core Bar Conn. Link
91	7255984	7255984	Spring - Slide Return
92	1219824	1219824	Tuner Slide and Push Button
93	7257711	7257711	Worm Gear and Bracket
			INSTALLATION PARTS
	7260743	7260743	"A" Lead and Fuse Holder
	7259644	7259644	Condenser - Generator
	7259643	7259643	Condenser - Ignition Coil
	7260814	7260814	Condenser - Ignition Switch
	1912900	6030	Condenser - Voltage Regulator
	7260599	7260599	Eye Bolt
	147685	147685	Fuse - 14 Amp.
	7260667	7260667	Knob - Control
	7260665	7260665	Knob - Dummy
	7260666	7260666	Knob - Tone Control
	7260835	7260835	Suppressor - Distributor
	7260671	7260671	Trim Plate

MODELS 982697,
982698, Oldsmobile

GENERAL

MOUNTING—982698 - All 1951 - 88 Series Oldsmobile Cars.
982697 - All 1951 - 98 Series Oldsmobile Cars.

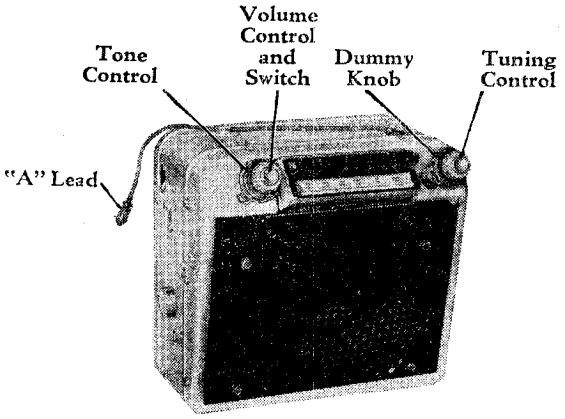
TUBES—Six, Plus Rectifier.

SPEAKER—6″ x 9″ Elliptical Permanent Magnet.

TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000050 - 0.000070 Mfd.

TUNING RANGE—540 - 1600 KC



MODELS 982697
982698

PUSHBUTTON SET-UP

Pull pushbutton to the left and out. Tune in desired station manually. Push button all the way in.

ALIGNMENT PROCEDURE:

Output Meter Connection ..... Across Voice Coil
Generator Return ..... To Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control Position ..... Maximum Volume
Tone Control Position ..... Treble
Generator Output ..... Minimum for Readable Indication

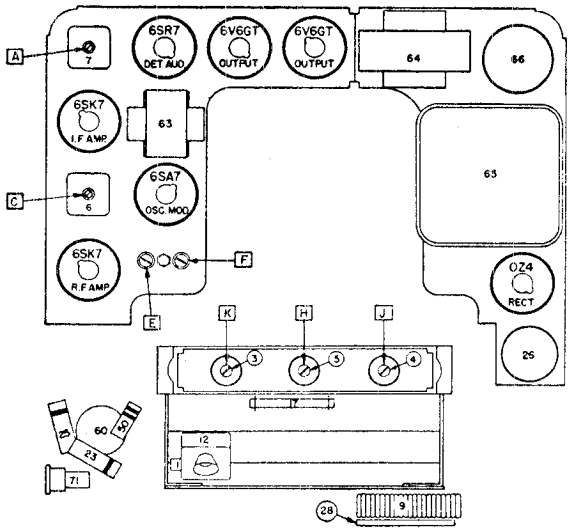
Steps	Series Condenser or Dummy Antenna	Connect to	Signal Generator Frequency	Tune Receiver to	Adjust in Sequence For Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Frequency Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1400 KC	Signal Generator Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	**L

*Before making this adjustment check the mechanical setting of the oscillator core "H." The slotted end of core should be $1\frac{3}{32}$" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) If adjustment is necessary, first dissolve the glyptal seal on the studs. Core adjustments should be made with an insulated screwdriver and core studs should be re-sealed in place with glyptal or household cement after alignment.

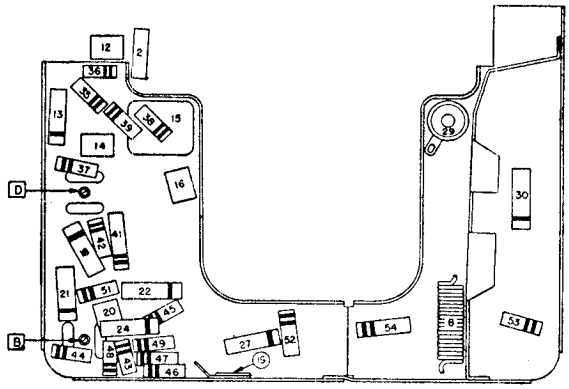
**"L" is the pointer adjustment screw which is on the pointer connecting link (see tuner drawing) and should be adjusted so the pointer reads 1000 KC. (On first "0" of "100.")

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station between 600 and 1000 KC. (See sticker on case.)

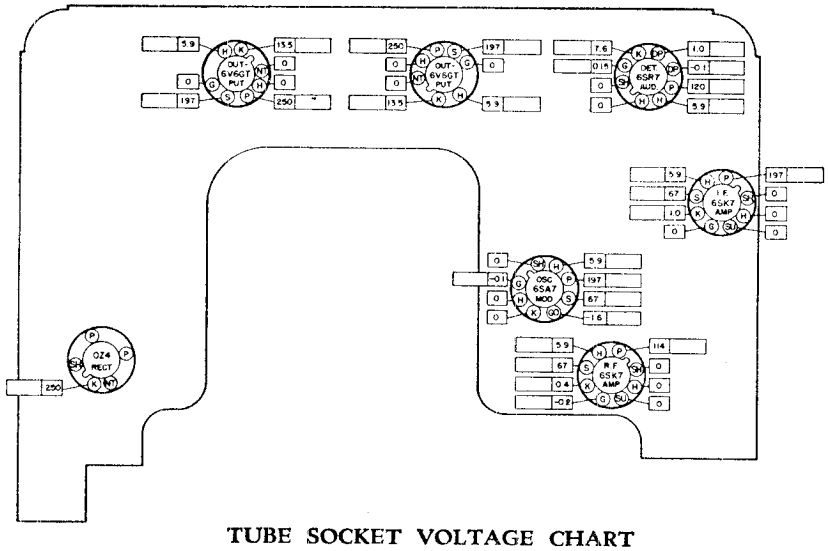
MODELS 982697,
982698, Oldsmobile



PARTS LAYOUT — TUBE VIEW



PARTS LAYOUT — CHASSIS VIEW

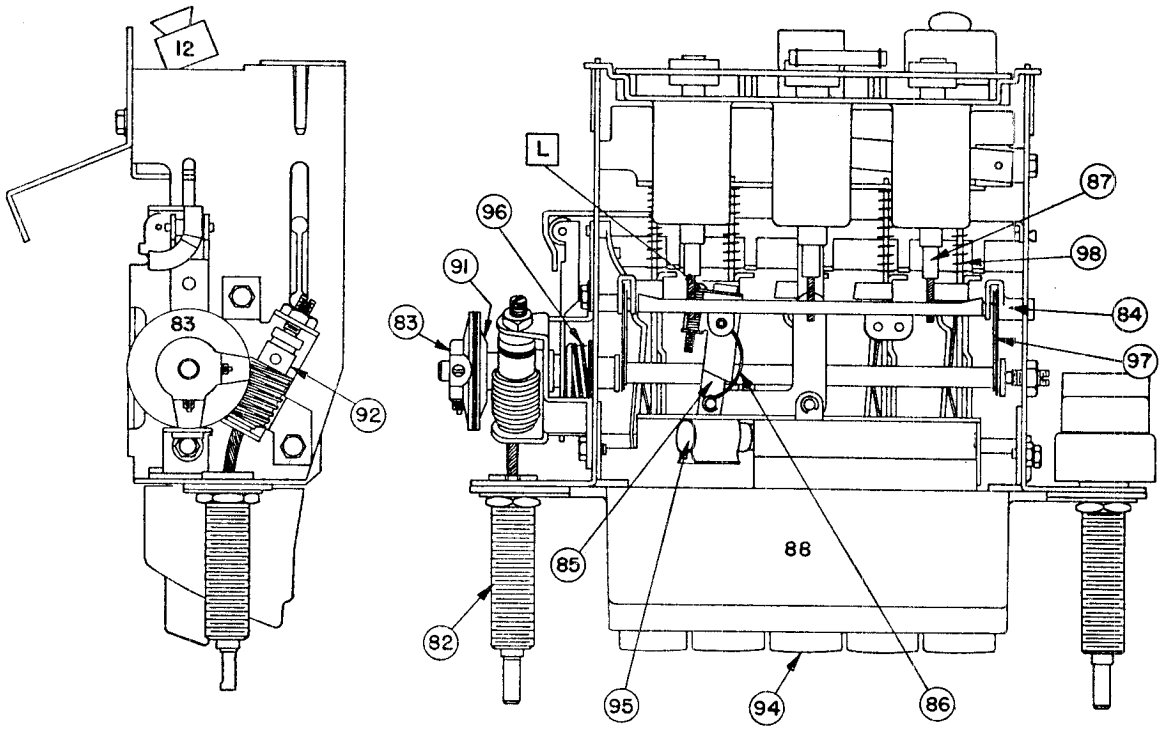


TUBE SOCKET VOLTAGE CHART

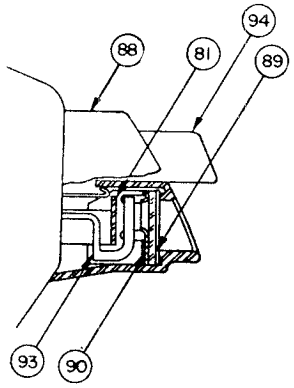
The tube socket voltages as measured at the factory and under the conditions shown on the schematic diagram are shown here. The blank spaces are provided so the serviceman may fill in the actual readings as taken with his own equipment. A normal operating radio should be used for these measurements.

VOLTMETER RESISTANCE ..... OHMS PER VOLT. READING TAKEN WITH ..... VOLTS AT SPARK PLATE. THE VOLTAGES ARE MEASURED FROM TUBE SOCKET TERMINALS TO CHASSIS AND ARE POSITIVE UNLESS MARKED OTHERWISE.

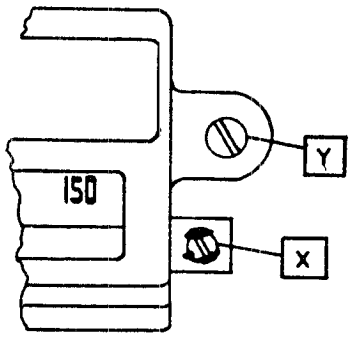
MODELS 982697,
982698, Oldsmobile



TUNER



ESCUTCHEON CROSS SECTION



ESCUTCHEON MOUNTING

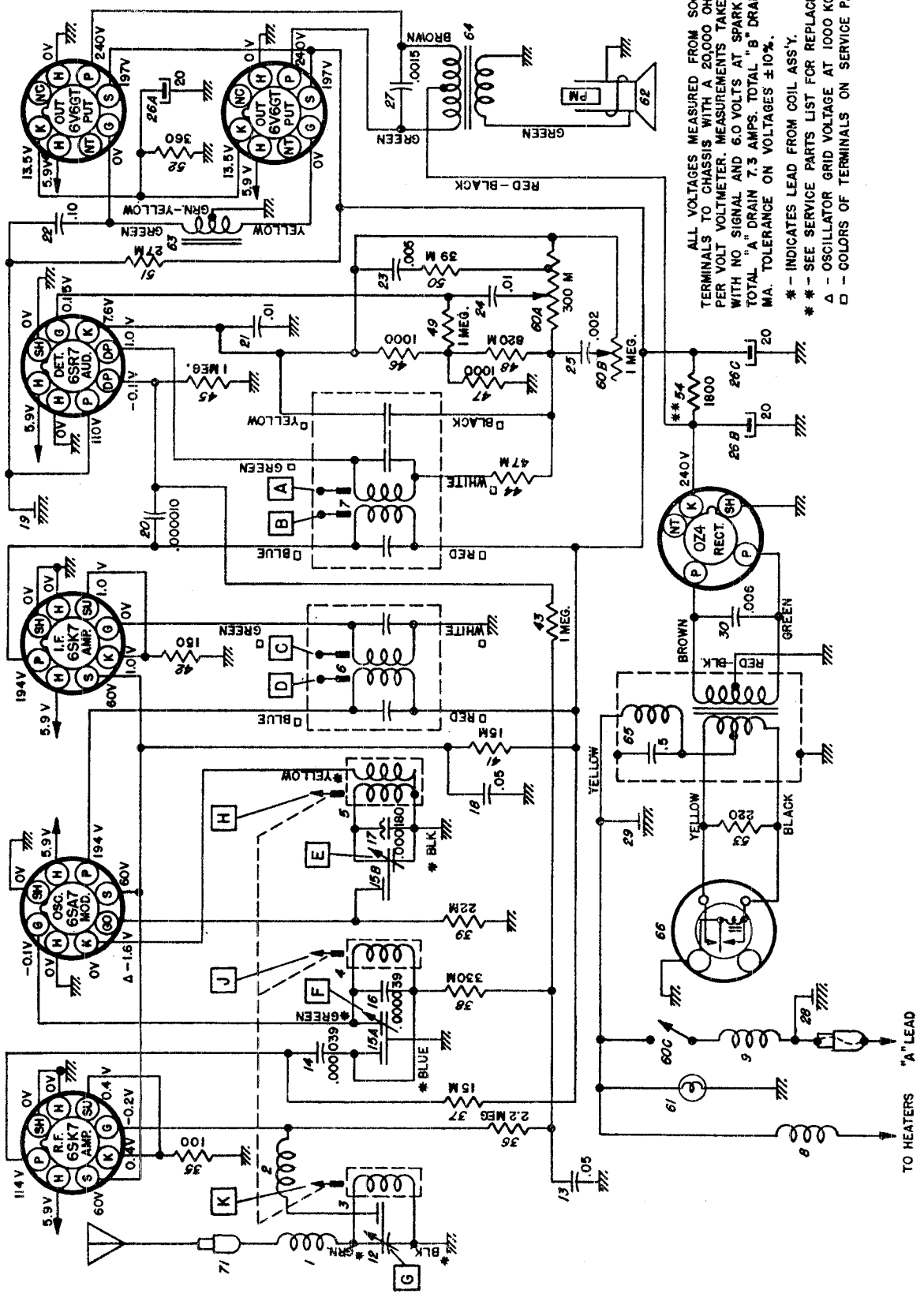
SPECIAL INSTRUCTIONS

Unless special precautions are taken in removing the dial escutcheon, there is a possibility that the dial pointer tip will be broken. Therefore, in removal of the escutcheon, the following procedure is recommended:

1. Loosen, but do not remove, the two screws holding the pointer back plate ("X" in Escutcheon Mounting drawing above) and loosen the shellac so that the back plate is free to move.
2. Remove the escutcheon mounting screws "Y" (see Escutcheon Mounting).
3. Carefully lift off the escutcheon (DO NOT FORCE). If the dial backplate is free to move slightly downward the escutcheon will come off easily.

The same caution should be exercised when replacing the escutcheon.

MODELS 982697,
982698, Oldsmobile



MODELS 982697, 982698, Oldsmobile

SERVICE PARTS LIST

Ill. No.	Production Part No.	Service Part No.	Description
		ELECTRICAL PARTS	
		Coils	
1	7255738	7255738	Antenna Series Choke
2	7240251	7240251	Antenna Spark Choke
3	7258914	7258914	Antenna
4	7258914	7258914	R.F.
5	7259687	7259687	Oscillator
6	7258849	1219508	1st I.F.
7	7258850	1219509	2nd I.F.
8	7237846	1217846	Hash Choke
*9	7259187	*7259187	Spark Choke
		Condensers	
*12	7260251	*7260251	Antenna Trimmer
13	7236842	6537	.05 mfd 200V Tubular
14	7258221	G 390	.000039 mfd Molded
15	7242454	7242454	Dual Trimmer
15A			R.F. Section
15B			Oscillator Section
16	7258221	G 390	.000039 mfd Molded
17	7257424	7257424	.000180 mfd Compensating
18	7230892	6537	.05 mfd 400V Tubular
19	1217848	1217848	Chassis Plate
20	1215189	G 100	.000010 mfd Molded
21	7237870	6533	.01 mfd 400V Tubular
22	1219495	6539	.1 mfd 400V Tubular
23	7232956	6531	.005 mfd 600V Tubular
24	7238881	6533	.01 mfd 400V Tubular
25	7237836	E 202	.002 mfd 600V Tubular
26	7240724	M 908	Electrolytic
26A			20 mfd 25V
26B			20 mfd 400V
26C			20 mfd 400V
27	7236134	7236134	.0015 mfd 800V Tubular
28	7241259	1219768	Spark Plate
29	1217848	1217848	Chassis Plate
30	7240906	H 602	.006 mfd 1600V Tubular
		Resistors	
35	1213217	A 101	100 Ohms ½W Insulated
36	1211147	A 225	2.2 Megohms ½W Insulated
37	7237595	B 153	15,000 Ohms 1W Insulated
38	7240732	A 334	330,000 Ohms ½W Insulated
39	1211192	A 223	22,000 Ohms ½W Insulated
41	7233653	C 153	15,000 Ohms 2W Insulated
42	1213220	A 151	150 Ohms ½W Insulated
43	7238873	A 105	1 Megohm ½W Insulated
44	7240731	A 473	47,000 Ohms ½W Insulated
45	7238873	A 105	1 Megohm ½W Insulated
46	1213235	A 102	1,000 Ohms ½W Insulated
47	1213235	A 102	1,000 Ohms ½W Insulated
48	1214561	1214561	820,000 Ohms ½W Insulated
49	7238873	A 105	1 Megohm ½W Insulated
50	1213480	A 393	39,000 Ohms ½W Insulated
51	7236080	B 273	27,000 Ohms 1W Insulated
52	7234563	7234563	360 Ohms 1W Insulated
53	1219738	B 221	220 Ohms 1W Insulated
54	1214573	C 272 B 562	1800 Ohms 2W Wire Wound (Or replace with 2700 Ohm 2W and 5600 Ohm 1W in parallel).
		Tubes	
	7237751	6SK7	R.F. and I.F. Amplifier
	7237752	6SA7	Oscillator Modulator
	1218107	6SR7	Detector - Audio
	1213793	6V6GT	Output
	1211924	0Z4	Rectifier

MODELS 982697,
982698, Oldsmobile

SERVICE PARTS LIST

Ill. No.	Production Part No.	Service Part No.		Description
		Miscellaneous Electrical		
*60	7260270	*7260270	(Model 982697)	Control - Volume, Tone, & Switch
*60	7260250	*7260250	(Model 982698)	Control - Volume, Tone, & Switch
60A				Volume Control
60B				Tone Control
60C				Switch
61	187189	44		Lamp - Dial Light
62	7258146	7258146		Speaker - 6 x 9 P. M.
63	7258941	7258941		Transformer - Input
64	7259419	7259419		Transformer - Output
65	7259375	7255881		Transformer - Power
66	7239124	8542		Vibrator - Non-Synchronous
		MECHANICAL PARTS		
		Chassis		
*70	7260133	*7260328		Connector - "A" Lead
71	7256742	7256742		Connector - Antenna
	7236279	7236279		Socket - Octal Tube
	7239125	7239125		Socket - Vibrator
		Tuner		
*81	7260134	*7260134	(Model 982697)	Backplate-Pointer
*81	7260247	*7260247	(Model 982698)	Backplate-Pointer
	147481	147481		Ball Bearings (12)
*82	7260352	*7260352	(Model 982697)	Bushing and Manual Drive Shaft
*82	7260354	*7260354	(Model 982698)	Bushing and Manual Drive Shaft
	7260351	*7260351	(Model 982697)	Manual Drive Shaft
	7260238	*7260238	(Model 982698)	Manual Drive Shaft
83	7258072	7258072		Clutch Disc-Driven
84	7258211	7258211		Core Guide Bar - Parallel
85	7256271	7256271		Pointer Connecting Link
86	7255992	7255992		Spring - Pointer Connecting Link
87	7258468	7258468		Core - Powdered Iron
*88	7260371	*7260371	(Model 982697)	Escutcheon Assy.
*88	7260367	*7260367	(Model 982698)	Escutcheon Assy.
89	7260245	*7260245		Dial
90	7259496	7259496		Dial Backplate
91	7256495	7256495		Gear and Bushing - Clutch
*92	7260212	*7260212		Gear and Bracket - Worm
*93	7260360	*7260360	(Model 982697)	Pointer Assy.
*93	7260361	*7260361	(Model 982698)	Pointer Assy.
	1219174	1219174		Pointer Tip Pkg.
94	1219173	1219173	(Model 982697)	Push Button and Slide Assy.
*94	1219856	*1219856	(Model 982698)	Push Button and Slide Assy.
95	1219758	1219758		Socket - Dial
96	7258756	7258756		Spring - Clutch
97	7257415	7257415		Spring - Core Bar Connecting Link
98	7255984	7255984		Spring - Slide Return
		INSTALLATION PARTS		
	7260632	*7260632		"A" Lead and Condenser Assy.
	1911095	6030		Condenser - Generator
	1912757	6030		Condenser - Ignition Coil
	7260190	6030		Condenser - Voltage Regulator
	120151	120151		Fuse - 15 Amps
	555348	555348		Hood Ground Clip
	7259818	*7259818		Knob - Control
	7260192	*7260192		Knob - Tone Control and Dummy
	7240138	7240138		Static Collector
	7258815	7258815		Trim Plate Model 982697
	7259789	*7259789		Trim Plate Model 982698

* Parts first used in 1951

MODELS 982699,
982700, Oldsmobile

GENERAL

MOUNTING—982700 - All 1951 88 Series Oldsmobile Cars.
982699 - All 1951 98 Series Oldsmobile Cars.

TUBES—Seven, Plus Rectifier.

SPEAKER—6" x 9" Elliptical Permanent Magnet.

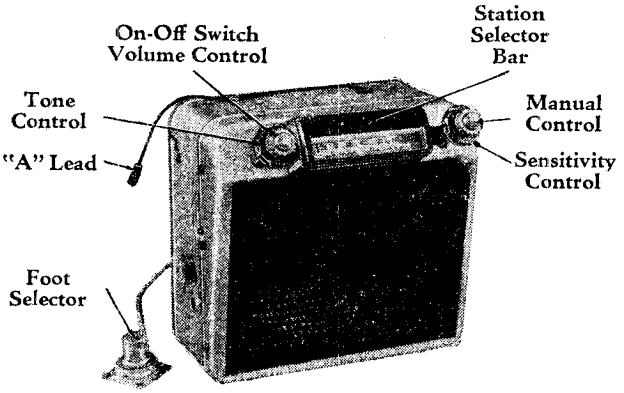
TUNING—Manual and Electronic.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000050 - 0.000070 Mfd.

TUNING RANGE—540 - 1600 KC.

PUSHBUTTON SET-UP

No Pushbutton Set-up is required. However, the number of stations on which the tuner will stop can be regulated by use of the Sensitivity Control.



MODELS 982699 982700

SIGNAL SEEKING TUNER ALIGNMENT PROCEDURE:

NOTE: When aligning the signal seeker tuner type radio, be sure to use a vacuum tube voltmeter as indicated and be sure to follow the alignment sequence given—(Notice that the primary of the 2nd I.F. is aligned first.)

Output Meter Connection ..... VTVM From [2] To Chassis (see Parts layout page 2)
Generator Return ..... Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control ..... Maximum Volume
Tone Control ..... Treble
Generator Output ..... Not to Exceed 2 Volts at VTVM

Step	Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust in Sequence For Max. Output
1	0.1 mfd	6SA7 Grid (Pin 8)	260 KC	*High Frequency Stop	A, B, C, D
2	0.000068 mfd	Antenna Connector	1615 KC	High Frequency Stop	**E, F, G
3	0.000068 mfd	Antenna Connector	600 KC	Signal Generator Signal	J, K
4	0.000068 mfd	Antenna Connector	1615 KC	Signal Generator Signal	F, G
5	0.000068 mfd	Antenna Connector	1000 KC	Signal Generator Signal	***L

*To tune to high frequency, put a 0.070" feeler gauge (or bare #13 wire) in slot against the high frequency stop. (See tuner pictures). Depress station selector bar and allow the planetary arm to run against the feeler gauge. Turn the radio off and then on.

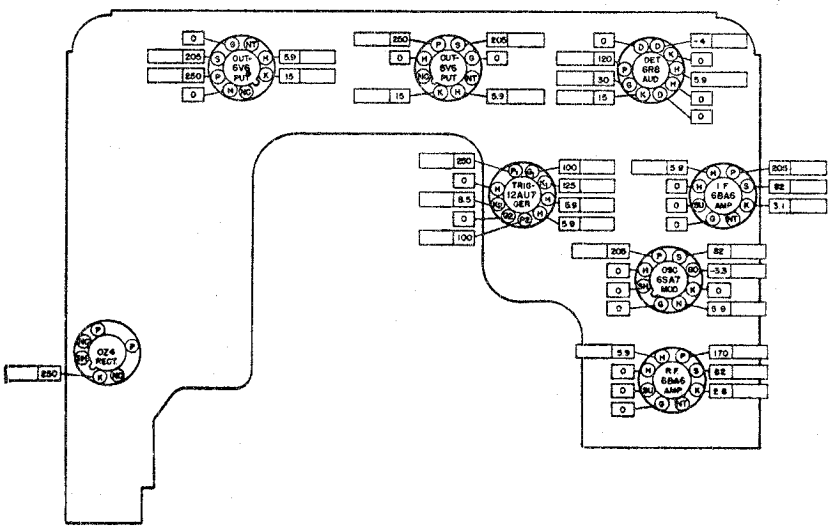
**Before making this adjustment, check the setting of oscillator core "H." The rear of the core should be $1\frac{3}{32}$" from the mounting end of the coil form. This measurement is readily made by inserting a suitable plug in the mounting end of the coil form. The core adjustment is made from the mounting end of the coil form with an insulated screw driver. (It will be necessary to steady the core guide bar by applying a downward pressure at the antenna core end of the bar while making these adjustments.) If this adjustment is necessary, first dissolve the glyptal seal on the core stud and be sure to re-seal after making the adjustment.

***"L" is the pointer adjustment screw on the end of the core guide bar—adjust so pointer reads 1000 KC.

With the radio installed and the antenna plugged in, adjust the antenna trimmer "C" for maximum volume with the radio tuned to a weak station between 600 and 1000 KC (see sticker on case).

MODELS 982699,
982700, Oldsmobile

TUBE SOCKET VOLTAGE CHART



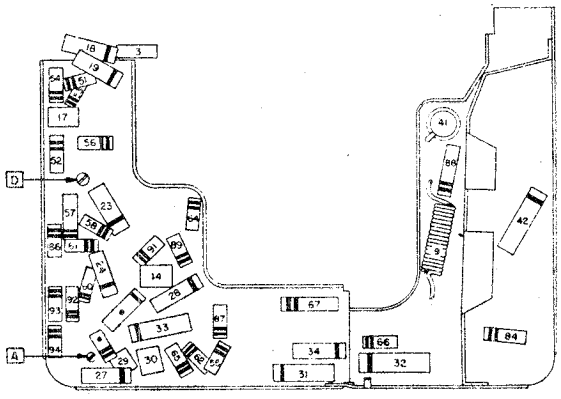
The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram, are shown above. The blank spaces are provided so that the serviceman may fill in actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.

Voltmeter resistance.....Ohms Per Volt.

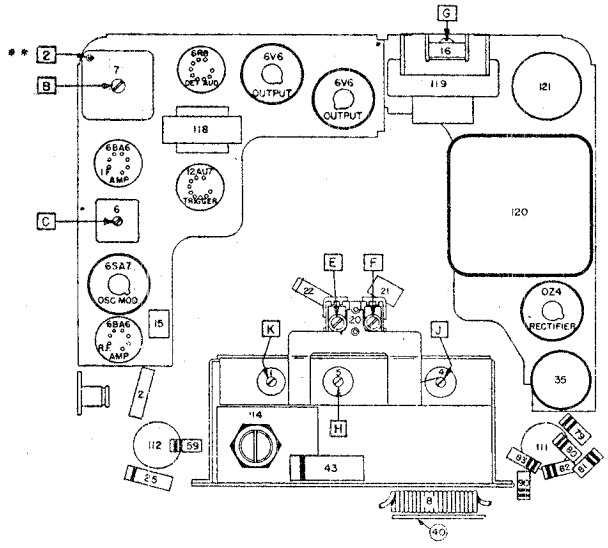
Readings taken with.....Volts at Spark Plate.

All voltages measured from socket terminals to chassis.

NOTE: For Complete Tuner Information See Bulletin 6D-620.



PARTS LAYOUT — CHASSIS VIEW

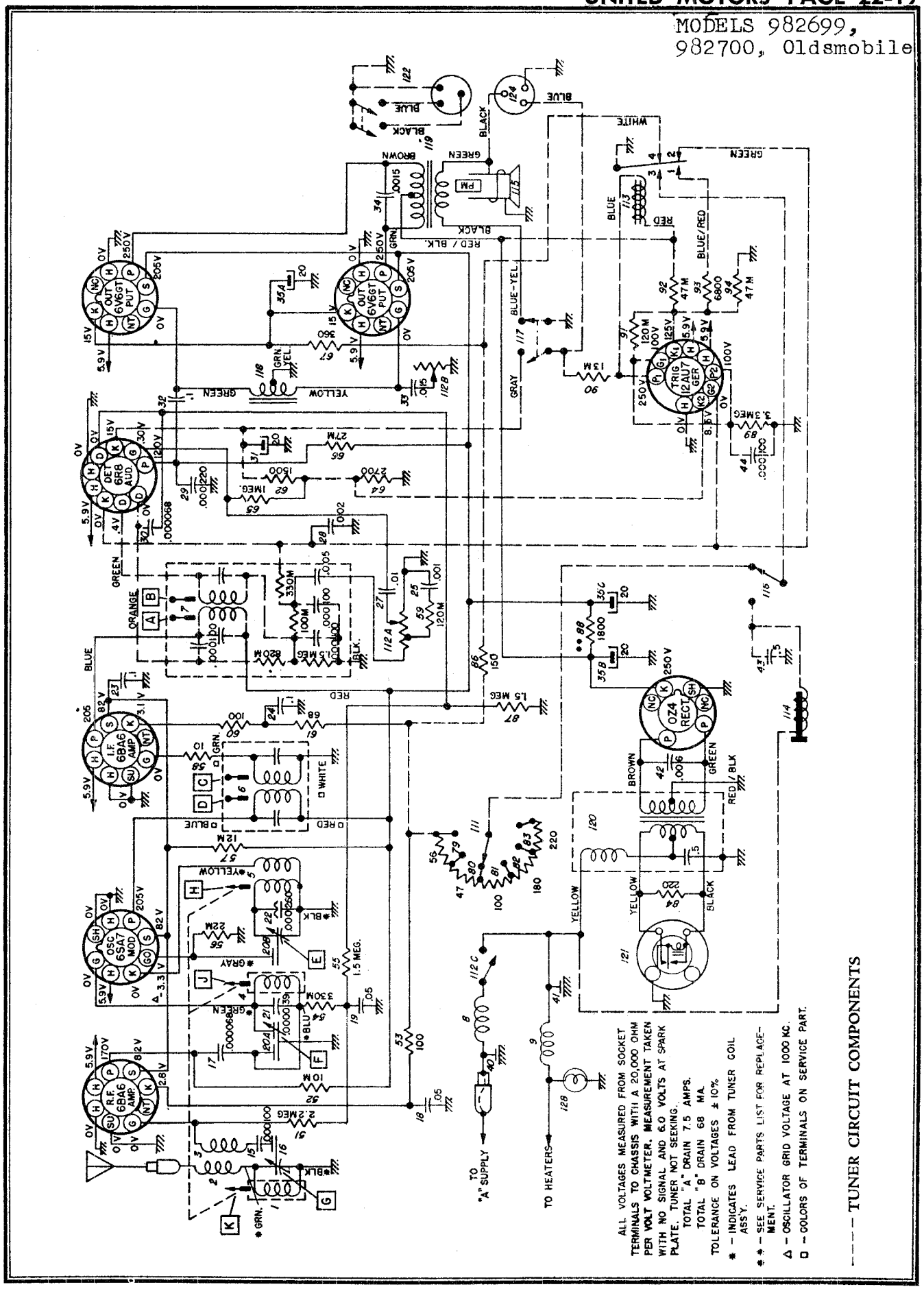


PARTS LAYOUT — TUNER VIEW

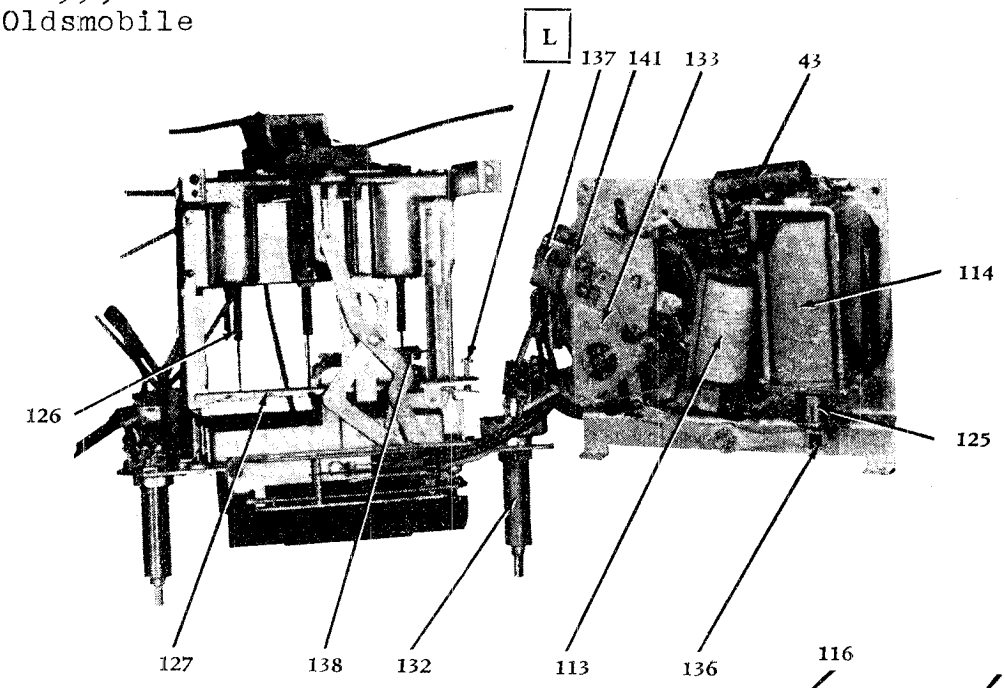
*Resistor and condenser are included in the 2nd IF Assy.

**Connect vacuum tube voltmeter between this point and ground during alignment.

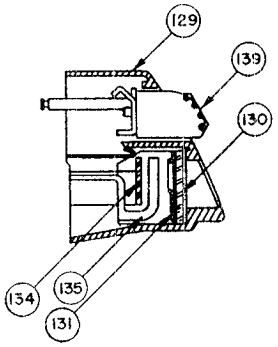
MODELS 982699,
982700, Oldsmobile



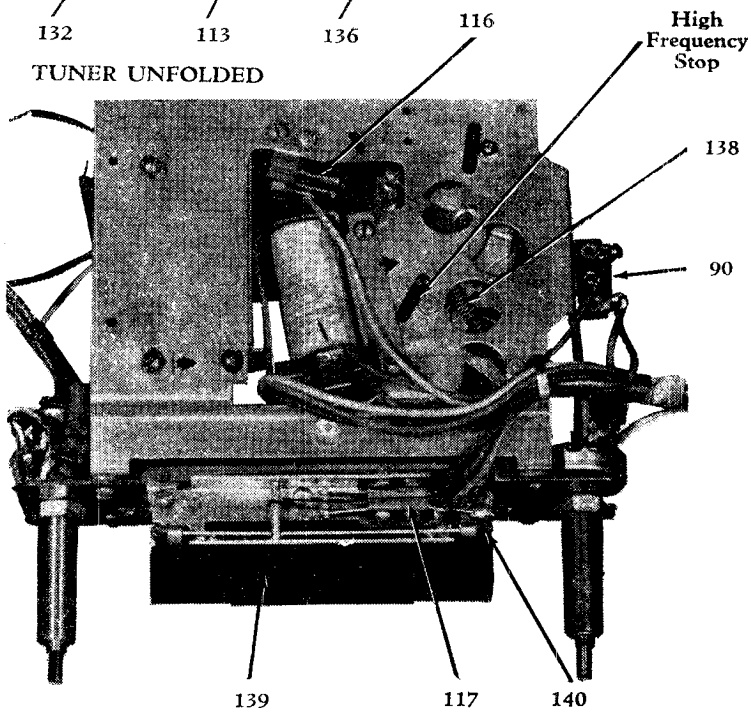
MODELS 982699,
982700, Oldsmobile



TUNER UNFOLDED



ESCUTCHEON
CROSS-SECTION



TUNER

NOTE: For a complete discussion of the Signal Seeking Tuner see Bulletin 6D-620.

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7257979	7257979	Antenna
2	7255738	7255738	Antenna Series Choke
3	7240251	7240251	Antenna Spark Choke
4	7257979	7257979	R.F.
5	7259184	7259184	Oscillator
6	1219508	1219508	1st I.F. Assy.
7	1219602	1219602	2nd I.F. Assy.
8	7259190	1217846	"A" Spark Choke
9	7259187	1217846	Hash Choke

MODELS 982699, 982700, Oldsmobile

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
		Condensers	
15	7239184	G 100	.000100 mfd molded
16	7258160	7258160	Antenna Trimmer
17	1219550	G 680	.000068 mfd molded
18	7236842	6537	.05 mfd 200 V Tubular
19	7236842	6537	.05 mfd 200 V Tubular
20	7242454	7242454	Dual Trimmer
20A			R.F. Section
20B			Oscillator Section
21	7258221	G 390	.000039 mfd molded
22	7257567	7257567	.000260 mfd compensating
23	7238788	6539	.1 mfd 400 V Tubular
24	1209306	6539	.1 mfd 200 V Tubular
25	1218883	6527	.001 mfd 600 V Tubular
27	7238881	6533	.01 mfd 600 V Tubular
28	7237836	E 202	.002 mfd 600 V Tubular
29	7238792	G 221	.000220 mfd molded
30	1219550	G 680	.000068 mfd molded
31	1219660	1219660	20 mfd 50 V Electrolytic
32	7239495	6539	.1 mfd 400 V Tubular
33	7237719	7237719	.015 mfd 600 V Tubular
34	7246134	7236134	.0015 mfd 800 V Tubular
35	7259128	7259128	Electrolytic
35A			20 mfd 100 V
35B			20 mfd 400 V
35C			20 mfd 400 V
40	7241259	7241259	Spark Plate Assy.
41	1217848	1217848	Chassis Plate
42	7240906	H 602	.006 mfd 1600 V Tubular
43*	7259954	7259954*	.5 mfd 100 V Tubular
44	7239184	G 101	.000100 mfd molded
		Resistors	
51	1211147	A 225	2.2 Megohms ½W Insulated
52	1211085	B 103	10,000 Ohms 1W Insulated
53	1213217	A 101	100 Ohms ½W Insulated
54	7240732	A 334	330,000 Ohms ½W Insulated
55	1211142	A 155	1.5 Megohms ½W Insulated
56	1211192	A 223	22,000 Ohms ½W Insulated
57	1212491	1212491	12,000 Ohms 2W Insulated
58	1219755	A 100	10 Ohms ½W Insulated
59	1213271	1213271	120,000 Ohms ½W Insulated
60	1213217	A 101	100 Ohms ½W Insulated
61	1215558	1215558	68 Ohms ½W Insulated
62	1219488	1219488	1500 Ohms ½W Insulated
64*	1219756	1219756*	2700 Ohms ½W Insulated (± 5%)
65	7238873	A 105	1 Megohm ½W Insulated
66	1213342	B 273	27,000 Ohms 1W Insulated
67	7234563	7234563	360 Ohms 1W Wire Wound
79	1219766	1214540	56 Ohms ½W Insulated
80	1219767	1213489	47 Ohms ½W Insulated
81	7257376	A 101	100 Ohms ½W Insulated
82	1219769	1215559	180 Ohms ½W Insulated
83	1219770	A 221	220 Ohms ½W Insulated
84	1219738	B 221	220 Ohms 1W Insulated
86	1213220	A 151	150 Ohms ½W Insulated
87	1211142	A 155	1.5 Megohms ½W Insulated
88	1214573	C 272 and B 562	1800 Ohms 2W Wire Wound. (Replace with C 272 and B 562 in parallel)
89	1214564	A 335	3.3 Megohms ½W Insulated
90	7231539	7231539	13,000 Ohms 1W Insulated
91	1213271	1213271	120,000 Ohms ½W Insulated
92	1216157	B 473	47,000 Ohms 1W Insulated
93	1216154	1216154	6800 Ohms 1W Insulated
94	1216157	B 473	47,000 Ohms 1W Insulated
		Tubes	
	1217690	5252	6BA6
	7237752	5222	6SA7
	1219485	5328	12AU7
	1219496	5541	6R8
	1213793	5241	6V6GT
	1211924	5003	0Z4

MODELS 982699, 982700, Oldsmobile

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.		Description
		Miscellaneous Electrical		
*	7260133	7260328*		"A" Lead and Fuse Holder Assy.
111*	7260300	7260300*	(Model 982699)	Control - Sensitivity
111*	7260285	7260285*	(Model 982700)	Control - Sensitivity
112*	7260301	7260301*	(Model 982699)	Control. Volume - Tone and Switch
112*	7260294	7260294*	(Model 982700)	Control - Volume, Tone and Switch
112A				Volume
112B				Tone
112C				Switch
113	7259009	7259009		Relay
114	7259010	1219661		Solenoid
125	7259164	7259164		Solenoid Plunger Assy.
115	7258146	7258146		Speaker
116	7259011	7259011		Switch - Tuner Return
117	7259012	7259012		Switch - Station Selector
122*	7260813	7260813*		Switch - Foot Station Selector
118	7258941	7258941		Transformer - Input
119	7259324	7259324		Transformer - Output
120	7259375	7255881		Transformer - Power
121	7239124	8542		Vibrator - Non-Synchronous
		MECHANICAL PARTS		
		Chassis		
	7256742	7256742		Antenna Connector
	1217820	1217820		Socket - Dial Light
124*	7260840	7260840*		Socket - Foot Switch
	7236279	7236279		Socket - Octal
	7259307	7259307		Socket - 9 Pin Miniature
	7258073	7258073		Socket - 7 Pin Miniature
	7239125	7239125		Socket - Vibrator
		Tuner		
126	7259201	7259201		Core - Tuning
127	7259178	7259178		Core Guide Bar
128	187189	44		Dial Light
129*	7260372	7260372*	(Model 982699)	Escutcheon
129*	7260297	7260297*	(Model 982700)	Escutcheon
130	7259344	7259344		Dial
131	7259496	7259496		Dial Backplate
132*	7260374	7260374*	(Model 982699)	Manual Drive Shaft Assy.
132*	7260282	7260282*	(Model 982700)	Manual Drive Shaft Assy.
133	1219610	1219610		Motor Gear Train Assy.
134*	7260134	7260134*	(Model 982699)	Pointer Backplate
134*	7260247	7260247*	(Model 982700)	Pointer Backplate
135	1219174	1219174		Pointer Tip Pkg.
136	7259100	6047		Spring Clip
137	7259207	7259207		Spring - Worm Anti-rattle
138	7259055	7259055		Spring - Motor Power
	1219611	1219611	(Model 982699)	Station Selector Bar Pkg.
*	1219849	1219849*	(Model 982700)	Station Selector Bar Pkg.
139	7259028	7259028	(Model 982699)	Station Selector Bar and Shaft Assy.
139*	7260289	7260289	(Model 982700)	Station Selector Bar and Shaft Assy.
	7259125	7259125		Switch Operating Ring
				Toggle Plate
140	7259111	7259111		Spring (2)
	7256121	7256121		"C" Washer
141	7259026	7259026		Worm Gear and Brkt. Assy.
		INSTALLATION PARTS		
	7260632	7260632*		"A" Lead and Condenser Assy.
	1911095	6030		Condenser - Generator
	1912757	6030		Condenser - Ignition
	7260190	6030		Condenser - Regulator
	555348	555348		Clip - Hood Grounding
	120151	120151		Fuse - 15 Amp
	7259818	7259818*		Knob - Control
	7260191	7260191*		Knob - Tone Control
	7260193	7260193*		Knob - Sensitivity
	7240138	7240138		Static Collector
	7258815	7258815	(Model 982699)	Trim Plate - 98 Series
	7259789	7259789*	(Model 982700)	Trim Plate - 88 Series

* Parts first used in 1951

MODEL 984592,
1951 Pontiac

GENERAL

MOUNTING—All 1951 Pontiac Cars.

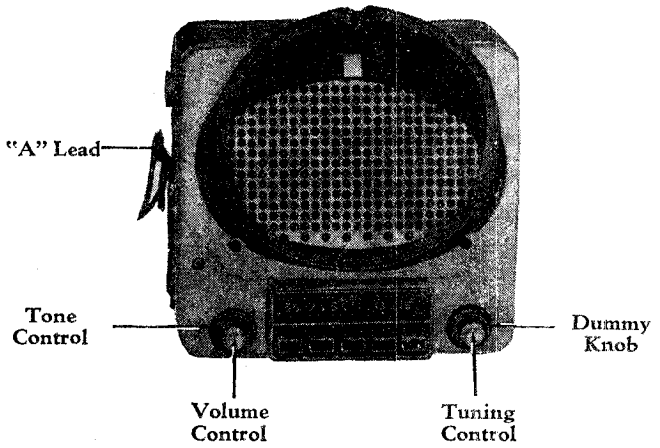
TUBES—Seven, Plus Rectifier.

SPEAKER—6" x 9" Elliptical, Permanent Magnet.

TUNING—Manual and 5 Push Button Mechanical.

ANTENNA TRIMMER COMPENSATION — For Antennas Between 0.000060 - 0.000090 Mfd.

TUNING RANGE — 550-1600 KC.



MODEL 984592

PUSHBUTTON SET-UP

Pull button to the right and out. Tune in desired station manually. Push button in as far as it will go.

ALIGNMENT PROCEDURE

Output Meter Connections ..... Across Voice Coil

Generator Ground ..... Receiver Chassis

Dummy Antenna ..... In Series With Generator

Volume Control Position ..... Maximum Volume

Tone Control Position ..... Treble

Generator Output ..... Minimum for Readable Indication

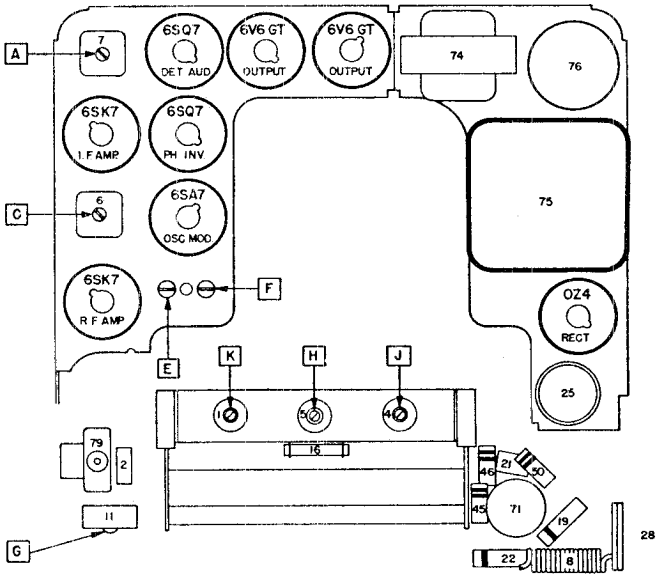
Steps	Series Condenser or Dummy Antenna	Connect to	Signal Generator Frequency	Tune Receiver To	Adjust in Sequence for Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8) or 7Q7 Grid (Pin #6)	260 KC	High Freq. Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Gen. Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1100 KC	Signal Gen. Signal	L**

*Before making this adjustment check the mechanical setting of the oscillator core "H." The slotted end of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form). If adjustment is necessary be sure to first dissolve the glyptal seal on the core studs. Core adjustments are made from the mounting end of the coil form with an insulated screwdriver, and core studs should be resealed with glyptal or household cement after alignment.

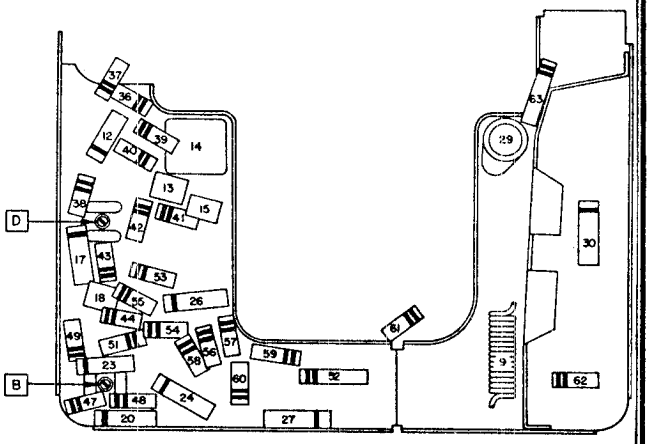
**"L" is the pointer adjustment screw on the pointer connecting link (see tuner drawing). Adjust so pointer reads 1100 KC.

With the radio installed and the car antenna plugged in adjust antenna trimmer "G" (see sticker on case) for maximum volume with the radio tuned to a weak station between 600 and 1000 KC.

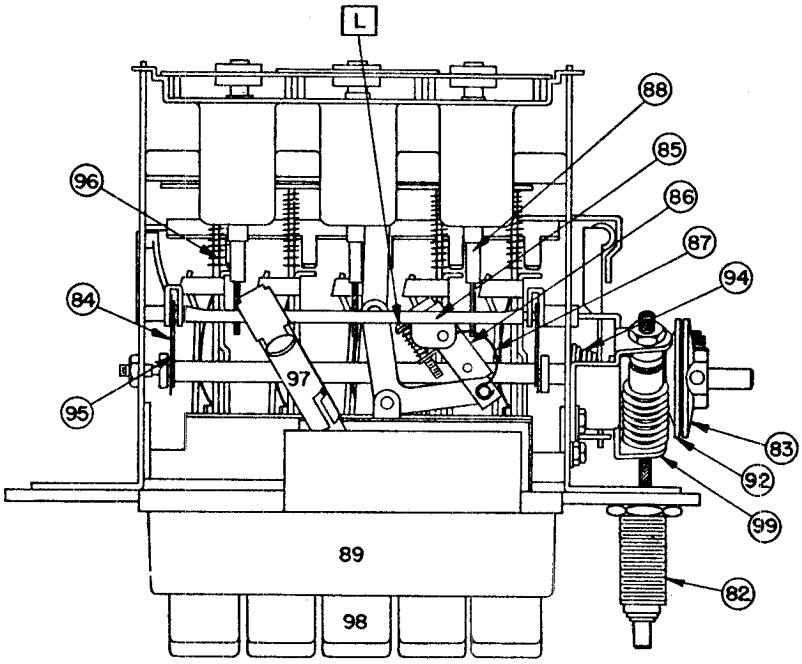
MODEL 984592,
Pontiac 1951

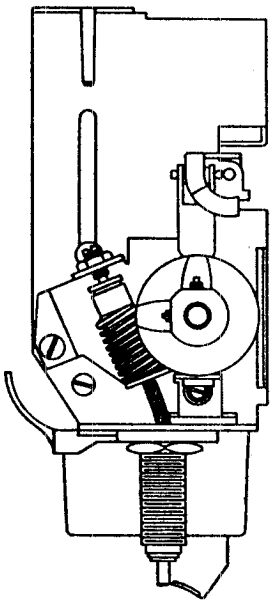


PARTS LAYOUT — TUBE VIEW



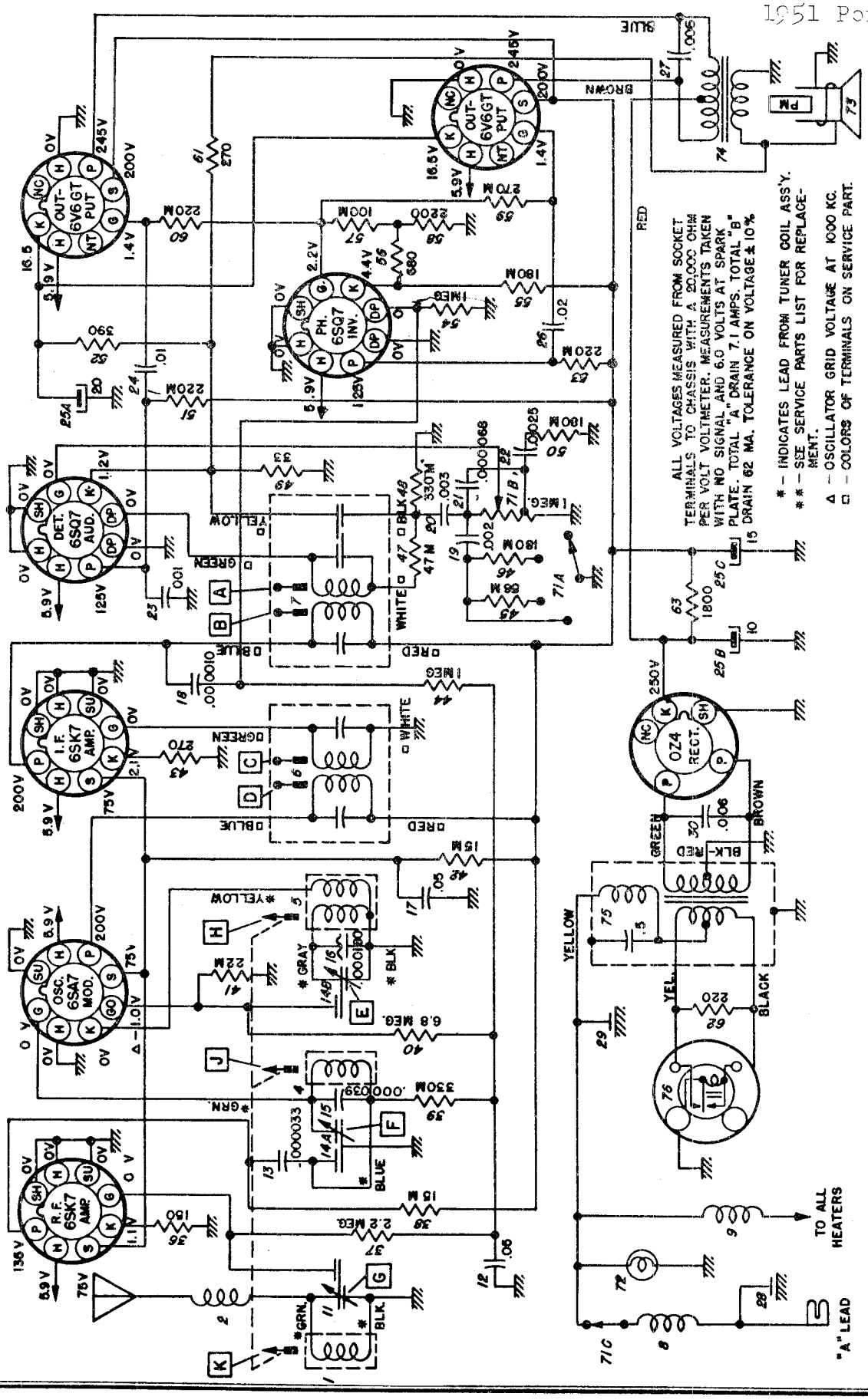
PARTS LAYOUT — CHASSIS VIEW



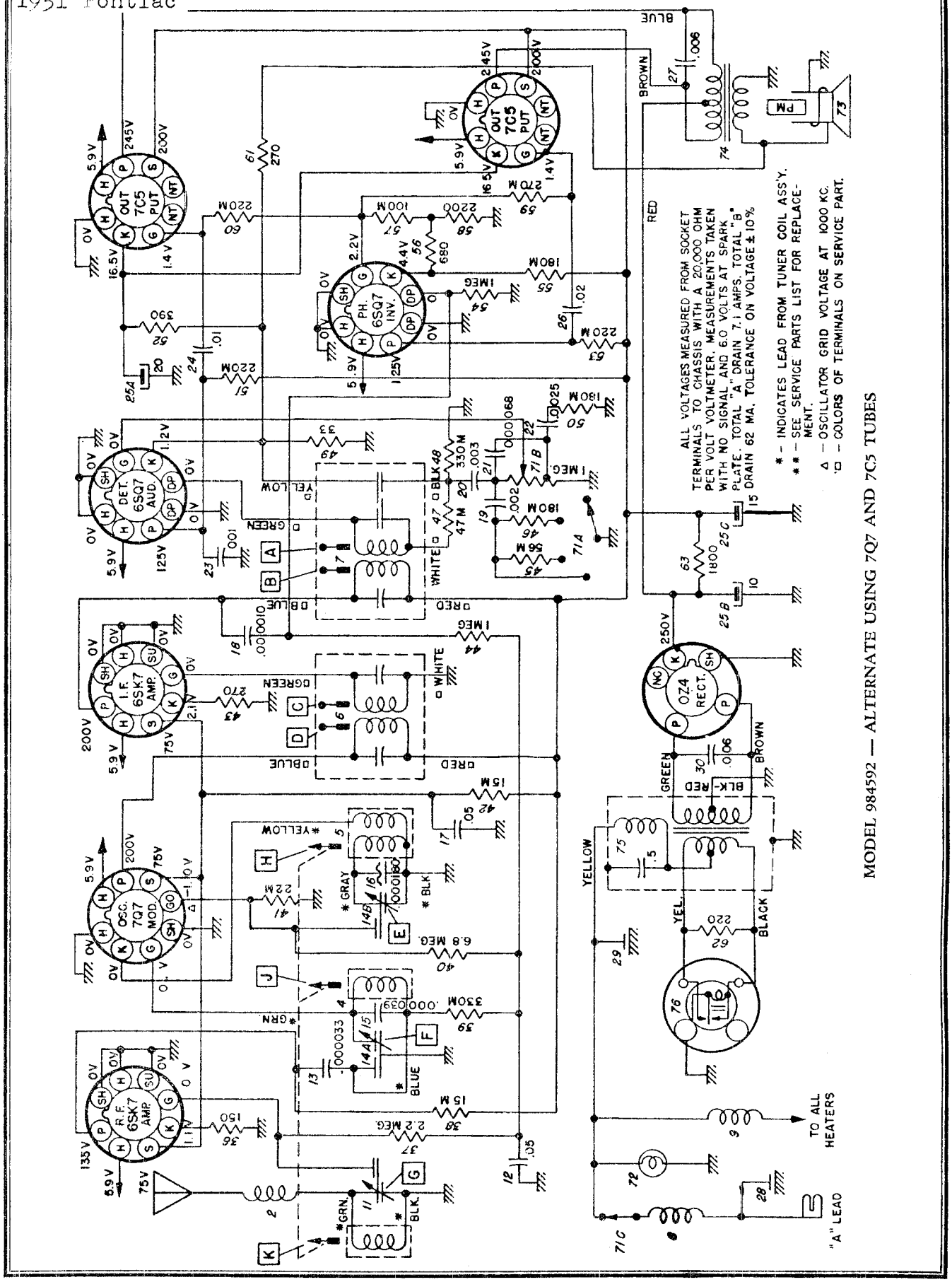


TUNER

MODEL 984592,
1951 Pontiac



MODEL 984592,
1951 Pontiac



MODEL 984592,
1951 Pontiac

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
		ELECTRICAL PARTS	
		Coils	
1	7258914	7258914	Antenna
2	7255738	7255738	Antenna Series Choke
3	7240251	7240251	Antenna Spark Choke
4	7258914	7258914	R.F.
5	7258911	7258911	Oscillator
6	7258849	1219508	1st I.F.
7	7258850	1219509	2nd I.F.
8	1217846	1217846	"A" Spark Choke
9	7241708	7241708	Hash Choke
		Condensers	
11	7257959	7257959	Antenna Trimmer
12	7236842	6537	.05 mfd 200 V Tubular
13	1218348	G 330	.000033 mfd ceramic
14	7242454	7242454	Dual Trimmer
14A			R. F. Section
14B			Oscillator Sec.
15	7258221	G 390	.000039 mfd Ceramic
16	7257424	7257424	.000180 mfd compensating
17	7258125	6537	.05 mfd 400 V Tubular
18	1215189	G 100	.000010 mfd Mica
19	7237954	E 202	.002 mfd 600 V Tubular
20	7257699	E 302	.003 mfd 600 V Tubular
21	1219691	G 680	.000068 mfd Mica
22	7240578	7240578	.0025 mfd 400 V Tubular
23	7239188	6527	.001 mfd 600 V Tubular
24	1208600	6533	.01 mfd 600 V Tubular
25	7238830	M 908	Electrolytic
25A			20 mfd 25 V
25B			10 mfd 400 V
25C			15 mfd 400 V
26	7258124	6534	.02 mfd 400 V Tubular
27	1219692	H 602	.006 mfd 1000 V Tubular
28	1219768	1219768	Spark Plate
29	1217848	1217848	Chassis Plate
30	7240906	H 602	.006 mfd 1600 V Tubular
		Resistors	
36	1213220	A 151	150 ohms ½W Insulated
37	1211147	A 225	2.2 Megohm ½W Insulated
38	7237595	B 153	15,000 ohms 1W Insulated
39	7240732	A 334	330,000 ohms ½W Insulated
40	7241937	A 685	6.8 megohms ½W Insulated
41	1211192	A 223	22,000 ohms ½W Insulated
42	7233653	C 153	15,000 ohms 2W Insulated
43	1214542	A 271	270 ohms ½W Insulated
44	7238873	A 105	1 megohm ½W Insulated
45	1213267	A 563	56,000 ohms ½W Insulated
46	1215560	1215560	180,000 ohms ½W Insulated
47	7240731	A 473	47,000 ohms ½W Insulated
48	1214557	A 334	330,000 ohms ½W Insulated
49	1214538	A 330	33 ohms ½W Insulated
50	1215560	1215560	180,000 ohms ½W Insulated
51	1214555	A 224	220,000 ohms ½W Insulated
52	1216149	B 391	390 ohms 1W Insulated
53	1214555	A 224	220,000 ohms ½W Insulated
54	7238873	A 105	1 Megohm ½W Insulated
55	1215560	1215560	180,000 ohms ½W Insulated
56	1214543	A 681	680 ohms ½W Insulated
57	1213270	A 104	100,000 ohms ½W Insulated
58	1214545	A 222	2200 ohms ½W Insulated
59	1214556	A 274	270,000 ohms ½W Insulated
60	1214555	A 224	220,000 ohms ½W Insulated
61	1214542	A 271	270 ohms ½W Insulated
62	1219738	B 221	220 ohms 1W Insulated
63	1214573	C 272 / B 562	1800 ohms 2W Wire Wound (Use 2700 ohm 2W Insulated and 5600 ohm 1W Insulated)

MODEL 984592,
1951 Pontiac

SERVICE PARTS LIST

Illus No.	Production Part No.	Service Part No.	Description
		Tubes	
	7237751	5229	6SK7
	7237753	5231	6SQ7
	7237752	5222	6SA7
	1213981	5301	7Q7 (Alternate)
	1213793	5241	6V6GT
	1213568	5295	7C5 (Alternate)
	1211924	5003	0Z4
		Miscellaneous Electrical	
*71	7260043	*7260043	Control - Volume, Tone and Switch
71A			Tone Control
71B			Volume Control
71C			Switch
72	187189	44	Lamp - Dial Light
*73	7260410	*7260410	Speaker 6x9 Elliptical PM
74	7259249	7240453	Transformer - Output
75	7259375	725588I	Transformer - Power
76	7239124	8542	Vibrator - Non-Synchronous
		MECHANICAL PARTS	
		Chassis	
79	7257746	7257746	Socket - Antenna
	7241356	7241356	Socket - Loctal Tube
	7236279	7236279	Socket - Octal Tube
	7239125	7239125	Socket - Vibrator
		Tuner	
81	7257722	7257722	Back Plate - Pointer
*82	7260039	*7260039	Bushing & Manual Drive Shaft
83	7258072	7258072	Clutch Disc - Driven
84	7258203	7258203	Connecting Link - Core Bar
85	7258210	7258210	Core Guide Bar - Parallel
86	7256271	7256271	Pointer Connecting Link
87	7255992	7255992	Spring - Pointer Conn. Link
88	7258468	7258468	Core - Tuning
89	7257717	7257717	Escutcheon Assy.
90	7257721	7257721	Dial
91	7257719	7257719	Dial Backplate
	7257718	7257718	Spring - Dial Retainer
92	7256495	7256495	Gear and Bushing - Clutch
*93	7260209	*7260209	Pointer Assy.
	1219120	1219120	Pointer Tip Pkg.
94	7258756	7258756	Spring - Clutch
95	7257415	7257415	Spring - Core Bar Conn. Link
96	7255984	7255984	Spring - Slide Return
*97	1219740	*1219740	Socket - Dial Light
*98	1219739	*1219739	Push Button & Slide Assy.
*99	7260037	*7260037	Worm Gear & Bracket Assy.
		INSTALLATION PARTS	
	1911095	6030	Condenser - Generator
	1913140	6030	Condenser - Voltage Regulator
	147685	147685	Fuse 14 Amps.
	514608	*514608	Knob - Control
	514782	*514782	Knob - Dummy
	514784	*514784	Knob - Tone Control
	511836	*511836	Trim Plate
	513486	513486	Washer - Anti Rattle

*Parts first used in 1951

MODEL 984688,
1951 Pontiac

GENERAL

MOUNTING—All 1951 Pontiac Cars.

TUBES—Seven, Plus Rectifier.

SPEAKER—6″ x 9″ Elliptical, Permanent Magnet.

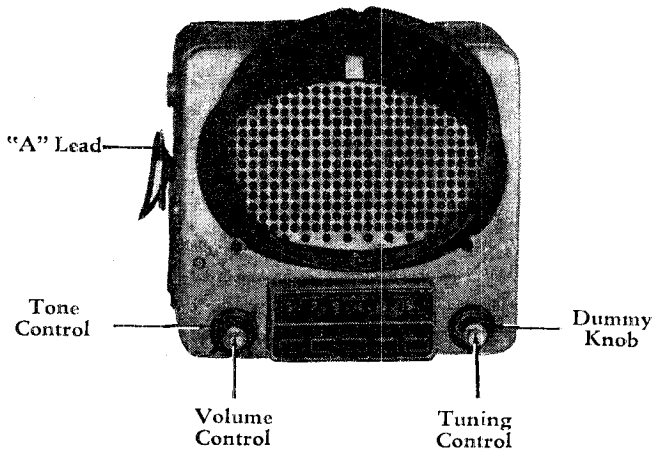
TUNING—Manual and 5 Push Button Mechanical.

ANTENNA TRIMMER COMPENSATION — For Antennas Between 0.000060 - 0.000090 Mfd.

TUNING RANGE — 550-1600 KC.

PUSHBUTTON SET-UP

Pull button to the right and out. Tune in desired station manually. Push button in as far as it will go.



MODEL 984688

SERVICE INFORMATION: This model is identical to the 1951 Pontiac Model 984592 radio covered in Bulletin 6D-1035 except for the parts shown below. However, it may use several miniature tubes on an alternate basis and when these are used additional components are altered as shown. For service information reference should be made to Bulletin 6D-1935 except that the schematic diagram using the miniature tubes is included on page 2 of this bulletin.

Parts changed on all 984688 radios

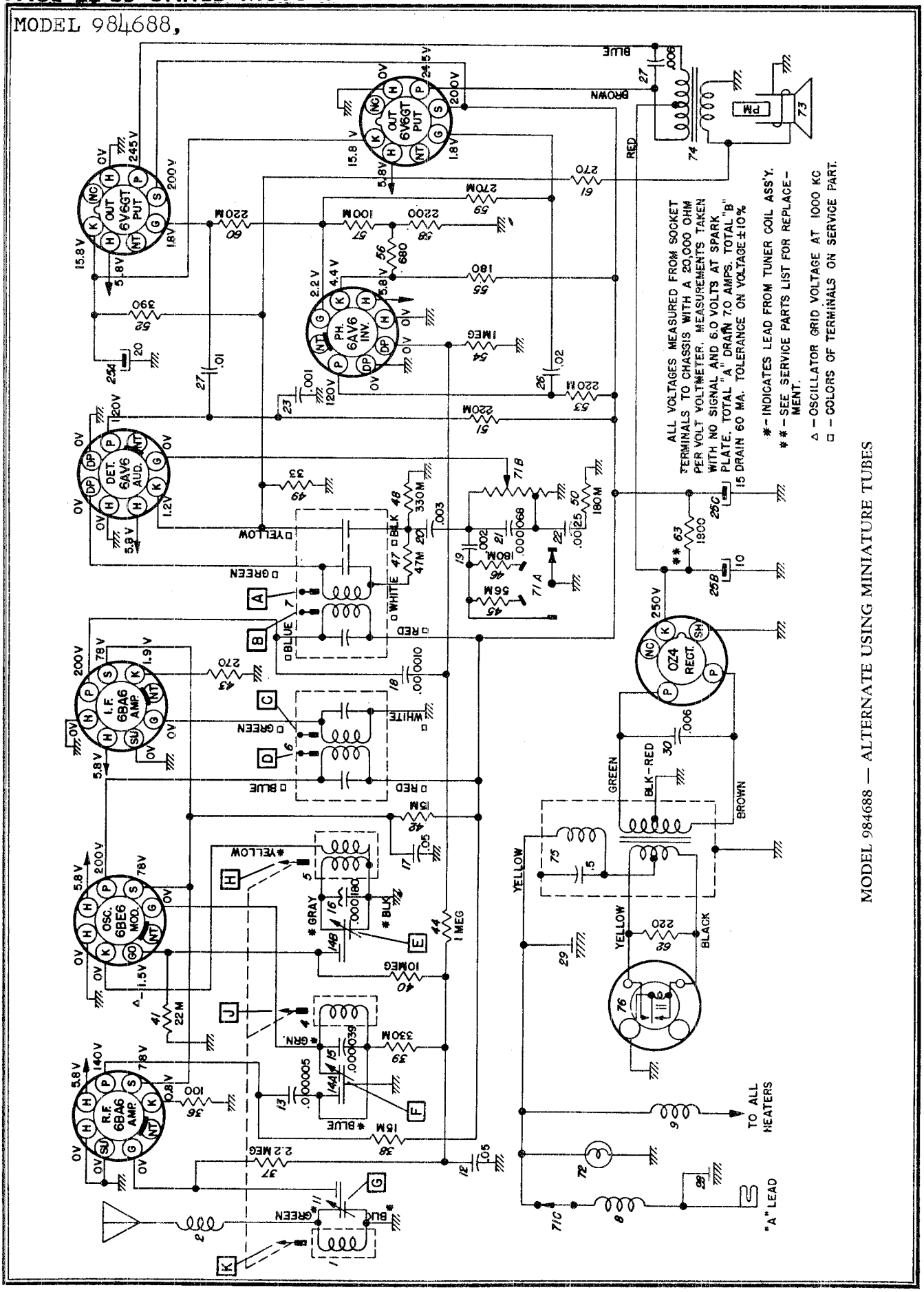
Illus. No.	Production Part No.	Service Part No.	Description
98	1218885	1218885	Push Button and Slide Assy.
	515718	515718	Knob - Control
	511831	511831	Knob - Dummy
	511833	511833	Knob - Tone

Additional parts changed only when miniature tubes are used

*13	1219862	*1219862	*.000005 Mfd. Molded Capacitor
36	1213217	A 101	100 Ohms ½ W. Insulated Res.
40	1215548	A 106	10 Megohms ½W Insulated Res.
	1217690	6BA6	R.F. and I.F. Tube
	1217691	6BE6	Oscillator-Modulator Tube
	1218506	6AV6	Detector-Auto & P.H. Inv. Tube
	7261021	*7261021	*Socket - Miniature Tube.

* Parts first used in 1951

MODEL 984688,



MODEL 986515,
Chevrolet

CHEVROLET DELUXE PUSH BUTTON RADIO
MODEL 986515

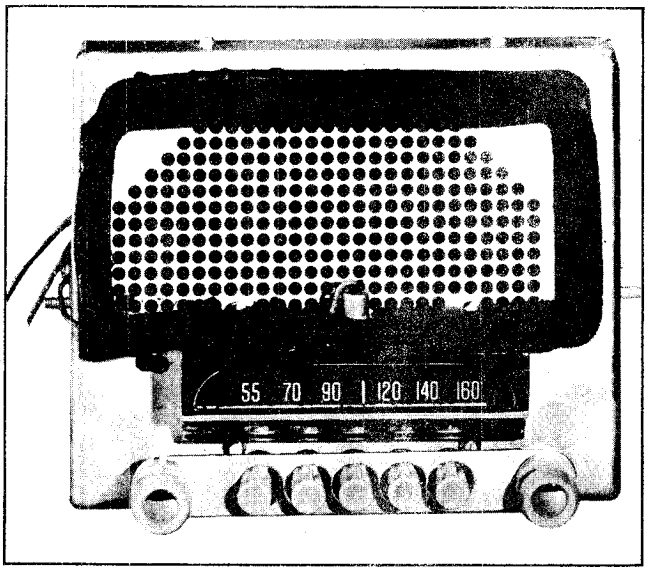


Figure 1

This radio is a five tube (plus rectifier) superheterodyne automobile receiver designed expressly for 1951 Chevrolet passenger car installation. The receiver is of the single unit design for ease of installation and service. In this type of design the speaker is integral with the receiver and instrument panel by means of a special rubber gasket which, due to location and baffling, permits exceptionally good tone quality.

ELECTRICAL DESCRIPTION

The circuit used in this receiver is the superheterodyne type and uses no regeneration. The tuning circuits are of the permeability type and are tuned by varying the iron cores in and out of the antenna, radio frequency and oscillator coils like pistons. (See Figure 2.)

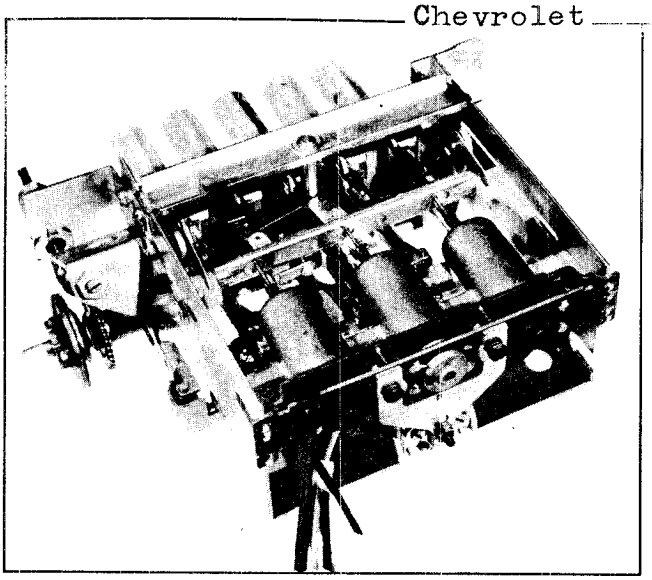


Figure 2

The Intermediate frequency stages are tuned by means of two iron cores being adjusted from the top and bottom sides of the I.F. transformer, both the first (input) and second (output) Intermediate frequency transformers are tuned by this method. (See Figure 3.)

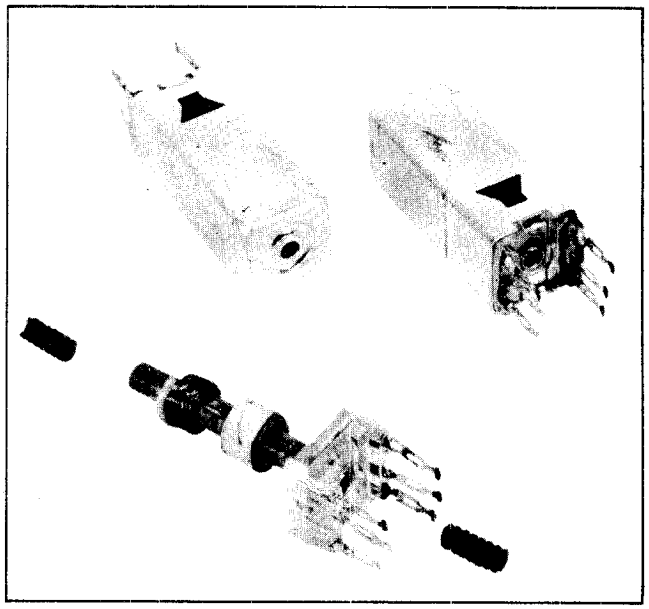


Figure 3

The antenna circuit is capacity coupled to the antenna by means of an antenna trimmer condenser to take care of normal variations in antenna and antenna coil capacity. The antenna condenser is adjustable by means of a small screwdriver, and is located on the bottom of the radio case. The audio stage is transformer coupled to the output tube to take advantage of all the gain and tone quality that the receiver

MODEL 986515,
Chevrolet

is capable of developing. The automatic volume control is of the delayed signal type and is very capable of maintaining a constant level of volume at all times. Very high frequency filter chokes are used in the radio frequency and oscillator grid circuits to discriminate against ignition interference in the receiver, thus eliminating the use of spark plug suppressors. The vibrator is the full wave non-synchronous type using an OZ4 rectifier tube and will operate on either a negative or positive ground.

TUBE COMPLEMENT AND FUNCTION

6BA6	Radio frequency amplifier.
6BE6	Oscillator - modulator.
6BA6	Intermediate frequency amplifier.
6AV6	Detector - automatic volume control - and first audio
6V6GT	Audio output.
OZ4	Cold cathode rectifier.

GENERAL INFORMATION

Tuning range 540 - 1615 Kilocycles.
Intermediate frequency 262 Kilocycles.
Maximum power output 5 watts.
Undistorted power output 3 watts.
Current drain with permanent magnet speaker 6.5 amperes at 6 volts.
Speaker size 6" x 9" elliptical permanent magnet type.
Voice coil impedance 4 ohms at 400 cycles.
Fuse protection 14 amperes 25 volt.

PUSH BUTTON TUNING

An outstanding feature of the 986515 radio is the new simplified method of setting up the push buttons, which can be done easily by anyone, without any tools With this type of push button tuning which is completely mechanical, no cords or pulleys are used thus assuring trouble-free operation and constant calibration of the radio stations set on the push buttons at all times.

PROCEDURE FOR SETTING PUSH BUTTONS

Turn on the receiver for ten minutes or longer to allow circuits to stabilize.

1. Pull button slightly to the left and out as far as it will go.

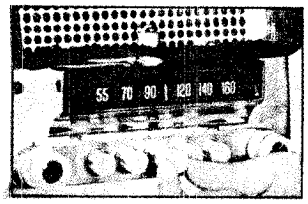


Figure 4

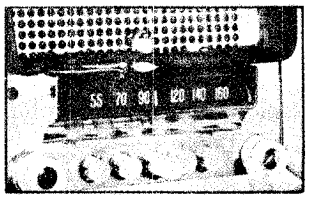


Figure 5

2. Tune in station desired with manual tuning knob to clearest point.

3. Push button in firmly to end of travel. Repeat same procedure for remaining four buttons

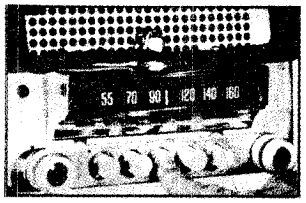


Figure 6

PROCEDURE FOR INSTALLATION OF 986515 RADIO AND ANTENNA

All 1951 Chevrolet passenger cars will use the fender type antenna which will mount on the left front fender.

INSTALLATION PROCEDURE 986257 ANTENNA

After the antenna has been unpacked, proceed as follows:

1. Assemble lead-in cable to antenna mast and tighten securely, place spacer "F" over antenna rod assembly. (See Figure 7.)

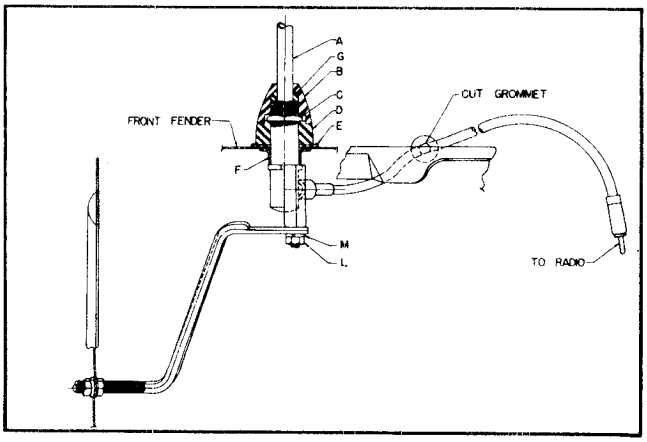


Figure 7

MODEL 986515,
Chevrolet

2. Place template on top of left front fender, at front door edge and line up template as indicated. Center punch and drill 13/16 inch hole.

3. Locate two dimples in top of left front fender baffle and drill two 5/16 inch holes for mounting brackets.

4. Place antenna thru 13/16 inch hole from bottom side of fender.

5. Place rubber pad "E," insulator "D" and nut "C" on antenna rod and tighten securely, making sure antenna is in a vertical position. (See Figure 7.)

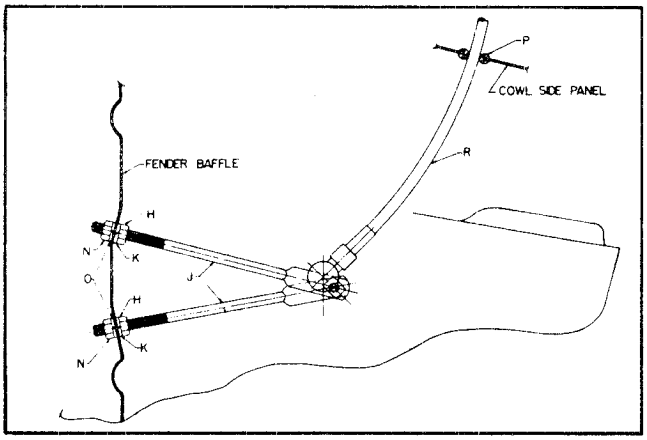


Figure 8

6. Be sure seal "G" is in place, then screw insulator "B" in place. (See Figure 7.)

7. Place nuts "H" and lockwashers "K" on braces "J" and place in 5/16 inch holes in fender baffle. (See Figure 8.)

8. Place braces "J" to stud on antenna mast base with washer "M" and nut "L," place washers "O," nuts "N" and tighten securely. (See Figure 8.)

INSTALLATION OF RECEIVER AND NOISE SUPPRESSION EQUIPMENT

After unpacking and checking radio, place on bench and hook-up radio to 6 volt power unit (or fully charged battery) and allow radio to play while installing suppression equipment. Fill out the warranty label on the cover to show owner's name and date of installation. RADIOS THAT WILL PLAY FOR 15 MINUTES BEFORE INSTALLATION WILL GIVE MANY MONTHS OF UNINTERRUPTED SERVICE. CHECK ALL RADIOS BEFORE INSTALLATION.

INSTALLATION NOISE SUPPRESSION EQUIPMENT

1. Mount voltage regulator condenser on voltage regulator. (See Figure 9.)

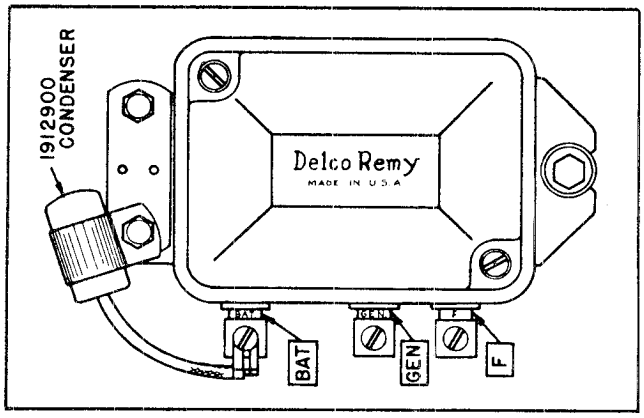


Figure 9

2. Mount generator condenser on generator. (See Figure 10.)

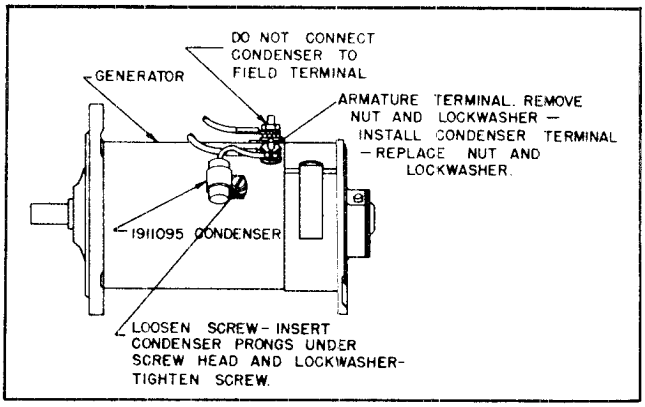


Figure 10

3. Install rubber nipple and distributor suppressor on high tension coil wire. (See Figure 11.)

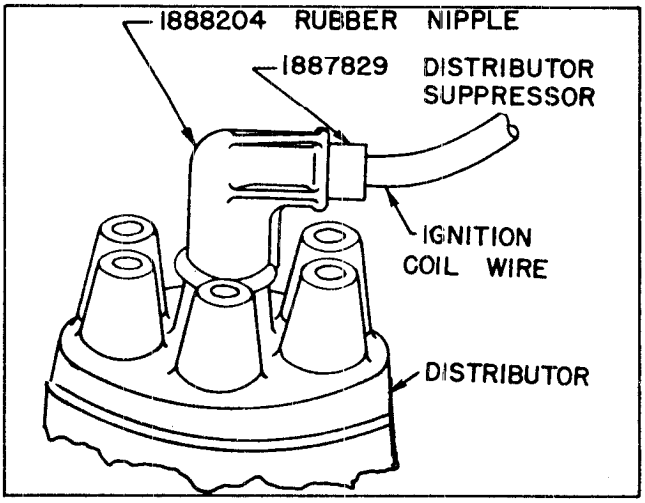


Figure 11

MODEL 986515,
Chevrolet

4. Remove front wheel hub and dust caps and install front wheel static collectors. Remove any grease from hole center of spindle to make a good connection, bend cotter pin to clear static collector. (See Figure 12.)

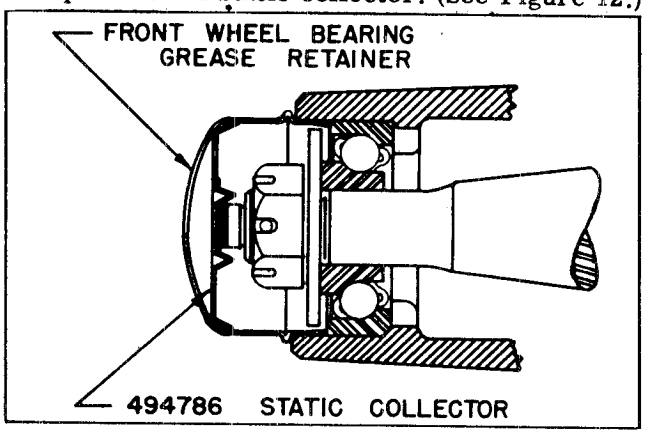


Figure 12

5. Mount ignition coil condenser on ignition coil. (See Figure 13.)

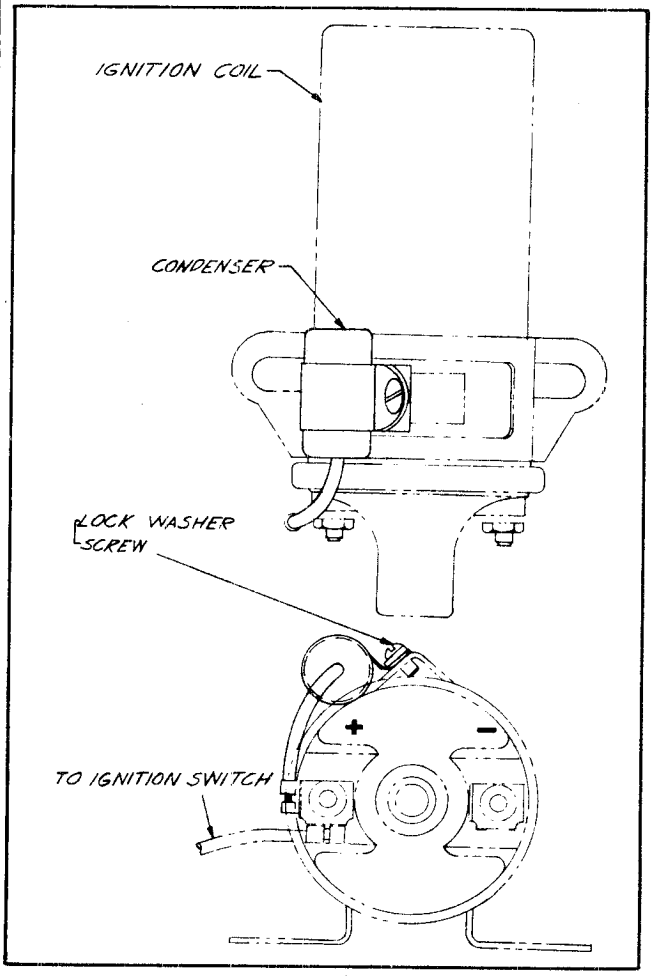


Figure 13

6. Drill 11/32 inch hole on right hand side of dash and pierce dash mat for radio mounting bracket. (See Figure 14.)

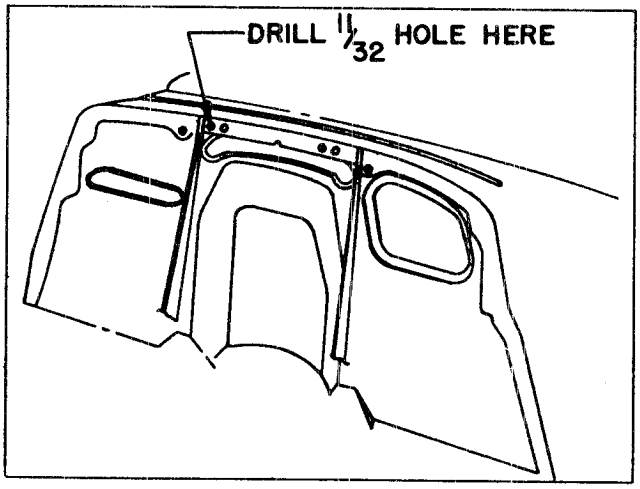


Figure 14

7. From inside of car cut dash mat around 11/32 inch hole, large enough to insert tubing spacer. (See Figure 16.)

8. Remove nut and lockwasher from two studs located on inside of instrument panel on lower portion of radio grille. DO NOT REMOVE SPECIAL SPACERS. Save nuts and washer for reassembling. (See Figure 16.)

9. Remove cardboard radio grille cover from inside of radio grille and discard. (THIS IS IMPORTANT.)

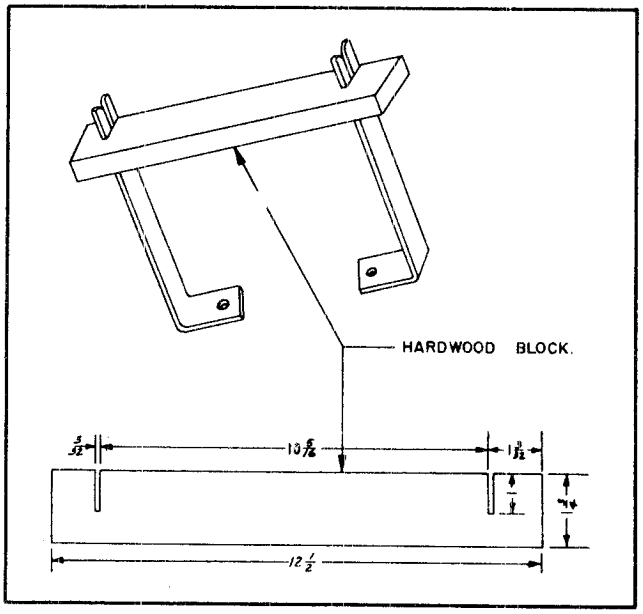


Figure 15

MODEL 986515, Chevrolet

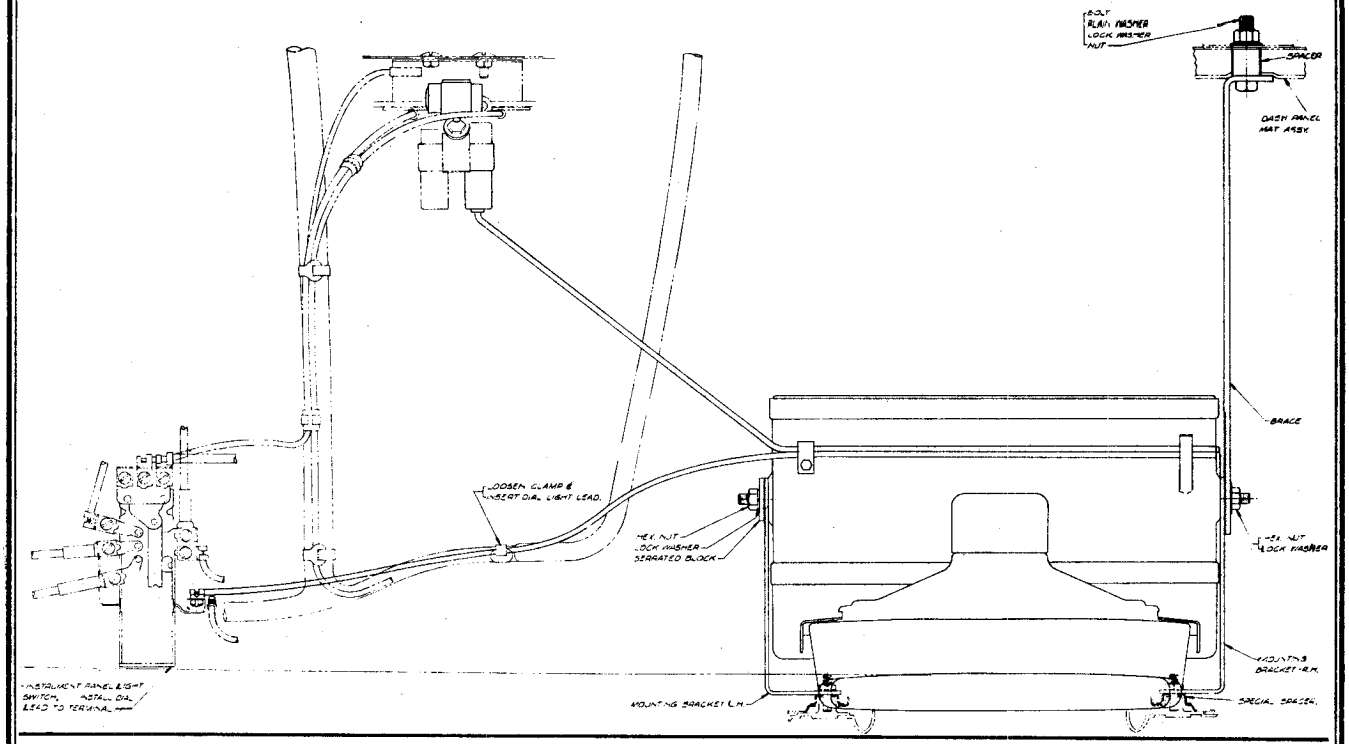


Figure 16

10. Assemble left and right hand brackets to studs (BEING SURE SPACERS ARE IN PLACE) with nuts and washers removed from studs as outlined in paragraph 8. (See Figure 16.) It is important that these brackets be mounted in a vertical position to allow radio receiver to enter into slots of brackets and as these brackets MUST be tightened before the receiver is installed, we suggest that you take a piece of hardwood and make a jig for holding the brackets while tightening. In Figure 15 complete dimensions and procedure for making a jig is outlined.

11. From inside of instrument panel below brackets just mounted, remove two stamped nuts which hold radio control cover plate assembly, remove plate and discard all these parts.

12. Install radio receiving set by inserting radio between mounting brackets being sure that studs on sides of radio are aligned with slots in mounting brackets.

13. Slide the set into place so that the tuning shafts and push buttons are protruding through the instrument panel in the opening provided. If radio escutcheon is too close or against radio grille opening, use thin flat washers provided to shim radio for proper clearance. (See Figures 17 & 20.)

14. Install trim place and hex nuts on tuning and volume shaft bushings. DO NOT TIGHTEN. (See Figure 17.)

15. Place slotted end of long brace on right hand stud of radio, placing tubing spacer between dash and brace, then insert 5/16 - 18 x 1-1/2 inch bolt through brace, tubing spacer and dash. Place plain washer, lockwasher and hex nut on engine side of dash and tighten securely. (See Figure 16.)

16. Install internal tooth lockwasher and nut on right hand stud, then install serrated block, lockwasher and nut on left hand stud, adjust the radio so that it appears in a level position with regard to dial space around radio grille and tighten the hex nuts on tuning shafts and on the sides of the receiver.

17. Put the dummy knob on left-hand tuning shaft and tone control knob on right-hand shaft, install felt washer and knobs on both shafts. (See Figure 18.)

18. Install dial light lead terminal to the instrument light terminal of light switch. (See Figure 16.)

MODEL 986515,
Chevrolet

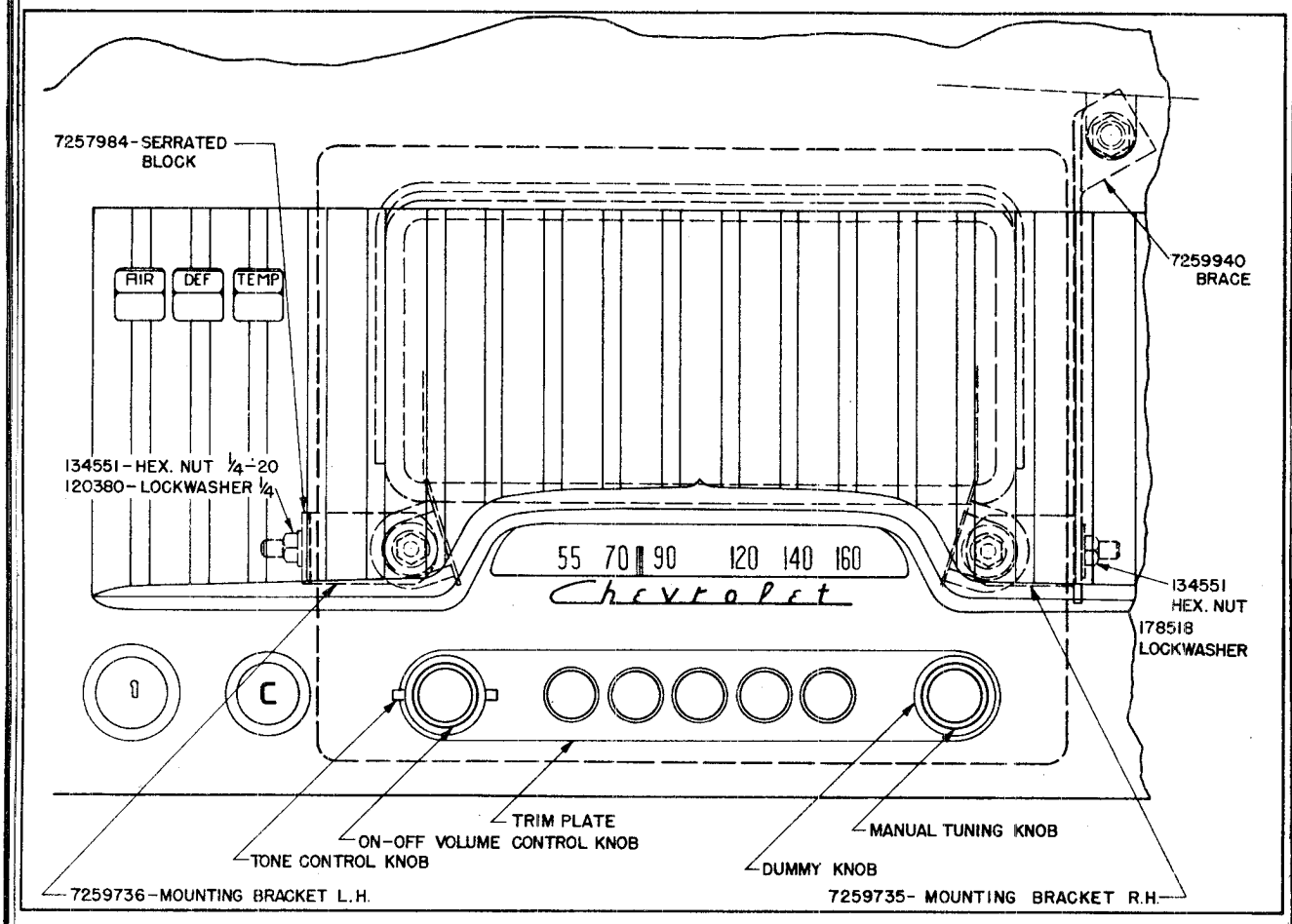


Figure 17

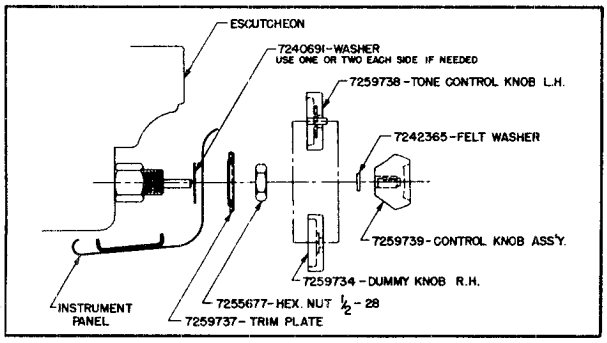


Figure 18

19. Attach male end of fuse holder to accessory junction block in either of optional positions (Figures 16 and 21) and then, insert fuse in male end of fuse holder and screw female end with "A" lead onto male fuse holder. (See Figures 20 and 21.)

20. Plug antenna into antenna socket on side of receiver (Figure 20), turn on receiver and tune in a weak station near 140 on the dial with volume in maximum position and antenna extended to full height. With a small screwdriver adjust antenna trimmer for maximum volume. (See Figure 19).

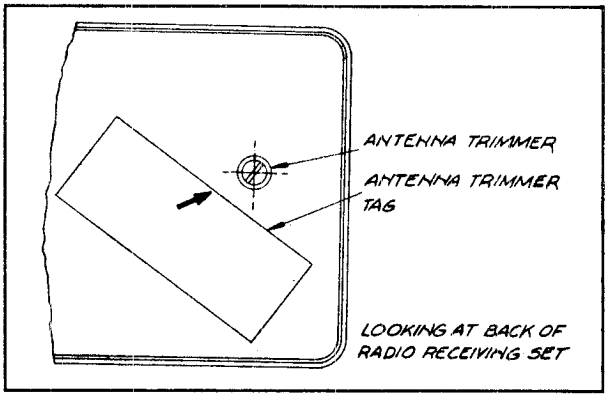


Figure 19

Select five good stations and set push buttons starting with left-hand button and a station near 55 on the dial, set remaining buttons in sequence with stations on dial, refer to page 4 for procedure to set push buttons.

MODEL 986515,
Chevrolet

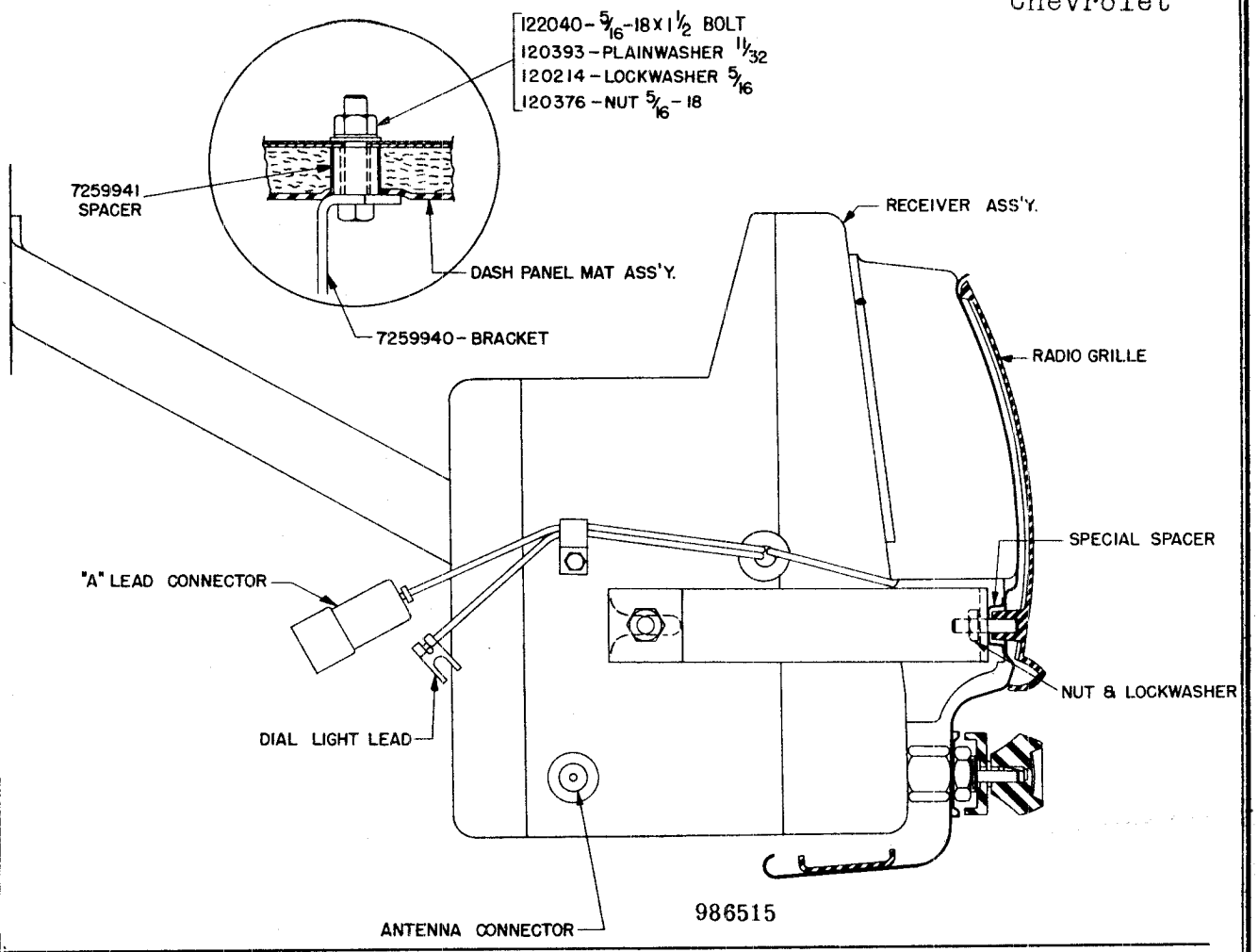


Figure 20

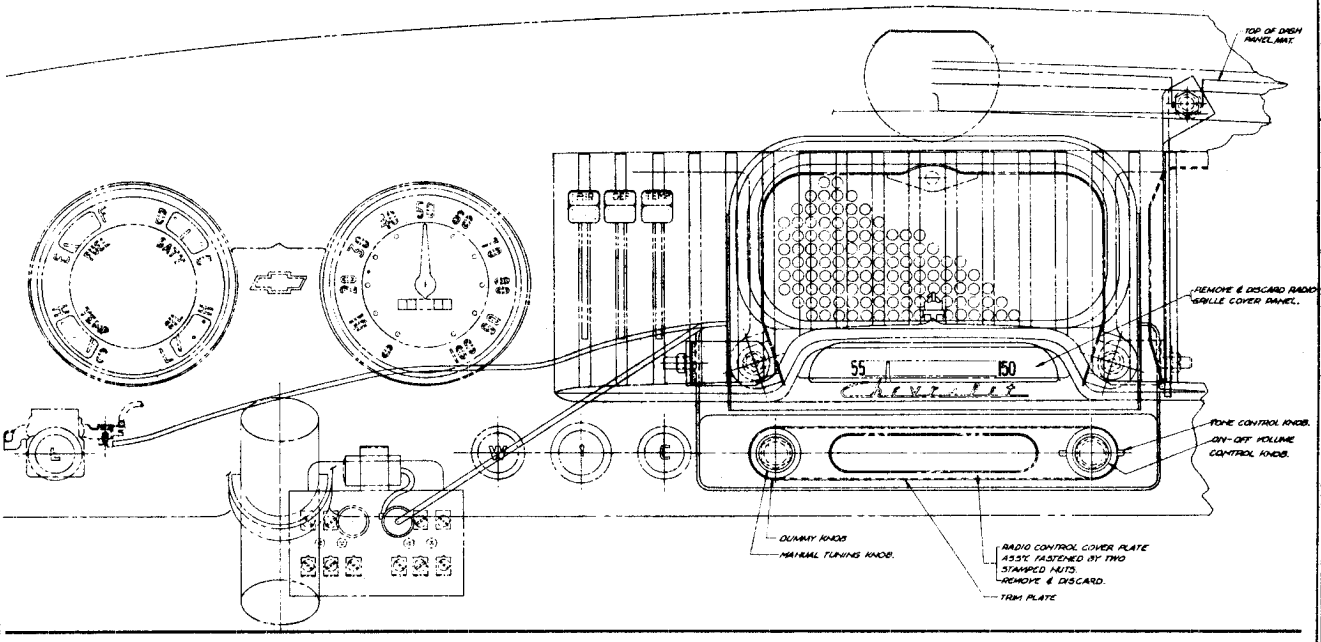


Figure 21

MODEL 986515,
Chevrolet

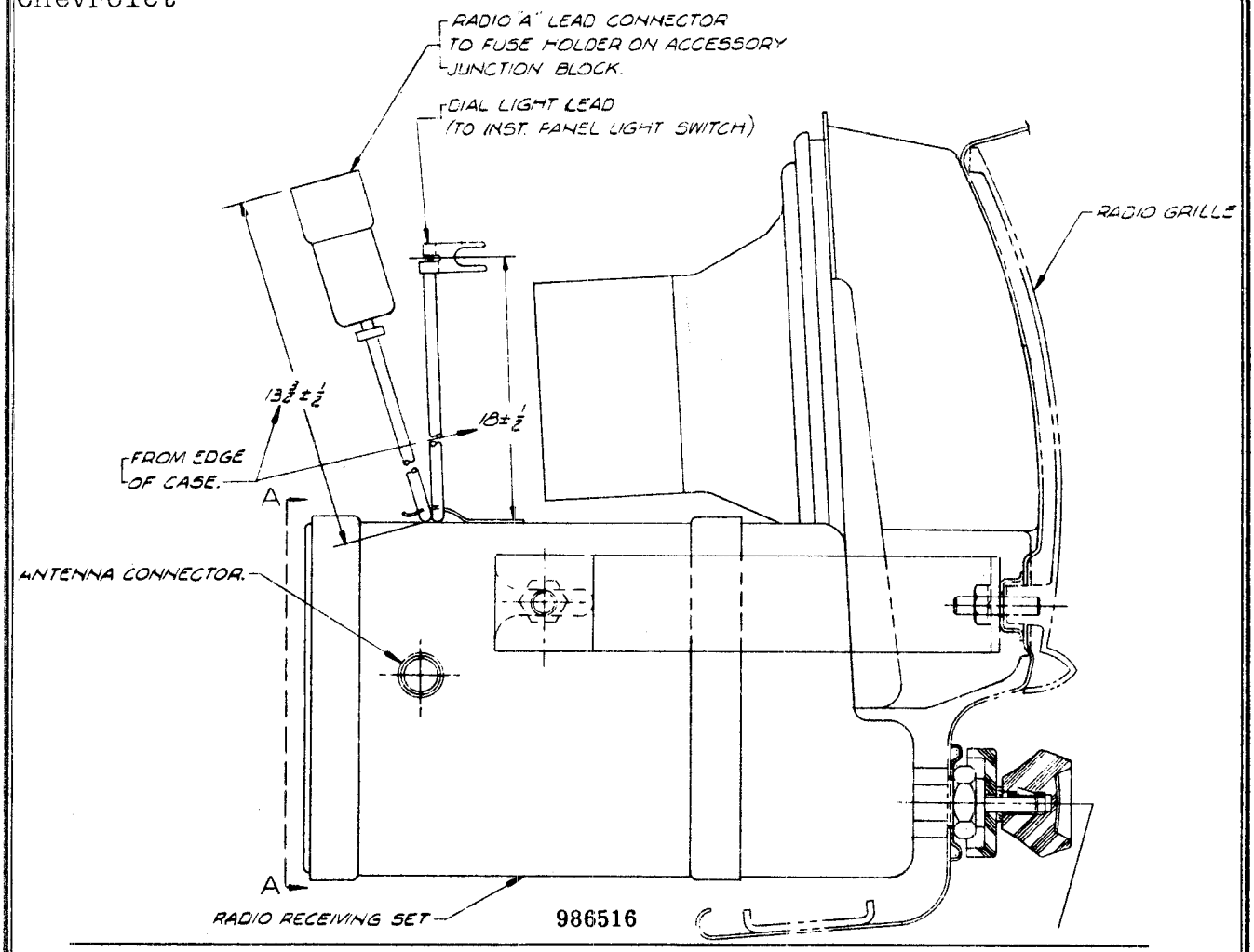


Figure 22

USE SAME INSTRUCTIONS FOR INSTALLING BOTH 986515 AND 986516 RADIOS.

PROCEDURE FOR CHECKING AND SERVICING 986515 RADIO

The most important operation in servicing automobile radios is, to talk with the customer and let him tell you what is wrong with his radio. The customer will save you untold time in locating the trouble and fixing the radio. You will find that complaints will come under one of the four following categories:

1. Fuse blown.
2. Noisy.
3. Weak, no volume.
4. Receiver completely dead.

Blown fuse is caused by one of the following three:

1. Vibrator points sticking or burning. Check vibrator on a vibrator analyzer, or if none is available, remove vibrator from radio and replace fuse, turn on radio and if the fuse does blow, replace vibrator with new one.

2. Excessive voltage from generator. Check voltage regulator and set to proper voltage, as outlined in Chevrolet shop manual.

3. Short in 6 volt circuit of radio. It will be necessary to remove radio from car and check all 6 volt wires, hash condensers and chokes in radio.

NOISY RADIOS

The noise can be caused by one or more of the following:

1. TIRE STATIC is caused by friction between the tires and pavement, is almost a continuous roar while car is in motion, and does not vary appreciably with car speed.

The intensity of the noise is greater on a dry sunshiny day and not so noticeable on humid or rainy days. To eliminate this noise be sure that the front wheel static collectors have been installed, being sure that they are free of grease at the spindle and are making good contact to the front wheel spindle. If the static still persists, install tire static powder in all five tires. It is impossible to determine in advance which cars will need tire static powder and for this reason it is recommended that the static powder be installed in all cars and trucks in which a radio is to be installed.

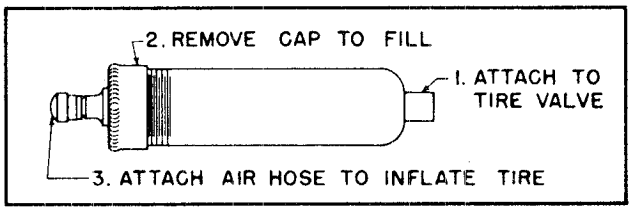


Figure 23

Tire static powder part number 986087 and injector part number 986033 are both available through General Motors Parts Warehouses.

2. NOISY ANTENNAS can be located by turning on the radio receiver and tuning in a station, then by tapping the antenna rod with a screwdriver handle, if noisy will crash in the radio each time you tap the antenna rod. The antenna lead-in can also cause noise in the radio if the shield is broken or unsoldered from the ends or if the lead-in wire in cable is loose or broken. Replace antenna rod or lead-in.

3. MOTOR INTERFERENCE in Chevrolet radios is usually caused by poor grounds when installing the antenna or receiver, or not using all the suppression material furnished with the receiver. Check to make sure all suppression material has been installed and that all grounds are bright, clean and tight.

4. GENERATOR INTERFERENCE is a whining noise similar to a siren and increases or decreases with speed of the engine. Install or replace generator condenser. (If generator brushes and armature are worn, true armature and replace generator brushes.)

5. NOISY RADIO TUBES can be located by turning on the radio and tuning in a station, then remove the tube inspection plate and with a small screwdriver, use the handle end to tap each of the tubes lightly. If noisy, it will cause a crashing noise in the radio as you tap the tube. Replace tube or tubes. If the foregoing does not eliminate the noise, it will be necessary to remove the radio from the car and hook-up radio on service bench, remove covers and check for loose or poorly soldered connections.

6. WEAK - NO VOLUME usually is caused by three things, weak tubes or vibrator or antenna being partially grounded.

PROCEDURE FOR CHECKING THE VOLTAGE OF 986515 RADIO

The same procedure is used for operating radio test equipment as outlined on pages 9 through 14 of the 1950 Chevrolet Radio Service and Shop Manual (P&A 15).

It will be necessary to remove the front cover of the radio case to check the voltages. Hook-up the radio on the service bench to a 6 volt power unit, or a fully charged battery. It is important that you have 6 volts at the spark plate of the radio or the voltage readings will be correspondingly lower.

Set the master selector switch of the volt-ohm-meter to the 12 position, set the voltage selector switch to D.C. 1K ~/v. Place the test leads in jack marked "Test Leads," ground the "-" negative lead to radio chassis for ground, with red lead check all tube pins marked "H" which show a reading on the voltage chart. (See Figure 24.)

If no voltage or incorrect check or replace the following:

1. Check or replace On and Off switch (Item 51C on circuit diagram and 51 on parts layout).

2. Check or replace Condensers. (Items 26A - 26B - 27 on circuit diagram and parts layout.)

3. Check or replace chokes. (Items 8 and 9 on circuit diagram and parts layout.)

Next check will be the A.C. voltage on secondary winding of the power transformer. Set the Master selector switch to the 600 position, set the voltage selector switch to A.C. 1K ~/v. With red lead check the tube pins marked "P"

MODEL 986515,
Chevrolet

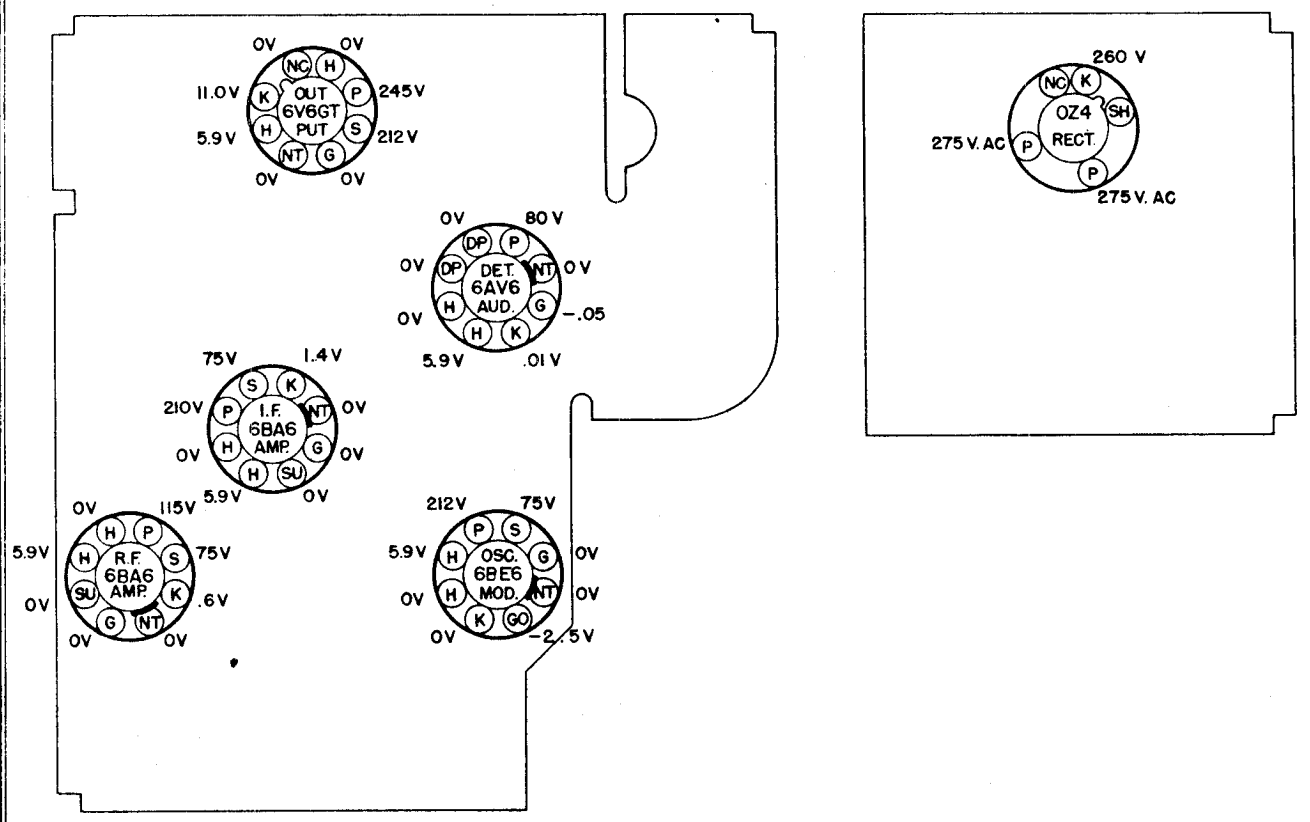


Figure 24

on OZ4 tube. Each terminal should read 270 to 280 volts A.C. If incorrect or no voltage, check or replace the following:

1. Check or replace condenser. (Item 28 on circuit diagram and parts layout.)

2. Check or replace vibrator. (Item 57 on circuit diagram and parts layout.)

3. Check or replace power transformer. (Item 56 on circuit diagram and parts layout.)

4. Check or replace OZ4 tube socket.

Next change the Master selector switch to the 300 position and the voltage selector switch to D.C. 1K ~/v position. With the black lead to the radio chassis for ground, with the red lead check the tube pin marked "K" on OZ4 tube. It should read 255 to 265 volts, if incorrect or no voltage, check or replace the following:

1. Check or replace the OZ4 tube.

2. Check or replace the OZ4 tube socket.

Next check the tube pin marked "P" on 6V6GT tube, should read 240 to 250 volts. If incorrect or no voltage, check or replace the following:

1. Check or replace Electrolytic condenser. (Item 19B on circuit diagram and 19 on parts layout.)

2. Check or replace audio transformer. (Item 55 on circuit diagram and parts layout.)

3. Check or replace condenser. (Item 21 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6V6GT tube, should read 207 to 217 volts. If incorrect or no voltage, check the following:

1. Check or replace Electrolytic condenser. (Item 19C on circuit diagram and 19 on parts layout.)

2. Check or replace resistor. (Item 48 on circuit diagram and parts layout.)

Next check the tube pin marked "K" on 6V6GT tube, should read 10 to 12 volts. If incorrect or no voltage check or replace the following:

1. Check or replace Electrolytic condenser.

(Item 19A on circuit diagram and 19 on parts layout.)

2. Check or replace resistor. (Item 43 on circuit diagram and parts layout.)

Next check tube pin marked "P" on 6AV6 tube, should read 75 to 85 volts. If incorrect or no voltage check or replace the following:

1. Check or replace resistor. (Item 40 on circuit diagram and parts layout.)

2. Check or replace condensers. (Item 18 and 20 on circuit diagram and parts layout.)

Next, check tube pin marked "P" on 6BA6 Intermediate frequency amplifier tube, should read 205 to 215 volts. If incorrect or no voltage, check the following:

1. Check or replace Intermediate Frequency Transformer. (Item 7 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6BA6 I.F. Amplifier tube, should read 70 to 80 volts. If incorrect or no voltage check or replace the following:

1. Check or replace resistor. (Item 33 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

Next check tube pin marked "P" on 6BE6 tube, should read 207 to 217 volts. If incorrect or no voltage, check or replace the following:

1. Check or replace Intermediate Frequency Transformer. (Item 6 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6BE6 tube, should read 70 to 80 volts. If incorrect or no voltage, check the following:

1. Check or replace resistor. (Item 33 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

Next check tube pin marked "P" on 6BA6 Radio Frequency amplifier tube, should read 110 to 120 volts. If incorrect or no voltage, check or replace the following;

1. Check or replace resistor. (Item 34 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6BA6 R.F. tube, should read 70 to 80 volts. If incorrect or no voltage, check the following:

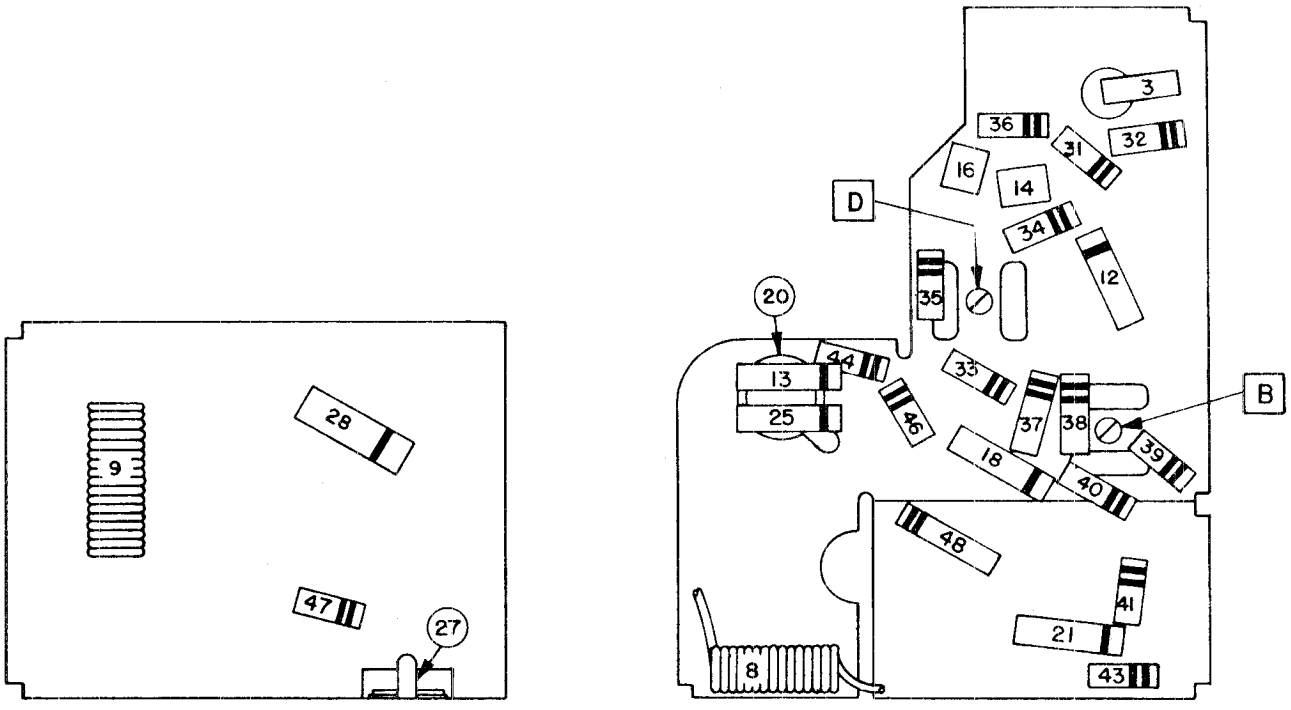


Figure 25

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Chevrolet

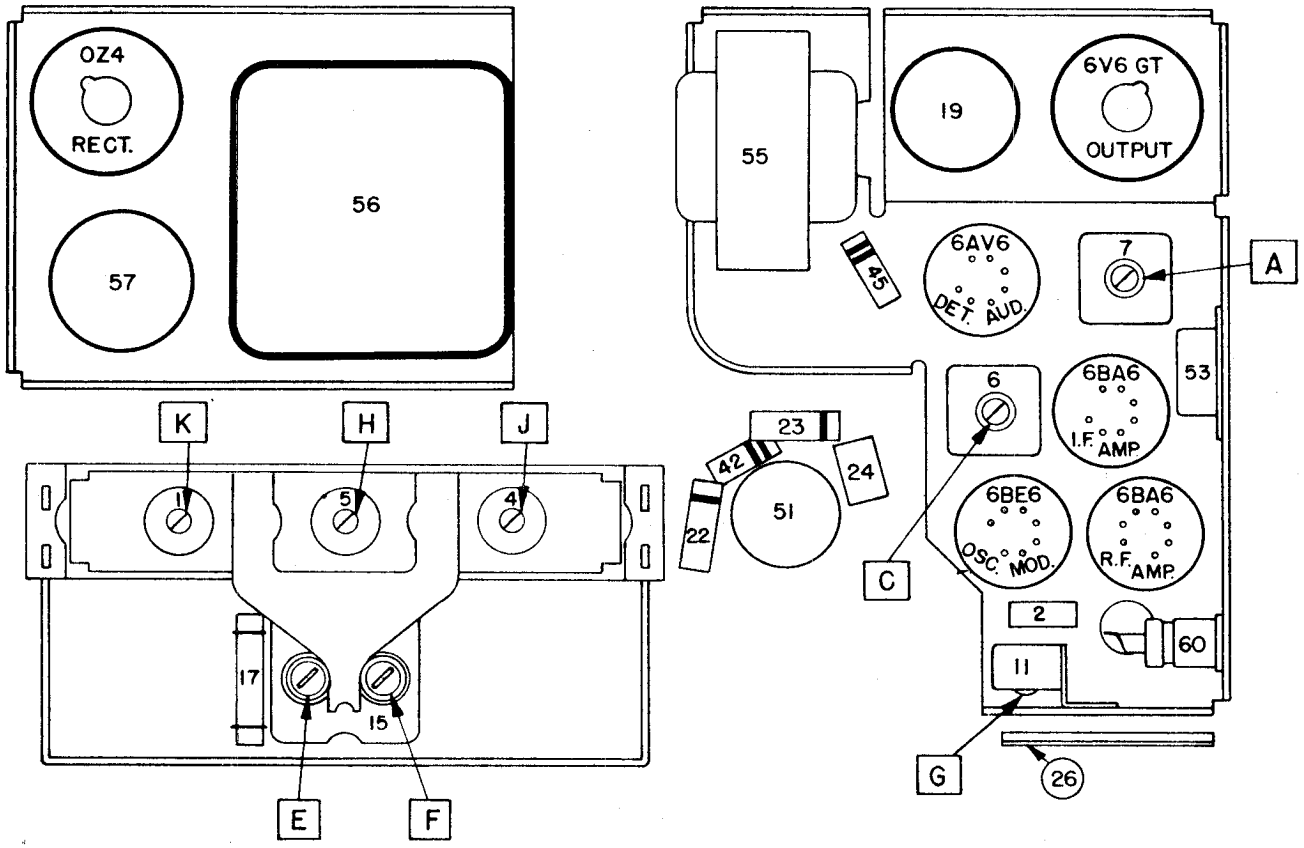

Figure 26

1. Check or replace resistor. (Item 33 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

We have now checked the tubes, vibrator and voltages, with these being correct and the radio still does not play, the trouble will be in the grid circuit of the radio. To continue, it will be necessary to check the grid circuit by means of Signal Tracing.

PROCEDURE FOR SIGNAL TRACING
986388 RADIO

Turn on Signal Generator On and Off switch, place the modulation switch in the modulated position, set Signal Generator tone control to .5, place the shielded lead assembly in jack marked "Audio." Ground the black lead of Signal Generator to the radio chassis.

With the red lead touch tube pin marked "P" on 6V6GT tube. If no signal check or replace the following:

1. Check or replace Audio transformer. (Item 55 on circuit diagram and parts layout.)

2. Check or replace speaker. (Item 54 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6V6GT tube. If no signal check or replace the following:

1. Check or replace 6V6GT tube.

2. Check or replace 6V6GT tube socket.

Next touch tube pin marked "P" on 6AV6 tube. If no signal check or replace the following:

1. Check or replace condenser. (Item 18 on circuit diagram and parts layout.)

2. Check or replace resistor. (Item 41 on circuit diagram and parts layout.)

Next touch tube pins marked "G" and "DP" on 6AV6 tube. If no signal at either point check

or replace the following:

1. Check or replace 6AV6 tube.

2. Check or replace 6AV6 tube socket.

3. Check or replace resistors. (Items 45 and 46 on circuit diagram and parts layout.)

Next remove the shielded lead-in assembly from the audio jack, and move to the jack marked "I.F." Set the band switch to "A" position, turn Signal Generator volume control about a third open, tune Signal Generator to exactly 262 Kilocycles.

With the red lead, touch tube pin marked "P" on 6BA6 Intermediate Frequency Amplifier tube. If no signal, check or replace the following:

1. Check or replace Intermediate Frequency Transformer. (Item 7 on circuit diagram and parts layout.)

2. Check or replace resistors. (Items 38, 39, 42 and 44 on circuit diagram and parts layout.)

3. Check or replace condensers. (Items 22, 23, 24 and 25 on circuit diagram and parts layout.)

4. Check or replace volume and tone control. (Items 51A and 51B on circuit diagram and 51 on parts layout.)

Next touch tube pin marked "G" on 6BA6 I.F. tube. If no signal check or replace the following:

1. Check or replace 6BA6 tube.

2. Check or replace 6BA6 tube socket.

3. Check or replace sensitivity control. (Item 53 on circuit diagram and parts layout.)

Next touch tube pin marked "P" on 6BE6 tube. If no signal check or replace the following:

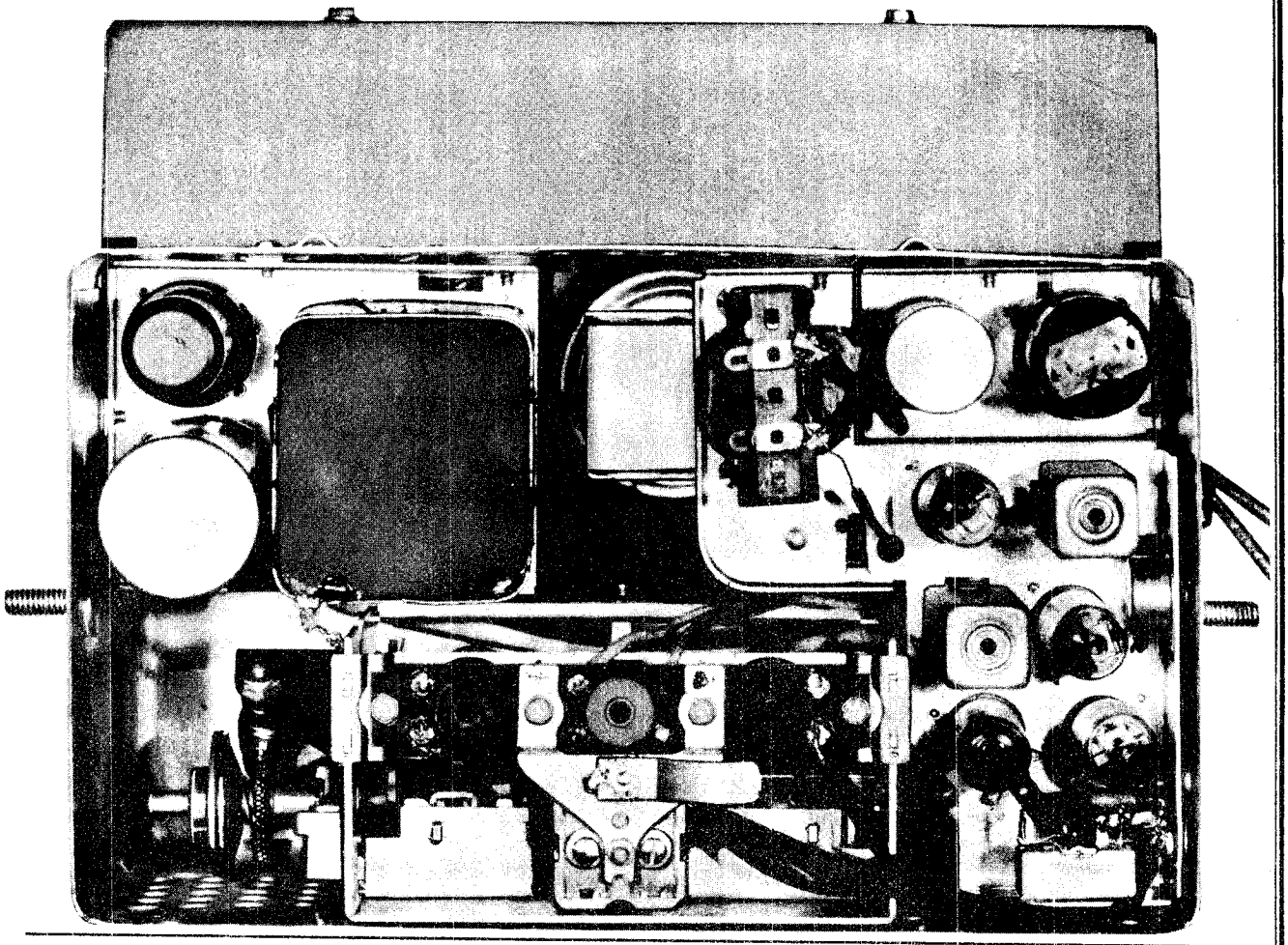

Figure 27

MODEL 986515,
Chevrolet

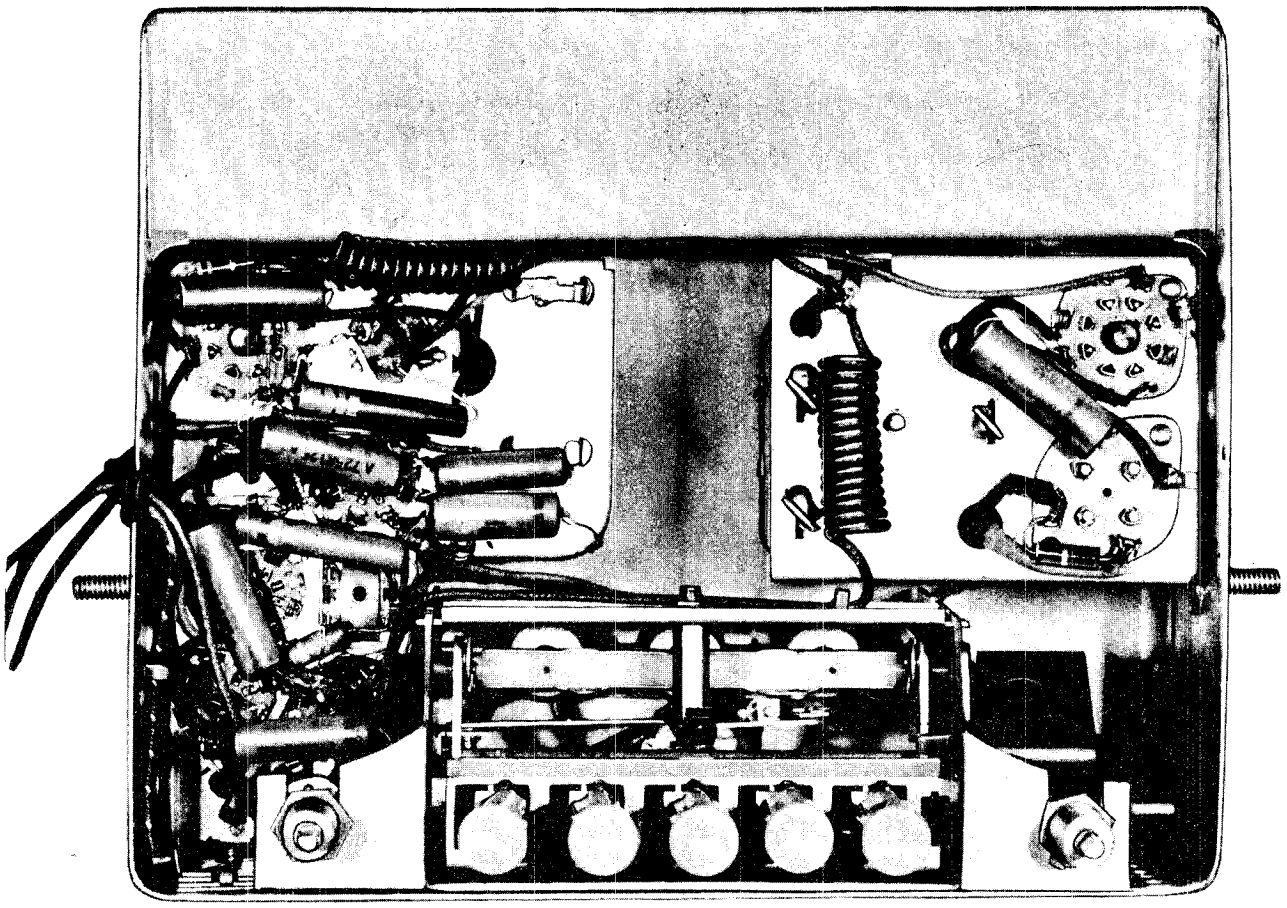

Figure 28

1. Check or replace Intermediate Frequency transformer. (Item 6 on circuit diagram and parts layout.)

2. Check or replace resistor. (Item 37 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6BE6 tube. If no signal check or replace the following:

1. Check or replace 6BE6 tube.

2. Check or replace 6BE6 tube socket.

Now change the shielded lead-in assembly from I.F. jack to jack marked "R.F.," tune Radio receiver and Signal Generator to 1000 kilocycles, set band switch to "B" position. Next touch tube pin marked "P" on 6BA6 Radio Frequency Amplifier tube. If no signal check or replace the following:

1. Check or replace Radio Frequency Coil. (Item 4 on circuit diagram and parts layout.)

2. Check or replace Oscillator coil. (Item 5 on circuit diagram and parts layout.)

3. Check or replace condensers. (Items 14, 15A, 15B, 16 and 17 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6BA6 R.F. tube. If no signal check or replace the following:

1. Check or replace 6BA6 tube.

2. Check or replace 6BA6 tube socket.

3. Check or replace resistor. (Item 31 on circuit diagram and parts layout.)

Leaving the Signal Generator set as above and radio still tuned to 1000 kilocycles, place a .000075 mfd. condenser on red lead of Signal Generator and plug into antenna socket. If no signal check or replace the following:

MODEL 986515,
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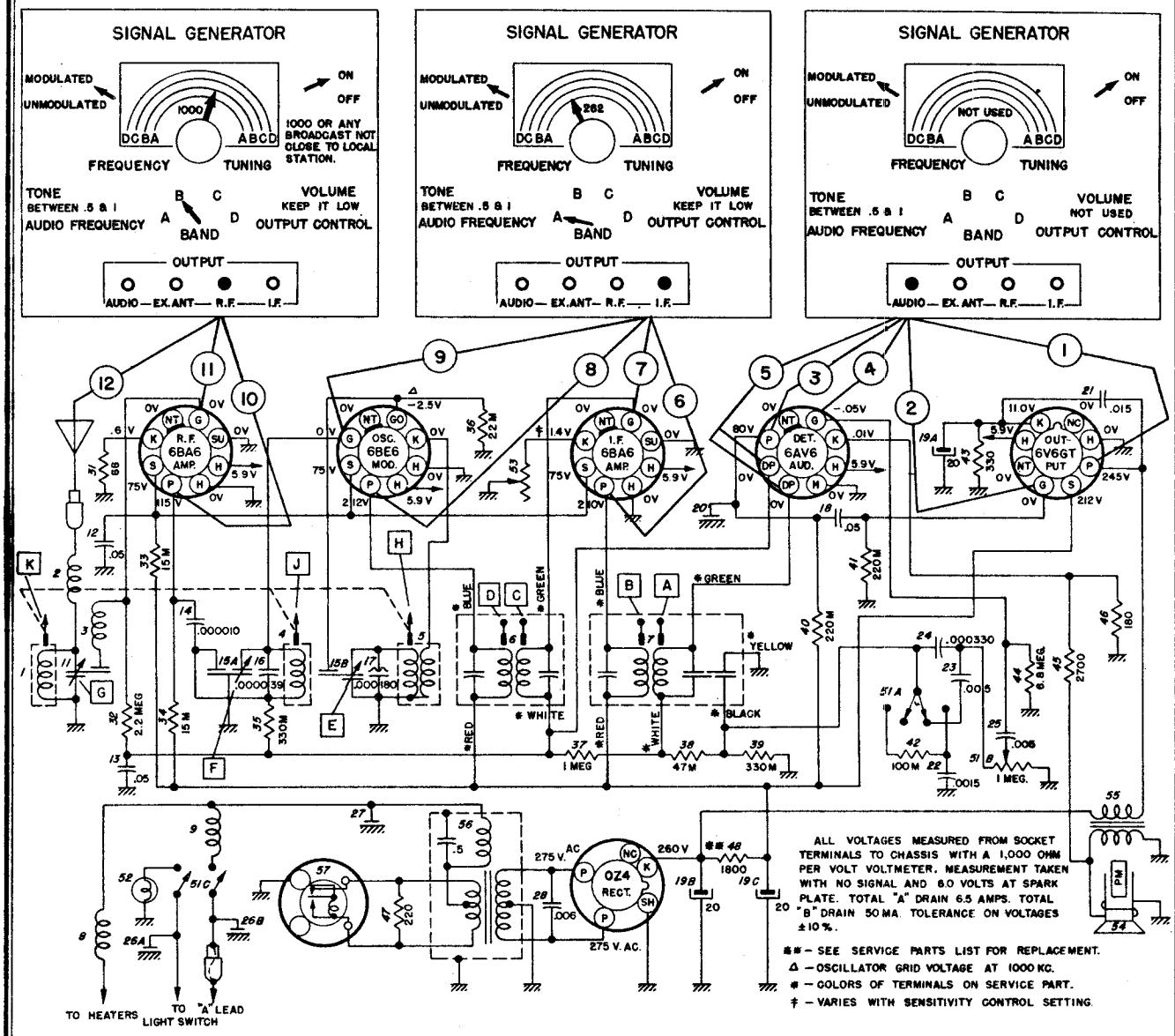
Tune radio to 1000 kilocycles



POINT SIGNAL STOPS - CHECK OR REPLACE ITEMS LISTED

No signal at point 1 - check or replace - items - 21-54-55	No signal at point 7 - check or replace - item - 53-6BA6 tube or tube socket
No signal at point 2 - check or replace - 6V6GT tube or tube socket	No signal at point 8 - check or replace - items - 6-37
No signal at point 3 - check or replace - items - 18-41	No signal at point 9 - check or replace - 6BE6 tube or tube socket
No signal at point 4 - check or replace - items - 45-46-6AV6 tube or tube socket	No signal at point 10 - check or replace - items - 4-5-14-15A-15B-16-17-35-36
No signal at point 5 - check or replace - 6AV6 tube or tube socket	No signal at point 11 - check or replace - item - 31-6BA6 tube or tube socket
No signal at point 6 - check or replace - items - 7-22-23-24-25-38-39-42-44-51A-51B	No signal at point 12 - check or replace - items - 1-2-3-11-13-32

Figure 29

Signal Tracing Procedure 986515 Radio

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Chevrolet

1. Check or replace antenna coil. (Item 1 on circuit diagram and parts layout.)

2. Check or replace chokes. (Items 2 and 3 on circuit diagram and parts layout.)

3. Check or replace condensers. (Items 11 and 13 on circuit diagram and parts layout.)

4. Check or replace resistor. (Item 32 on circuit diagram and parts layout.)

PROCEDURE FOR ALIGNMENT OF 986515 RADIO

All receivers are properly aligned at the factory and should require no further adjustments, unless the adjustments have been tampered with, or new coils, I.F. Transformers or tuning cores have been installed.

To properly align the receiver, it will be necessary to have an output meter and signal generator. If any of the tuning coils or cores have been replaced, see "Capacity and Inductance Alignment Procedure." If only the adjustments have been tampered with or an I.F. transformer has been replaced the receiver is aligned as follows:

Set the Volt-Ohm-Milliammeter Master selector switch in the 30 position, the voltage selector switch in A.C. 1K ~/V position and place the leads in the jack marked "output meter," place the other end of the black lead to radio chassis for ground. Place the red lead to the terminal of the speaker to which the green lead of the audio output transformer is connected, as outlined in the 1950 Chevrolet Radio Service and Shop Manual. (Speaker is item 54 and audio output transformer item 55 on circuit diagram and parts layout.)

Turn on the Signal Generator On and Off switch and turn on the radio receiver, turn volume control to maximum position. Set modulation switch in the modulated position, turn the band selector to the "A" position and tune the Signal Generator to exactly 262 Kilocycles. Place the Signal Generator shielded lead in jack marked "I.F." and place the black lead to the radio chassis for ground. Place red lead to tube pin marked "G" on the 6BE6 tube.

Adjust the Signal Generator volume control so that the meter reads about 10 on the meter scale. Adjust in sequence trimmers "A, B, C and D" (on circuit diagram and parts layout) for maximum meter reading. Repeat adjustment to get best alignment. (Keep the Signal Generator volume turned down so that during adjustments, the meter does not read more than 10 on the meter scale.)

Now place Signal Generator shielded lead assembly in the jack marked "R.F.", set the band selector switch in "B" position, tune the Signal Generator to exactly 1615 kilocycles, place a .000075 mfd. condenser on the red lead and connect to the antenna connector. Tune the radio receiver to the stop at the 1600 kilocycle end of the dial. (Keep the Signal Generator volume control adjusted so the meter reads about 10 on the meter scale.)

Now adjust trimmers "E, F and G" (on circuit diagram and parts layout), in sequence for maximum reading on the meter scale. Repeat for best alignment. Tune the Signal Generator and radio receiver to exactly 1000 kilocycles and repeat adjustments of trimmers "F and G" only for maximum meter reading.

After the receiver has been installed in the car, tune in a weak station near 1000 kilocycles, with volume control turned to maximum position and antenna extended to full height. Readjust trimmer "G" only for maximum volume.

CAPACITY AND INDUCTANCE ALIGNMENT PROCEDURE

This alignment procedure is to be used only when any of the following parts have been replaced in the radio, antenna coil, radio frequency coil, oscillator coil or any of the tuning cores.

The Intermediate Frequency alignment at 262 kilocycles are the same as outlined in "Alignment procedure" on page 18. After completing the alignment at 262 kilocycles for the intermediate frequency transformers "A, B, C and D" proceed as follows:

Connect Signal Generator red lead to a .000075 mfd. condenser and connect to antenna connector.

Mechanically align iron cores "H, J and K" (on circuit diagram and parts layout) to measure 1-25/32 inches in coil forms from rear mounting edge of coil forms. (See Figure 26.) Now set the Signal Generator to exactly 1615 kilocycles, set band switch to "B" position. tune radio receiver to the stop on the 1600 kilocycle end of the dial. Have output meter

MODEL 986515, Chevrolet

hooked up as outlined in "Alignment Procedure." Now adjust iron cores "H, J and K" (on circuit diagram and parts layout) in sequence for maximum meter reading.

Now adjust trimmers "E, F and G" (on circuit diagram and parts layout) in sequence for maximum reading on meter scale. Now tune Signal Generator and radio receiver to 1000 kilocycles, and readjust iron cores "J and K" only for maximum reading on meter scale. DO NOT READJUST IRON CORE "H" ON THIS ADJUSTMENT. Repeat the adjustment of iron cores "J and K" at 1000 kilocycles for maximum reading on meter scale.

Reset Signal Generator to 1615 kilocycles and tune radio receiver to stop on 1600 kilocycle end of dial, then readjust trimmers "F and G" only until no further increase in the meter reading can be obtained.

After the radio receiver has been installed in the car, tune in a weak station near 1000 kilocycles, with volume control turned to maximum position and antenna extended to full height. Readjust trimmer "G" only for maximum volume.

SERVICE PARTS LIST 986515 RADIO

Illus. No.	Service Part No.	Description
		COILS
1	7258914	Antenna
2	7258502	Antenna Series Choke
3	7240251	Antenna Spark Choke
4	7258914	Radio Frequency
5	7258911	Oscillator
6	1218725	1st. I.F.
7	1218726	2nd I.F.
8	7260470	Hash Choke
9	7260090	Hash Choke
		CONDENSERS
11	7260172	Antenna Trimmer
12	7230592	.05 mfd. 600V. Tubular
13	7230592	.05 mfd. 600V. Tubular
14	1215189	.000010 mfd. molded
15	7242454	Dual Trimmer
15A		R.F. Section
15B		Oscillator Section
16	1217736	.000039 Mfd. Molded
17	7257424	.000180 Mfd. Compensating
18	7230592	.05 mfd. 600V. Tubular
19	7260065	Electrolytic
19A		20 mfd. 25 V.
19B		20 mfd. 400 V.
19C		20 mfd. 400 V.
20	1217848	Hash plate (chassis)
21	1219693	.015 mfd. 800V. Tubular
22	1218499	.0015 mfd. 200V. Tubular
23	7230767	.005 mfd. 600V. Tubular
24	7232957	.000330 mfd. molded
25	7230767	.005 mfd. 600V. Tubular
26	1219369	Dual Spark Plate
27	1217848	Hash plate (chassis)
28	7240906	.006 mfd. 1600V. Tubular
		RESISTORS
31	1215558	68 ohms 1/2W. Insulated
32	1214563	2.2 megohms 1/2W. Insulated
33	7233653	15,000 ohms 2W. Insulated
34	7237595	15,000 ohms 1W. Insulated
35	1214557	330,000 ohms 1/2W. Insulated
36	1214550	22,000 ohms 1/2W. Insulated
37	1213282	1 megohm 1/2W. Insulated
38	1214553	47,000 ohms 1/2W. Insulated
39	1214557	330,000 ohms 1/2W. Insulated
40	1214555	220,000 ohms 1/2W. Insulated
41	1214555	220,000 ohms 1/2W. Insulated
42	1213270	100,000 ohms 1/2W. Insulated
43	7233773	330 ohms 1W. Insulated
44	1215563	6.8 megohms 1/2W. Insulated
45	1213240	2,700 ohms 1/2W. Insulated
46	1215559	180 ohms 1/2W. Insulated
47	7237994	220 ohms 1W. Insulated
48	USE	7242844 - 2700 ohms 2W. 7240918 - 5600 ohms 1W. in parallel
		TUBES
	1217690	6BA6 R.F. and I.F. Amplifier
	1217691	6BE6 Oscillator-Modulator
	1218506	6AV6 Detector-A.V.C.-1st Audio
	1213793	6V6GT Audio Output
	1211924	Rectifier
		MISCELLANEOUS ELECTRICAL PARTS
51	7260084	Control - Volume, Tone and Switch
51A		Tone Control
51B		Volume Control
51C		Switch
52	125588	Lamp - Dial
53	7242204	Sensitivity Control
54	7259381	Speaker - 6" x 9" P.M.
55	7260060	Transformer - Audio Output

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56	7260100	Transformer - Power
57	7239124	Vibrator

MECHANICAL PARTS

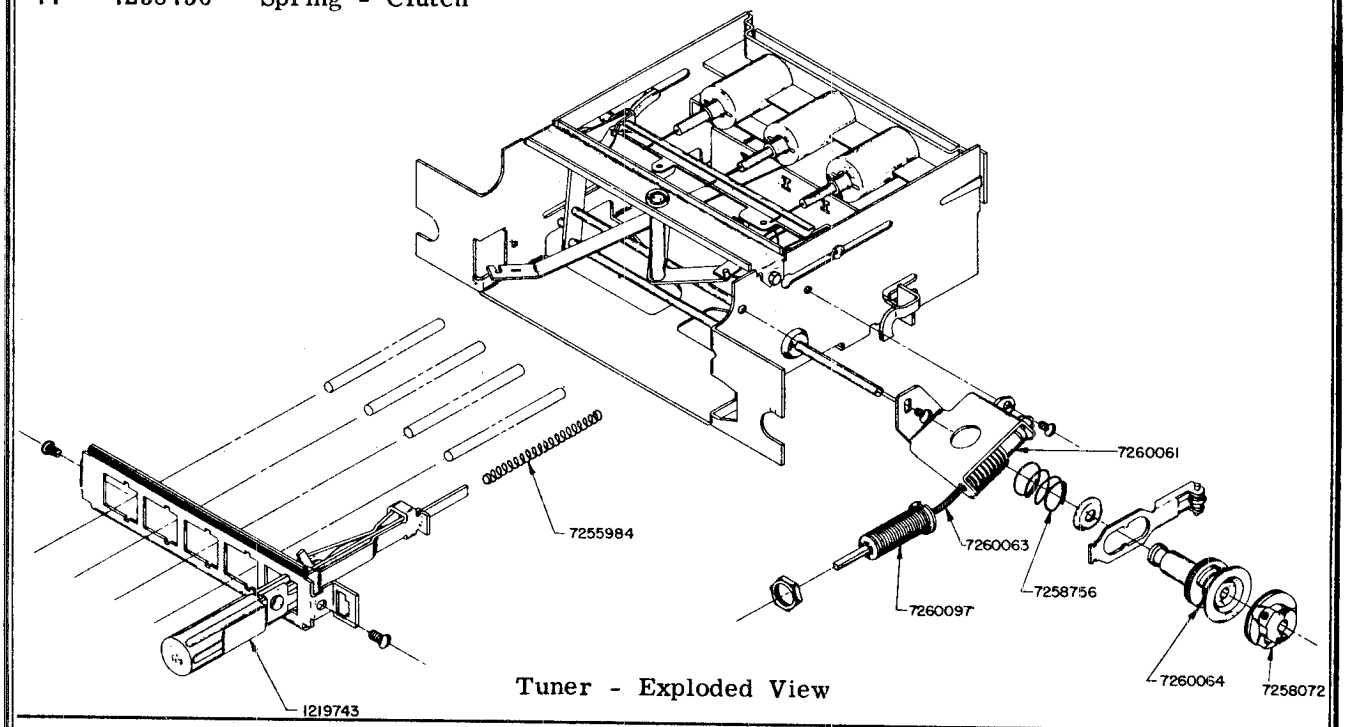
60	7239475	Socket - Antenna
	7258073	Socket - 7 Pin Miniature
	7236279	Socket - Octal Tube
	7239125	Socket - Vibrator

TUNER PARTS

62	7260018	Backplate - Pointer
	147481	Ball bearing (10 to Unit)
63	7260097	Bushing & Manual Drive Shaft Assy.
64	7260068	Manual Drive Shaft
65	7258072	Clutch - Disc, Driven
66	7258203	Connecting Link Core Bar
67	7258210	Core Guide Bar
68	7256271	Pointer Connecting Link
69	7255992	Spring Pointer Connecting Link
70	7258468	Core Iron Tuning
71	7260076	Escutcheon Assembly
72	1219744	Dial Package
73	7260064	Gear and Bushing - Clutch
74	7260074	Pointer Assembly
75	7260093	Pointer Tip
76	1219742	Push Button and Slide Assembly
77	7258756	Spring - Clutch
78	7257415	Spring - Core Bar Connecting Link
79	7255984	Spring Slide Return
80	1219743	Socket - Dial Light
81	7260061	Worm Gear and Bracket

INSTALLATION PARTS

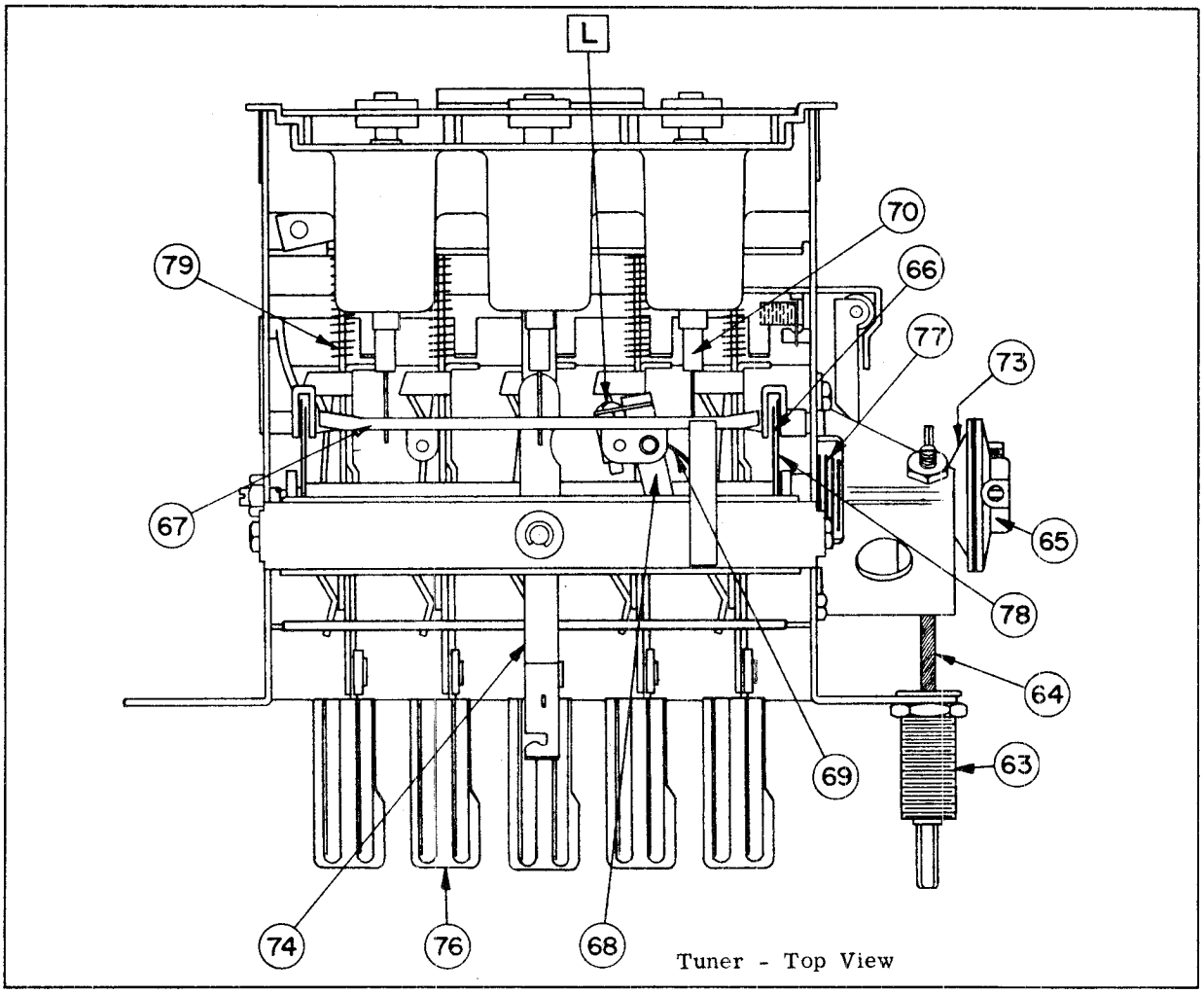
7259728	Installation Package Contains the following:
1912900	Condenser - Ammeter
1910147	Condenser - Generator
1910147	Condenser - Ignition Coil
1912900	Condenser - Voltage Regulator
1887829	Suppressor - Distributor
147685	Fuse
7257921	Fuse Holder Body - Male
7259733	Knob - Control
7259734	Knob - Dummy
7259738	Knob - Tone Control
7259736	Mounting Bracket L.H.
7259735	Mounting Bracket R.H.
7259940	Brace - Receiver Mounting, Rear
1888204	Nipple - Rubber - Distributor
7257984	Serrated Pad
7259941	Spacer - Mounting
494786	Collector - Static



Tuner - Exploded View

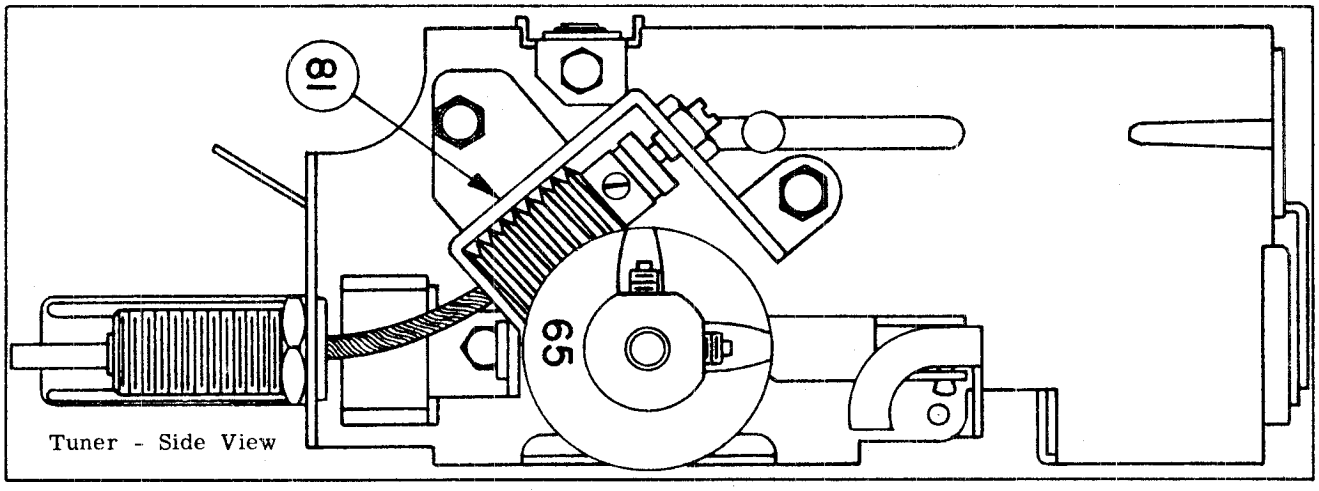
Figure 30

MODEL 986515,
Chevrolet



Tuner - Top View

Figure 31



Tuner - Side View

Figure 32

MODEL 986515,
Chevrolet

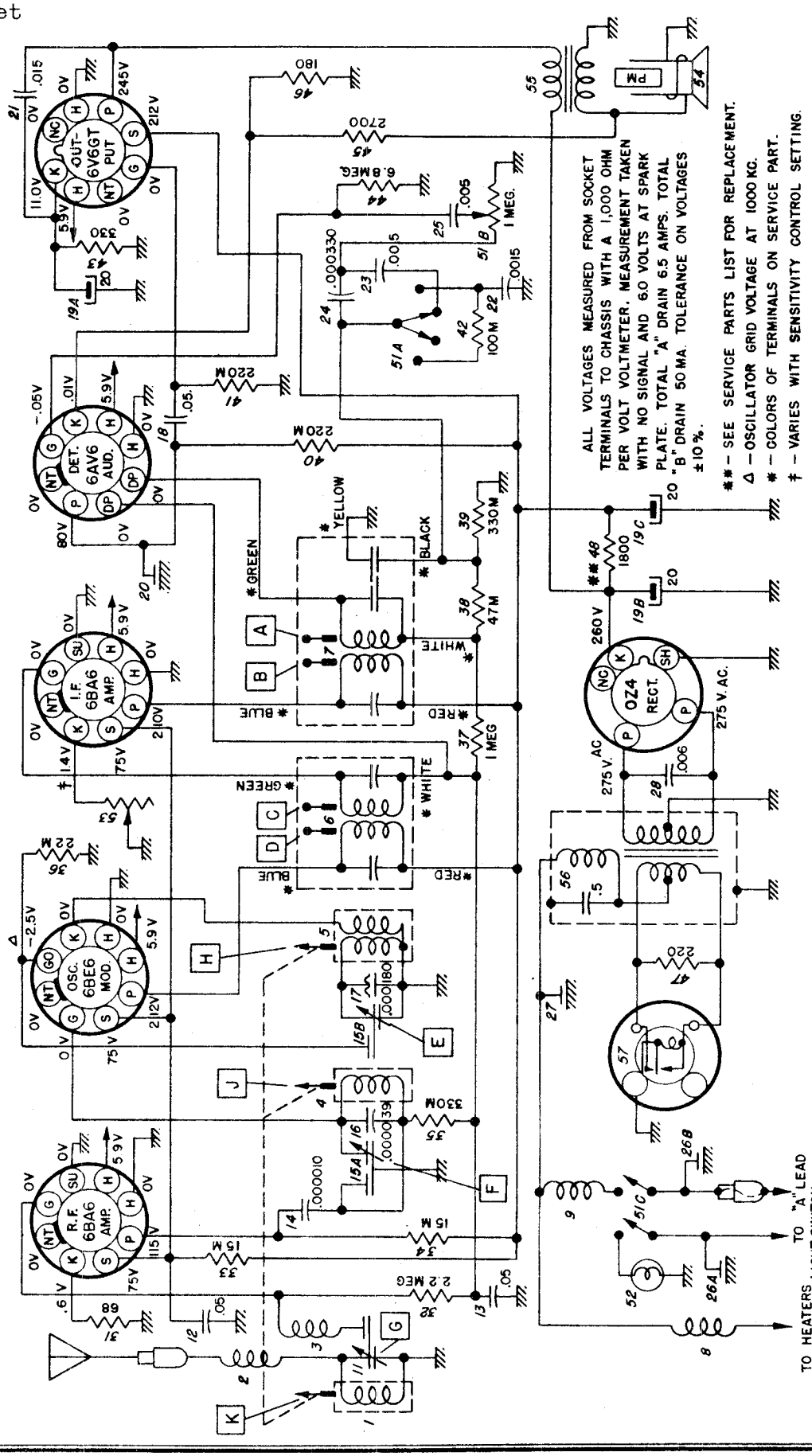


Figure 33
Circuit Diagram - 986515 Radio

MODEL 986516, Chevrolet

CUSTOM DELUXE RADIO MANUAL TUNING 986516

This radio is a single unit five tube (plus rectifier) superheterodyne automobile receiver designed expressly for 1951 Chevrolet passenger car installation. In this type of design the speaker is integral with the receiver and instrument panel by means of a special rubber gasket which, due to location and baffling, permits exceptionally good tone quality.

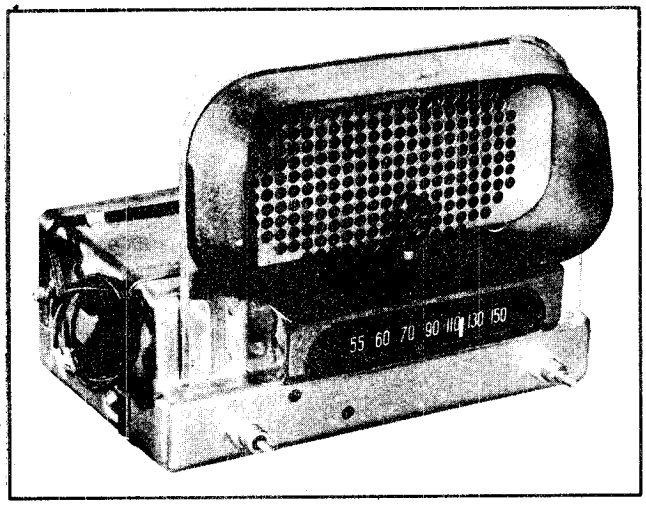


Figure 34

ELECTRICAL DESCRIPTION

The circuit used in this receiver is the superheterodyne type and uses no regeneration. The tuning circuits are of the permeability type and tuned by varying the iron cores in and out of the antenna, radio frequency and oscillator coils like pistons. (See Figure 35.)

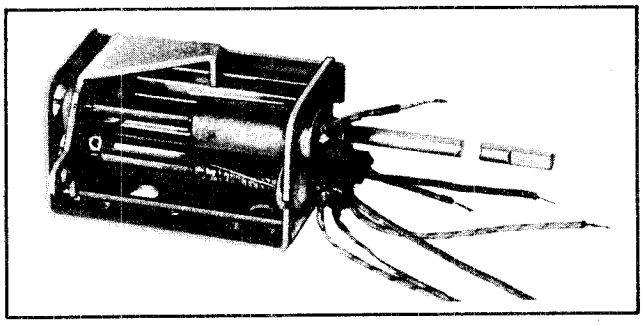


Figure 35

The Intermediate Frequency stages are tuned by means of two iron cores being adjusted the top and bottom sides of the I.F. transformer, both the first (input) and second (output) Intermediate Frequency transformers are tuned by this method. (See Figure 36.)

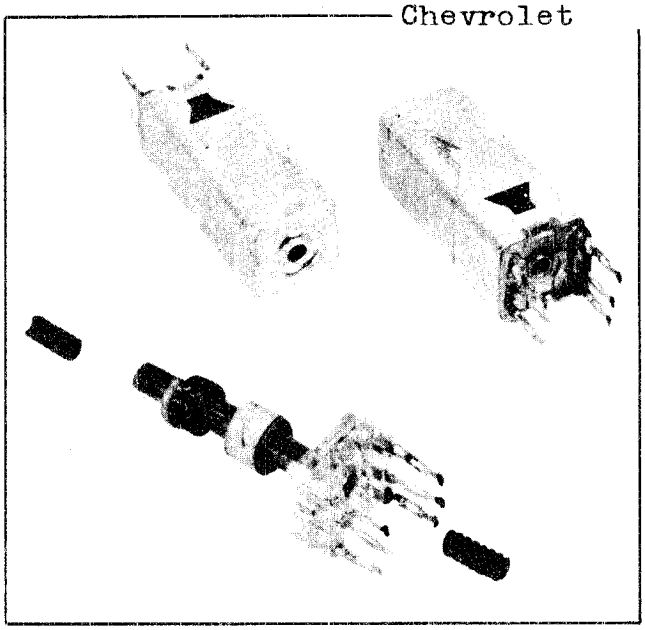


Figure 36

The antenna circuit is capacity coupled to the antenna by means of an antenna trimmer condenser to take care of normal variations in antenna and antenna coil capacity. The antenna condenser is adjustable by means of a small screw driver, and is located at the rear of the radio case. The audio stage is transformer coupled to the output tube to take advantage of all gain and tone quality that the receiver is capable of developing. The automatic volume control is of the delayed signal type and is very capable of maintaining a constant level of volume at all times. Very high frequency filter chokes are used in the radio frequency and oscillator grid circuits to discriminate against ignition interference in the receiver, thus eliminating the use of spark plug suppressors. The vibrator is the full wave non-synchronous type using a 6X5GT rectifier tube and will operate on either a negative or positive ground.

TUBE COMPLEMENT AND FUNCTION

6BA6	Radio Frequency Amplifier
6BE6	Oscillator - Modulator
6BA6	Intermediate Frequency Amplifier
6AT6	Detector - Automatic Volume Control and First Audio
6V6GT	Audio Output
6X5GT	Rectifier

GENERAL INFORMATION

Tuning range 540 - 1610 Kilocycles.

MODEL 986516,
Chevrolet

Intermediate Frequency 257.5 Kilocycles.
Maximum Power Output 3.5 Watts.
Undistorted Power Output 2.5 Watts.
Current Drain Permanent Magnet Speaker 6.5 Amperes at 6 Volts.
Voice Coil Impedance 3.2 ohms at 400 Cycles
Fuse protection 14 Amperes 25 Volt.

PROCEDURE FOR INSTALLATION OF 986516 RADIO AND ANTENNA

The installation procedure for the antenna and receiver are the same as for 986515 receiver.

PROCEDURE FOR SERVICING 986516 RADIO

The same procedure for operating radio test equipment as outlined for 986515

PROCEDURE FOR CHECKING THE VOLTAGE OF 986516 RADIO

It will be necessary to remove the front cover with the dial and speaker assembly to check the voltages.

Hookup radio on the service bench to a 6 volt power-unit, or a fully charged battery. It is important that you have at least 5.9 volts at the spark plate of the radio, or the voltage readings will all be low.

First set the Master selector switch of the volt-ohm-milliammeter to the 12 position, set the voltage selector switch to D.C. 1K ~ /V. Place the test leads in jack marked "test leads," ground the "-" negative lead to radio chassis for ground, with the red lead check all tube pins marked "H" which show a reading on the voltage chart. (See Figure 37.) If no voltage or incorrect, check or replace the following:

1. Check or replace On and Off switch. (Item 51C on circuit diagram and 51 on parts layout.)
2. Check or replace condensers. (Items 24, 25 and 26 on circuit diagram and parts layout.)
3. Check or replace choke. (Item 5 on circuit diagram and parts layout.)

Now set the Master selector switch to the 600 position and the voltage selector switch to A.C. 1K ~ /V. position. With the red lead check the two terminals marked "P" on the 6X5GT tube, both terminals should read 270 to 280 volts A.C. If incorrect or no voltage check the following:

1. Check or replace condensers. (Item 26 and 27 circuit diagram and parts layout.)
2. Check or replace choke. (Item 5 on circuit diagram and parts layout.)
3. Check or replace power transformer. (Item 55 on circuit diagram and parts layout.)
4. Check or replace resistors. (Items 43 and 44 on circuit diagram and parts layout.)
5. Check or replace vibrator. (Item 56 on circuit diagram and parts layout.)

Now change the Master selector switch to the 300 position, and the voltage selector switch to D.C. 1K ~ /V. position, leaving the leads in the same jacks and the black lead grounded to the radio chassis. Now with the red lead check the voltage on the 6X5GT tube, pin marked "K." It should read 245 to 255 volts D.C. If incorrect or no voltage check the following:

1. Check or replace 6X5GT tube.
2. Check or replace 6X5GT socket.

Next check the voltage on the 6V6GT tube, pin marked "P." It should read 225 to 235 volts D.C. If incorrect or no voltage check the following:

1. Check electrolytic condenser. (Item 21 on parts layout, 21A on circuit diagram.)
2. Check or replace audio transformer. (Item 54 on circuit diagram and parts layout.)
3. Check or replace condenser. (Item 23 on circuit diagram and parts layout.)
4. Check or replace "B" choke. (Item 6 on circuit diagram and parts layout.)

Now check pin marked "S" on 6V6GT tube, should read 215 to 225 volts D.C. If incorrect or no voltage check the following:

1. Check or replace electrolytic condenser.

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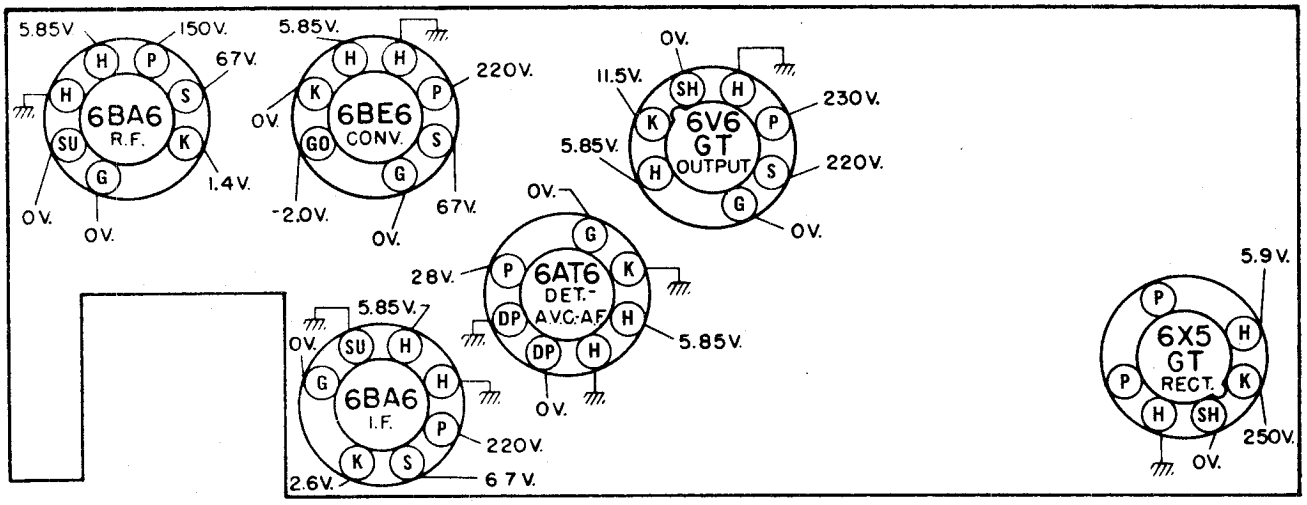
Chevrolet



READINGS TAKEN FROM TUBE SOCKET CONTACTS TO CHASSIS WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT. "A" SUPPLY AT SPARK PLATE 5.9 VOLTS. "B" SUPPLY DRAIN APPROXIMATELY 50 MA.

Figure 37

(Item 21B on circuit diagram, 21 on parts layout.)

2. Check or replace resistor. (Item 42 on circuit diagram and parts layout.)

Next check pin marked "K" on 6V6GT tube, should read 10 to 12 volts D.C. If incorrect or no voltage, check the following:

1. Check or replace electrolytic condenser. (Item 21A on circuit diagram, 20 on parts layout.)

2. Check or replace resistor. (Item 40 on circuit diagram and parts layout.)

Now check pin marked "P" on 6AT6 tube, should read 25 to 28 volts D.C. If incorrect or no voltage check the following:

1. Check or replace condensers. (Item 19 and 20 on circuit diagram and parts layout.)

2. Check or replace resistor. (Item 39 on circuit diagram and parts layout.)

Next check pin marked "P" on 6BA6 I.F. tube, should read 215 to 225 volts D.C. If incorrect or no voltage check the following:

1. Check or replace Intermediate frequency transformer. (Item 4 on circuit diagram and parts layout.)

Now check pin marked "S" on 6BA6 I.F. tube, should read 62 to 72 volts D.C. If incorrect or no voltage check the following:

1. Check or replace resistor. (Item 35 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 11 on circuit diagram and parts layout.)

Next check pin marked "P" on 6BE6 tube, should read 215 to 225 volts D.C. If incorrect or no voltage check the following:

1. Check or replace Intermediate frequency transformer. (Item 3 on circuit diagram and parts layout.)

Next check pin marked "S" on 6BE6 tube, should read 62 to 72 volts D.C. If incorrect or no voltage check the following:

1. Check or replace resistor. (Item 35 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 11 on circuit diagram and parts layout.)

Next check pin marked "P" on 6BA6 radio frequency tube, should read 145 to 155 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace condensers. (Items 12 and 13 on circuit diagram and parts layout.)

MODEL 986516,
Chevrolet

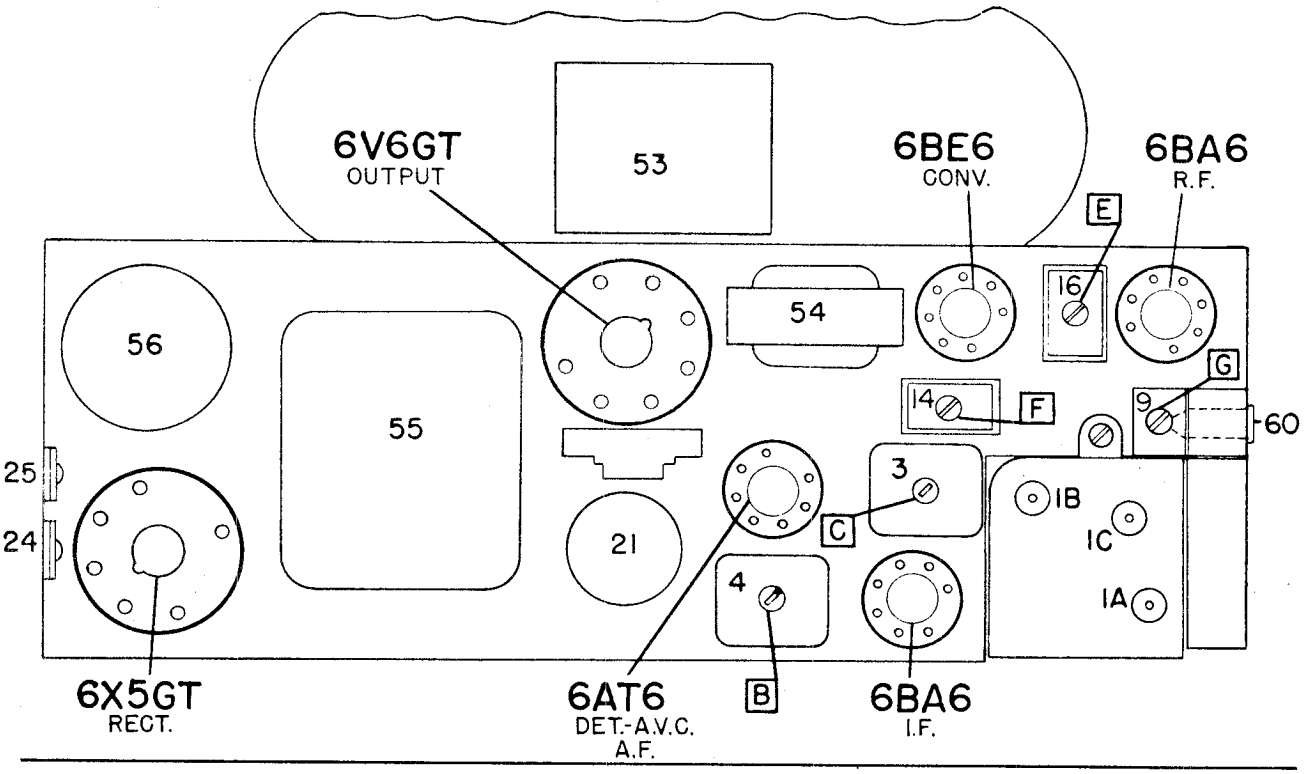


Figure 38

2. Check or replace resistor. (Item 31 on circuit diagram and parts layout.)

Next check pin marked "S" on 6BA6 radio frequency tube, should read 62 to 72 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace resistor. (Item 35 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 11 on circuit diagram and parts layout.)

We have now checked the tubes, vibrator and voltages, with these being correct and radio does not play, the trouble will be in the grid circuit of the radio. To continue it will be necessary to check the grid circuit by means of Signal Tracing.

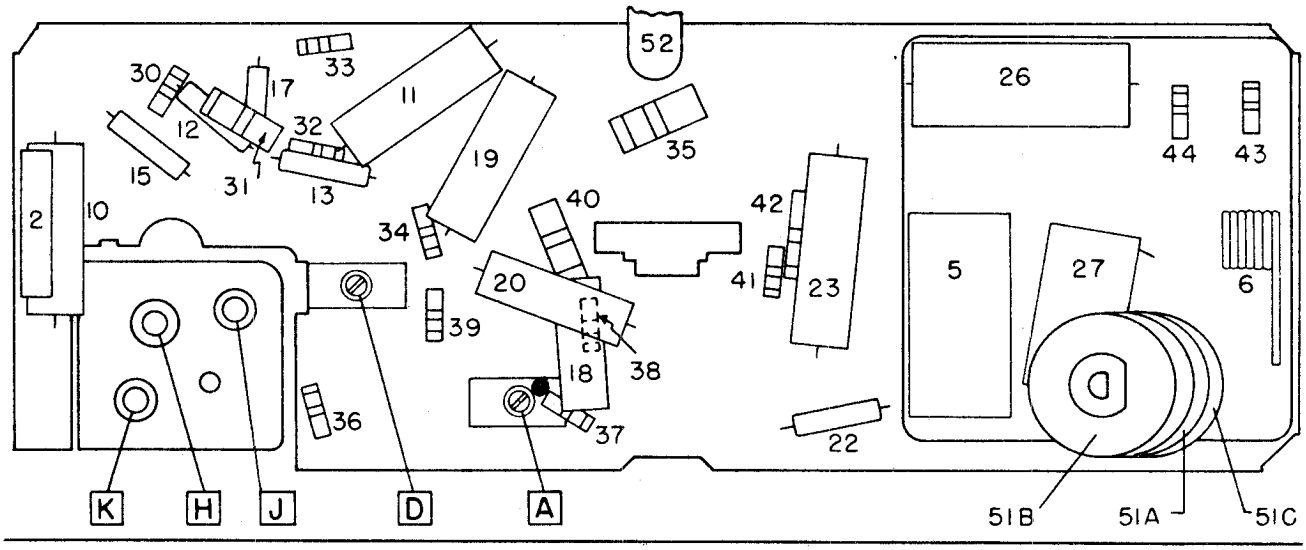


Figure 39

MODEL 986516,
Chevrolet

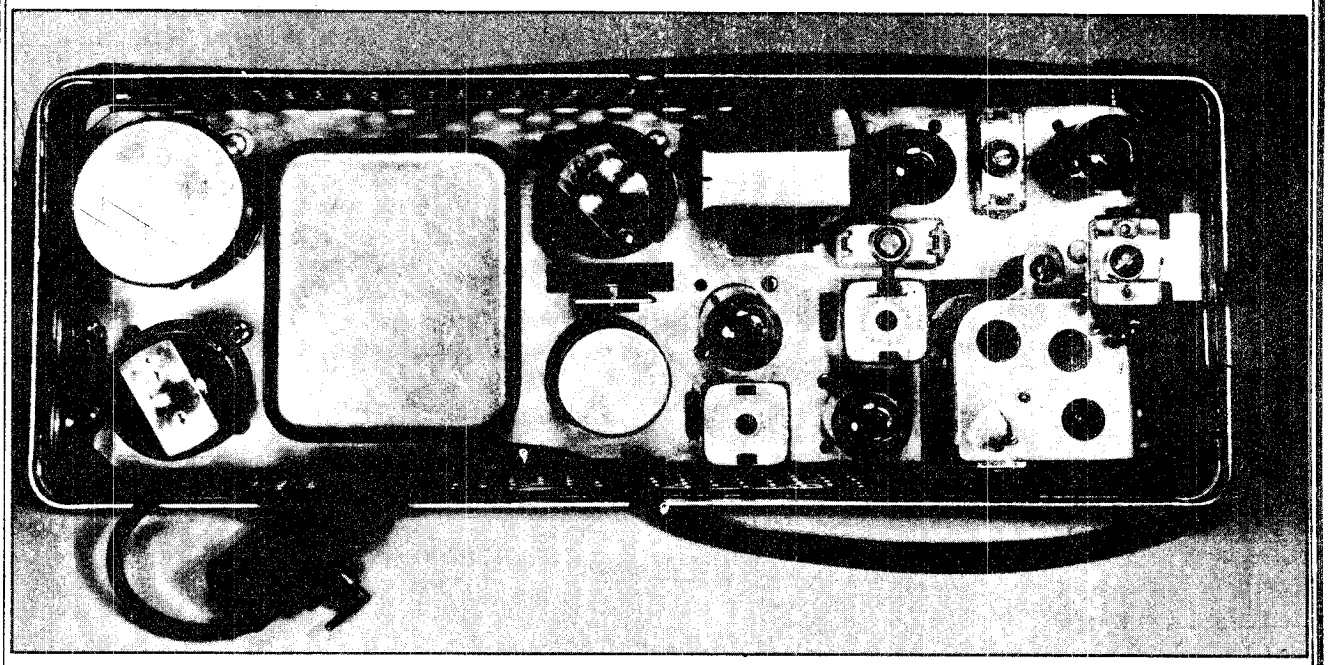


Figure 40

PROCEDURE FOR SIGNAL TRACING
RADIO 986516

Turn on Signal Generator On and Off switch, place the modulation switch in the modulated position, set Signal Generator tone control to .5, place shielded lead assembly in jack marked "Audio." Ground the black lead of Signal Generator to the radio chassis.

With red lead touch tube pin marked "P" on 6V6GT tube. If no signal check or replace the following:

1. Check or replace condenser. (Item 23 on circuit diagram and parts layout.)

2. Check or replace audio transformer. (Item 54 on circuit diagram and parts layout.)

3. Check or replace speaker. (Item 53 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6V6GT tube. If no signal check or replace the following:

1. Check or replace 6V6GT tube.

2. Check or replace 6V6GT tube socket.

Next touch tube pin marked "P" on 6AT6 tube. If no signal check or replace the following:

1. Check or replace condensers. (Items 19, 20 and 22 on circuit diagram and parts layout.)

2. Check or replace resistor. (Item 41 on circuit diagram and parts layout.)

3. Check or replace tone control. (Item 51B on circuit diagram and 51 on parts layout.)

Next touch tube pin marked "G" on 6AT6 tube. If no signal check or replace the following:

1. Check or replace 6AT6 tube.

2. Check or replace 6AT6 tube socket.

Next touch the ungrounded tube pin marked "DP" on the 6AT6 tube. If no signal check or replace the following:

1. Check or replace 6AT6 tube.

2. Check or replace 6AT6 tube socket.

Now change the shielded lead assembly to the jack marked "I.F." Intermediate Frequency on the Signal Generator, tune the Signal Generator to exactly 257.5 kilocycles, set band switch in "A" position, turn Signal Generator volume control about one third open.

Next touch tube pin marked "P" on 6BA6 I.F. amplifier tube. If no signal check or replace

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the following:

1. Check or replace intermediate frequency transformer. (Item 4 on circuit diagram and parts layout.)

2. Check or replace resistors. (Items 37 and 38 on circuit diagram and parts layout.)

3. Check or replace condenser. (Item 18 on circuit diagram and parts layout.)

4. Check or replace volume control. (Item 51A on circuit diagram and 51 on parts layout.)

Next touch tube pin marked "G" on 6BA6 I.F. amplifier tube. If no signal check or replace the following:

1. Check or replace 6BA6 tube.
2. Check or replace 6BA6 tube socket.
3. Check or replace resistor. (Item 36 on circuit diagram and parts layout.)

Next touch tube pin marked "P" on 6BE6 tube. If no signal check or replace the following:

1. Check or replace intermediate frequency transformer. (Item 3 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6BE6 tube. If no signal check or replace the following:

1. Check or replace 6BE6 tube.

2. Check or replace 6BE6 tube socket.

Now change shielded lead assembly to the "R.F." radio frequency jack on the Signal Generator, set band switch to "B" position, tune Signal Generator to 1000 kilocycles.

Tune radio receiver to 1000 kilocycles. Next touch tube pin marked "P" on 6BA6 radio frequency tube. If no signal check or replace the following:

1. Check or replace coil and core assembly. (Item 1A, 1B and 1C on circuit diagram and 1 on parts layout.)

2. Check or replace condensers. (Items 12, 13, 14, 15, 16 and 17 on circuit diagram and parts layout.)

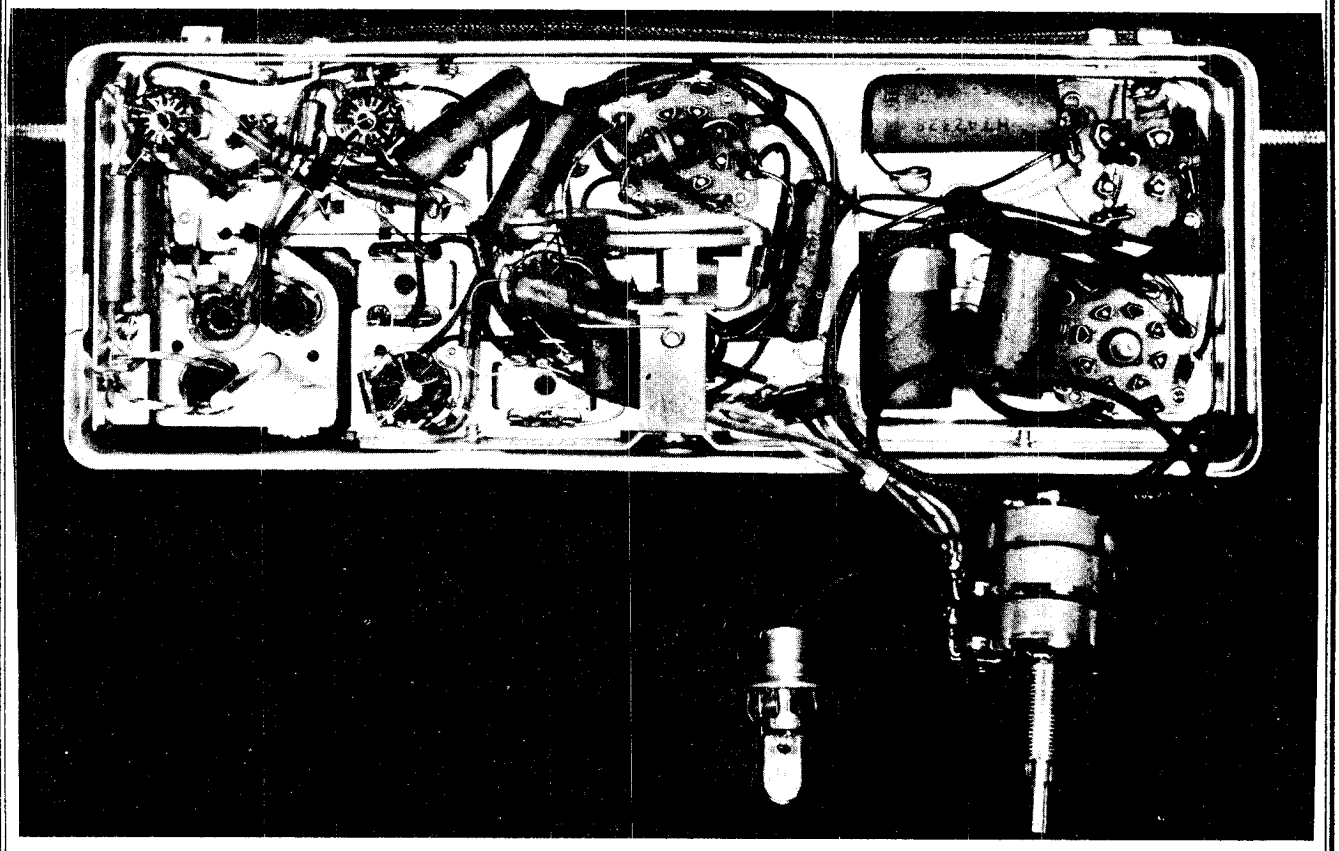
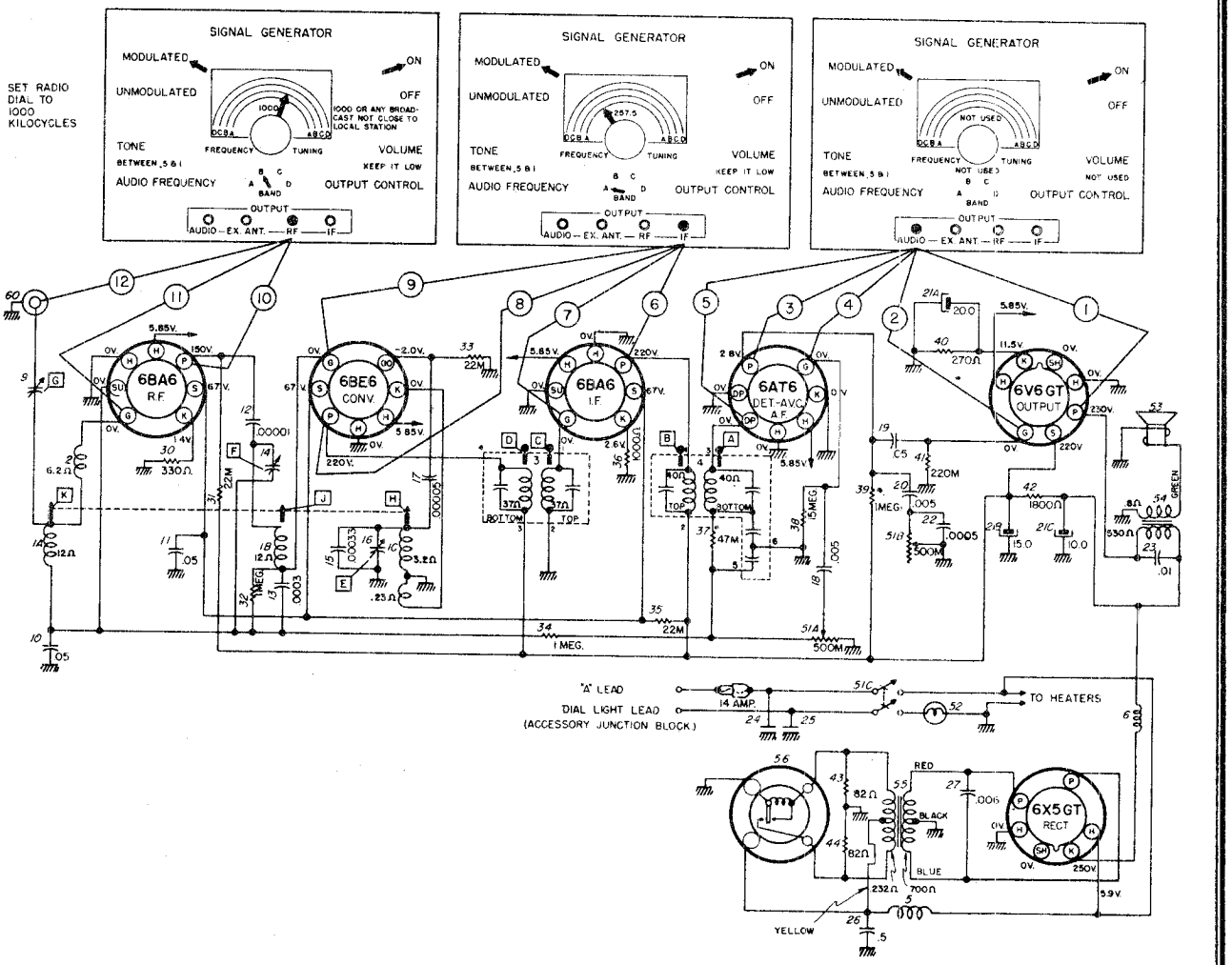


Figure 41

MODEL 986516,
Chevrolet



POINT SIGNAL STOPS - CHECK OR REPLACE ITEMS LISTED

No signal at point 1 - check or replace - items 23-53-54	No signal at point 7 - check or replace - item 36 - 6BA6 tube or tube socket
No signal at point 2 - check or replace - 6V6GT tube or tube socket	No signal at point 8 - check or replace - item 3
No signal at point 3 - check or replace - items 19-20-22-41-51B	No signal at point 9 - check or replace - 6BE6 tube or tube socket
No signal at point 4 - check or replace - 6AT6 tube or tube socket	No signal at point 10 - check or replace - items 1B-1C-12-13-14-15-16-17-32-33
No signal at point 5 - check or replace - 6AT6 tube or socket	No signal at point 11 - check or replace - 6BA6 tube or tube socket
No signal at point 6 - check or replace - items 4-18-37-38-51A	No signal at point 12 - check or replace - items 1A-2-9-10

Figure 42

Signal Tracing Procedure 986516 Radio

MODEL 986516,
Chevrolet

3. Check or replace resistors. (Items 32 and 34 on circuit diagram and parts layout.)

Next touch tube pin marked "G" on 6BA6 radio frequency tube. If no signal check or replace the following:

1. Check or replace 6BA6 tube.

2. Check or replace 6BA6 tube socket.

3. Check or replace resistor. (Item 30 on circuit diagram and parts layout.)

Next place red lead to antenna socket. If no signal check or replace the following:

1. Check or replace coil assembly. (Items 1A, 1B and 1C on circuit diagram and 1 on parts layout.)

2. Check or replace condensers. (Items 9 and 10 on circuit diagram and parts layout.)

3. Check or replace choke. (Item 2 on circuit diagram and parts layout.)

PROCEDURE FOR ALIGNMENT OF 986516 RADIO

All receivers are aligned at the factory and should require no further adjustment, unless the adjustments have been tampered with, or new coils, I.F. Transformers or tuning cores have been installed.

To properly align the receiver it will be necessary to have an output meter and signal generator. If any of the tuning coils or cores have been replaced, see "Capacity and Inductance Alignment Procedure." If only the adjustments have been tampered with or an I.F. transformer has been replaced, the receiver is aligned as follows: Set the volt-ohm-meter Master selector switch in 30 position, the voltage selector switch in A.C. 1K ~/V., place leads in jacks marked "output meter." Place the other end of the black lead to the radio chassis for ground. Place red lead to the terminal of the speaker to which the green wire of the Audio transformer is connected, as outlined in the 1950 Chevrolet Radio Service and Shop Manual. (Speaker is item 53 and audio output transformer item 54 on circuit diagram and parts layout.)

Turn on the On and Off switch of the Signal Generator, turn radio receiver on with volume control turned to maximum position, set modulation switch in modulated position, turn band selector switch to "A" position, tune Signal Generator to exactly 257.5 kilocycles. Place shielded lead in "I.F." jack, place black lead to radio chassis for ground, red lead to 6BE6 tube pin marked "G."

Adjust Signal Generator volume control so that the meter reads about 10 on the meter scale. Adjust in sequence trimmers "A, B, C and D" (on circuit diagram and parts layout) for maximum reading on the meter scale. (Keep the Signal Generator volume control turned down so that during adjustments the meter does not read more than 10 on the meter scale.)

Now place Signal Generator shielded lead assembly in the jack marked "R.F.", set band selector in "B" position, tune Signal Generator to exactly 1610 kilocycles, place the red lead to a .000075 mfd. condenser and connect to the antenna connector. Tune radio receiver to stop on the 1600 kilocycle end of dial. (Keep Signal Generator volume control adjusted so the meter reads about 10 on the meter scale.)

Now adjust trimmers "E, F and G" (on circuit diagram and parts layout) for maximum reading on meter scale. Repeat for best alignment. After the receiver has been installed in the car tune in a weak station near 1400 kilocycles, with volume control turned to maximum and antenna extended to full height. Readjust trimmer "G" only for maximum volume.

CAPACITY AND INDUCTANCE ALIGNMENT

This alignment procedure is to be used only when the tuner unit with the antenna, radio frequency, oscillator coils and tuning cores have been changed.

The intermediate frequency alignment at 257.5 kilocycles is the same as outlined in "Alignment Procedure" on page 18. After completing the alignment at 257.5 kilocycles for the intermediate frequency transformers "A, B, C and D" proceed as follows: Connect Signal Generator red lead to a .000075 mfd. condenser, and connect to antenna connector. Set Signal Generator to exactly 1610 kilocycles, tune radio receiver to stop at 1600 kilocycle end of dial. Have output meter hooked-up as outlined in "Alignment Procedure." Adjust trimmers "E, F and G" for maximum reading on meter scale.

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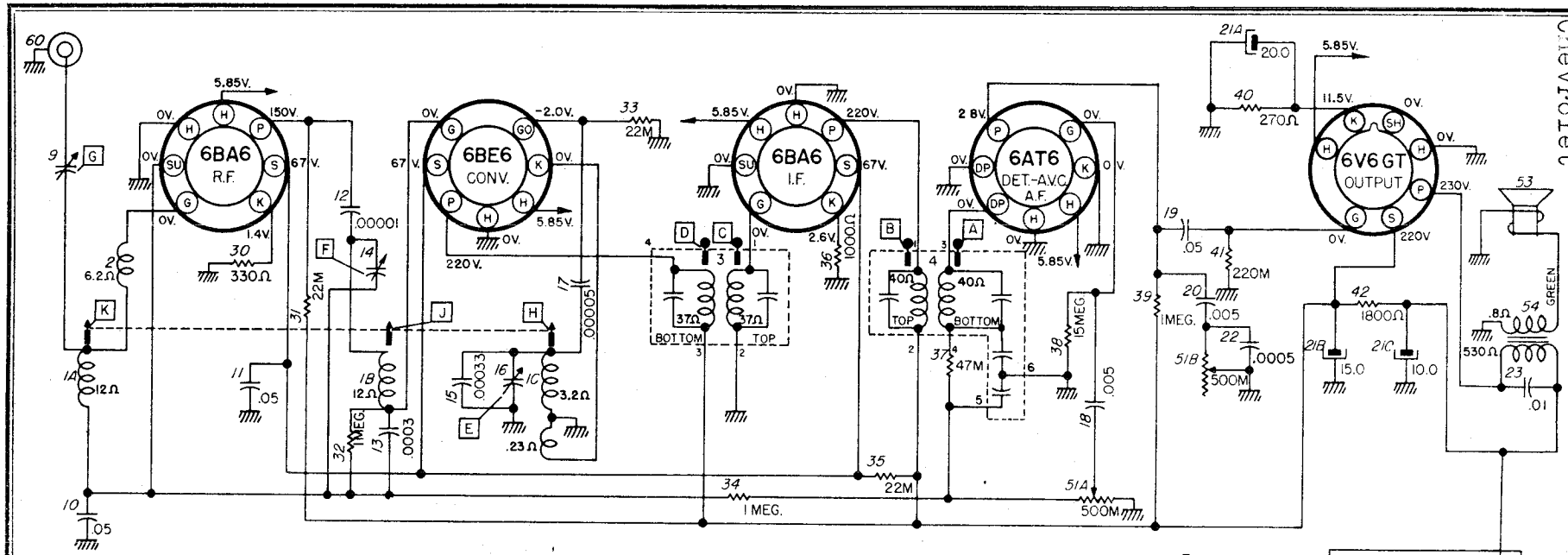
Next tune Signal Generator to exactly 1400 kilocycles, tune radio receiver to exactly 1400 on the dial and adjust iron cores "H, J and K" for maximum reading on output meter scale. NOTE: The front end of the iron cores are slotted so that these adjustments can be made with a non-metallic screw driver that fits loosely in the coil form.

Repeat alignment procedure at 1610 and 1400 kilocycles until the maximum reading has been attained at 1600 and 1400 kilocycles adjustments.

After the receiver has been installed in the car, tune in a weak station near 1400 kilocycles, with volume control turned to maximum position and antenna extended to full height. Readjust trimmers "G" only for maximum volume.

SERVICE PARTS LIST 986516 RADIO

Illus. No.	Service Part No.	Description
1	1219701	Coil Assembly - Permability Tuning
1A		Antenna Coil
1B		R.F. Coil
1C		Oscillator Coil
2	1218639	Antenna Spark Choke
3	1219702	1st I.F. Transformer
4	1219703	2nd I.F. Transformer
5	1219704	Hash Choke
6	1219705	B Choke
		CONDENSERS
9	1219706	Antenna Trimmer
10	7230592	.05 mfd. 600V. Tubular
11	7230592	.05 mfd. 600V. Tubular
12	1215189	.0001 mfd. Molded
13	7232957	.0003 mfd. Molded
14	1218636	R.F. Trimmer
15	1219566	.00033 mfd. Temperature Compensating
16	1218635	Oscillator Trimmer
17	1207625	.00005 mfd. Molded
18	7230767	.005 mfd. 100V. Tubular
19	7230592	.05 mfd. 600V. Tubular
20	7230767	.005 mfd. 400V. Tubular
21	1218009	Electrolytic Condenser
21A		20 mfd. 25V.
21B		15 mfd. 350V.
21C		10 mfd. 350 V.
22	1216881	.0005 mfd. Molded
23	1208600	.01 mfd. 600V. Tubular
24	1219707	Spark Plate
25	1219707	Spark Plate
26	1214939	.5 mfd. 100V. Tubular
27	7240906	.006 mfd. 1600V. Tubular
		RESISTORS
30	1213224	330 ohm 1/2W. Insulated
31	1216156	22,000 ohm 1W. Insulated
32	1213282	1 megohm 1/2W. Insulated
33	1214550	22,000 ohm 1/2W. Insulated
34	1213282	1 megohm 1/2W. Insulated
35	7240590	22,000 ohm 2W. Insulated
36	1213235	1000 ohm 1/2W. Insulated
37	1213289	15 megohm 1/2W. Insulated
38	1213282	1 megohm 1/2W. Insulated
39	1213846	270 ohm 1W. Insulated
40	1214555	220,000 ohm 1/2W Insulated
41	1214573	1800 ohm 2W. Insulated
42	1214541	82 ohm 1/2W. Insulated
43	1214541	82 ohm 1/2W. Insulated
44	1214553	47,000 ohm 1/2W. Insulated
		TUBES
	1217690	6BA6 R.F. Amplifier
	1217691	6BE6 Oscillator - Modulator
	1217690	6BA6 I.F. Amplifier
	1218105	6AT6 Detector A.V.C. 1st Audio
	1213793	6V6GT Audio Output
	1213794	6X5GT Rectifier
		MISCELLANEOUS ELECTRICAL PARTS
51	1219708	Control-Volume, Tone, Switch
51A		Volume Control
51B		Tone Control
51C		On-Off Switch
52	125588	Lamp - Dial (Mazda 44)
53	1219709	Speaker 5"x7" Permanent Magnet
54	1219710	Transformer - Audio Output
55	1219711	Transformer - Power
56	7239124	Vibrator
		MECHANICAL PARTS
60	1218651	Socket - Antenna Connector
	7236279	Socket - Octal Tube
	1219570	Socket - Miniature Tube
	7239125	Socket - Vibrator
	1219713	Socket - Pilot Lamp
	1219714	Case - Wraparound (includes spark plates)
	1219586	Clip - I.F. Transformer Mtg.
	1219716	Cover - Front
	1219717	Cover - Rear
	1219718	Spring - Tension, Pointer Return
	1219719	Link - Pointer
	1219720	Pointer
	1219722	Dial
	1219723	Escutcheon
	1219724	Nut - Control Mounting
	1219725	Background - Dial
	1219727	Clip - Pointer Adjust
	1219728	Lever - Pointer
	1219731	Spring - Dial Retaining R.H.
	1219732	Spring - Dial Retaining L.H.



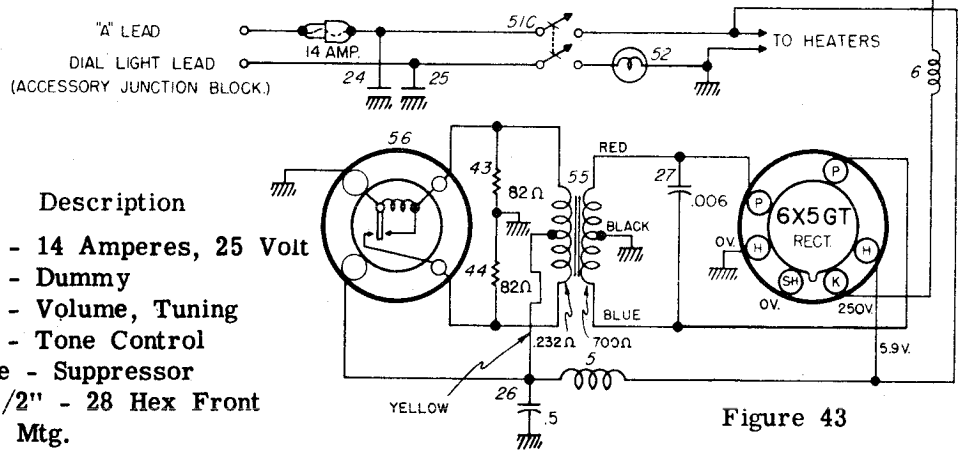


Figure 43

Circuit Diagram - 986516 Radio

INSTALLATION PARTS

1219746	Package - Mounting Contains the following parts:
1219729	Shroud - Speaker
7257921	Body - Fuse Holder, Male

Service Part No.	Description
7259735	Bracket - Receiver Mounting, R.H.
7259736	Bracket - Receiver Mounting, L.H.
7259940	Brace - Receiver Mounting, Rear
1912900	Condenser - Generator
1910147	Condenser - Ignition Coil
1912900	Condenser - Voltage Regulator
494786	Static Collector - Front Wheel

Service Part No.	Description
147685	Fuse - 14 Amperes, 25 Volt
7259734	Knob - Dummy
7259733	Knob - Volume, Tuning
7259738	Knob - Tone Control
1888204	Nipple - Suppressor
7235969	Nut 1/2" - 28 Hex Front Panel Mtg.
1219737	Trim Plate
1887829	Suppressor - Distributor

TUBE SOCKETS VIEWED FROM TERMINAL SIDE. VOLTAGES MEASURED FROM SOCKET TERMINALS TO CHASSIS WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT. ALL VOLTAGES POSITIVE UNLESS OTHERWISE DESIGNATED. READINGS TAKEN WITH 5.9 VOLTS AT SPARK PLATE. TOLERANCE ON VOLTAGES ± 10%

TOTAL CURRENT DRAIN (PERMANENT MAGNET SPEAKERS) 6.5 AMPS.
"B" SUPPLY DRAIN 50 MA

CUSTOM DELUXE TRUCK PUSH BUTTON RADIO MODEL 986443

This radio is single unit five tube (plus rectifier) radio designed expressly for 1951 Chevrolet Trucks, and can also be installed on 1947-48-49 and 50 Chevrolet Trucks. The receiver has been designed in conjunction with the truck and when installed, becomes an integral part of the instrument panel, with dial, push buttons and controls extending through the instrument panel. In this type of design, the speaker is integral with the receiver and instrument panel by means of a special rubber gasket which, due to location and baffling, permits exceptionally good tone quality. The receiver incorporates a five station mechanical tuning unit which permits easy instant tuning.

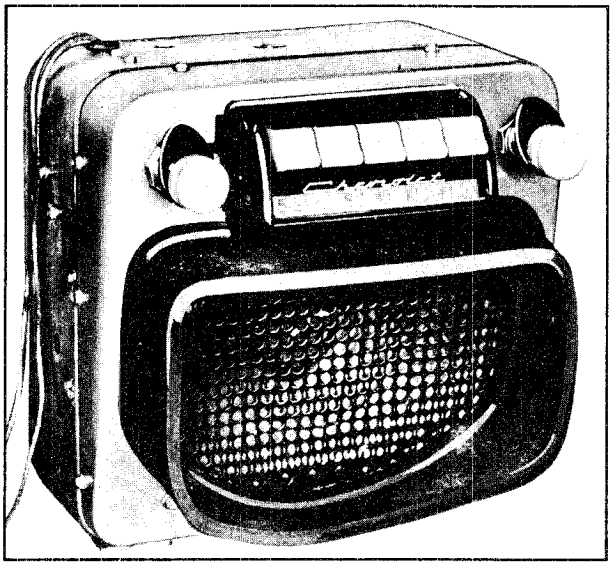


Figure 52

PUSH BUTTON TUNING

An outstanding feature of the 986443 radio is the new simplified method of setting up the push buttons, which can be done easily by anyone, without any tools. With this type of push button tuning which is completely mechanical, (no cords or pulleys are used), assures trouble free operation and constant calibration of the radio stations set on the push buttons at all times.

PROCEDURE FOR SETTING PUSH BUTTONS

Turn on the receiver for ten minutes or longer to allow circuits to stabilize.

1. Pull button slightly to the left and out as far as it will go.
2. Tune in station desired with manual tuning knob to clearest and loudest point.
3. Push button in firmly to end of travel. Repeat same procedure for remaining four buttons.

ELECTRICAL DESCRIPTION

The circuits used in this receiver are of the super-heterodyne type and use no regeneration. The tuning circuits are of the permeability type and are tuned by varying the iron tuning cores in and out of the antenna, radio frequency and oscillator coils, like pistons. (See Figure 53.)

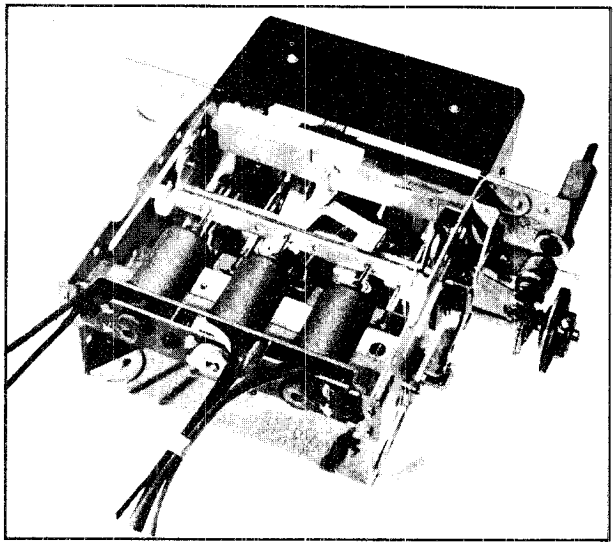


Figure 53

The intermediate frequency stages are tuned by means of two adjustable iron cores, one located on the top side and the other on the bottom side of the transformer. Both the first (input) and second (output) intermediate frequency transformers are tuned by this method. (See Figure 54.)

The antenna circuit is capacity coupled to the antenna by means of an antenna trimmer condenser to take care of normal variations in antenna and antenna coil capacity. The antenna condenser is adjustable by means of a small screw driver, and is located on the bottom side of the radio case. The audio stage is transformer coupled to the output tube to take advantage of all the gain and tone quality that

MODEL 986443,
Chevrolet Truck

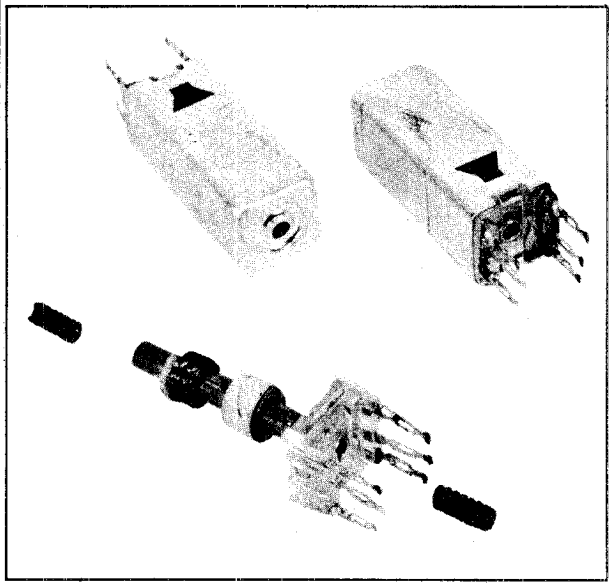


Figure 54

the receiver is capable of developing. The automatic volume control is of the delayed signal type and is very capable of maintaining a constant level of volume at all times. Very high frequency filter chokes are used in the radio frequency and oscillator grid circuits to discriminate against ignition interference in the receiver, thus eliminating the use of spark plug suppressors. The vibrator is the full wave non-synchronous type using an OZ4 rectifier tube and will work on either a negative or positive ground.

TUBE COMPLEMENT AND FUNCTION

6SK7	Radio Frequency Amplifier
6SA7	Oscillator - Modulator
6SK7	Intermediate Frequency Amplifier
6SQ7GT	Second Detector - Automatic Volume Control, First Audio
6V6GT	Audio Output
OZ4	Cold Cathode Rectifier

GENERAL DESCRIPTION

Tuning range 540 to 1615 kilocycles.
Intermediate frequency 262 kilocycles.
Maximum power output 4.5 watts.
Undistorted power output 3 watts.
Current drain with permanent magnet speaker 6.1 amperes at 6 volts.
Speaker size 6" x 9" Elliptical type, permanent magnet.
Voice coil impedance 4 ohms at 400 cycles.

Fuse protection 14 amperes 25 volt.

INSTALLATION PROCEDURE
TRUCK RADIO AND ANTENNA

All 1951 Chevrolet trucks will use the cowl type antenna, which will mount on the left-hand side of cab cowl. (See Figure 55.)

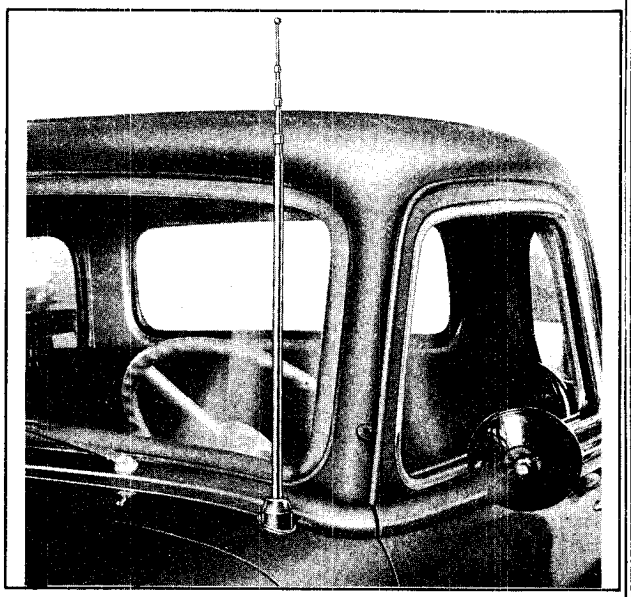


Figure 55

1. Assemble lead-in cable "P" and bracket "N" to antenna mast, then place spacer "F" over rod assembly

2. Place template on outside of cowl, left-hand side, lining up with body contour as indicated and drill 13/16" hole, scrape sound deadening from underside of cowl to insure good ground for antenna.

3. Pass antenna mast from inside cab thru 13/16" hole in cowl and attach bracket "O" to bracket "N" with bolt and nut "J" and "Q," fasten bracket "O" to side panel with self-tapping screws "L" and "M." DO NOT TIGHTEN. (See Figure 56.)

4. Place rubber pad "E," spacer "D" and nut "C" over antenna mast and tighten nut "C," make sure seal "G" is placed, then slip top insulator "B" over antenna and tighten. (See Figure 56.)

5. Tighten self-tapping screws "L" and "M" also bolt and nut "J" and "Q" making sure antenna is perpendicular.

MODEL 986443,
Chevrolet Truck

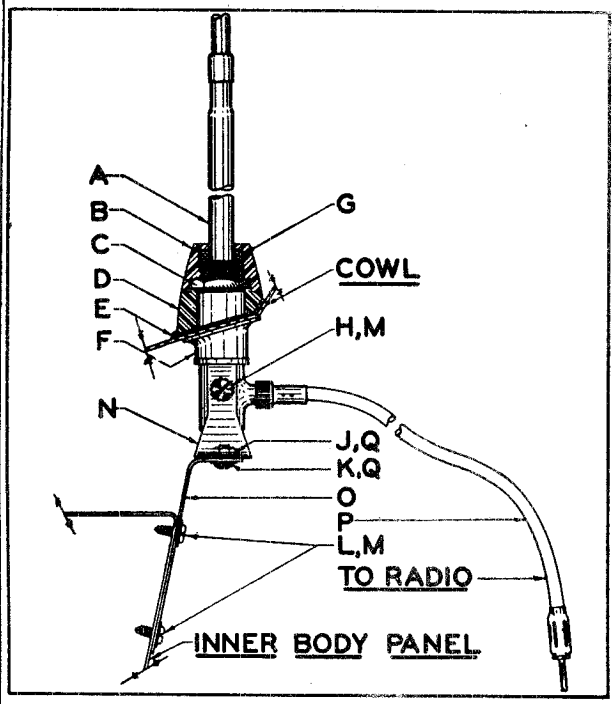


Figure 56

INSTALLATION OF RECEIVER AND NOISE SUPPRESSION EQUIPMENT

After unpacking and checking radio, place on bench and hook-up radio to 6 volt power unit (or fully charged battery) and allow radio to play while installing suppression equipment. Fill out the warranty label on the rear cover to show owner's name and date of installation.

RADIO THAT WILL PLAY FOR 15 MINUTES BEFORE INSTALLATION WILL GIVE MANY MONTHS OF UNINTERRUPTED SERVICE. CHECK ALL RADIOS BEFORE INSTALLATION.

1. Mount generator condenser on generator. (See Figure 57.)

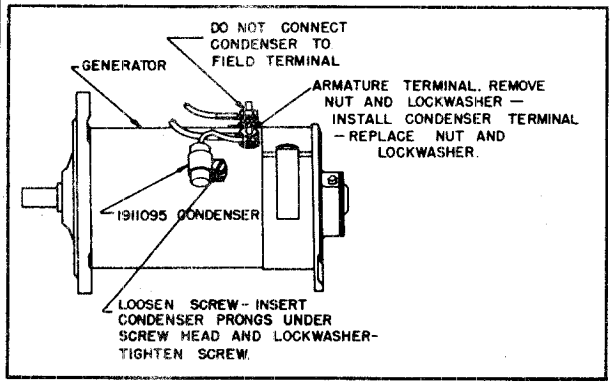


Figure 57

2. Install distributor suppressor and rubber nipple on high tension coil wire. (See Figure 58.)

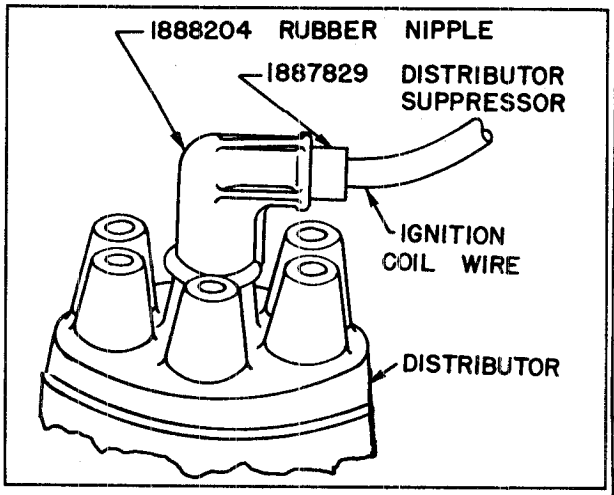


Figure 58

3. Remove front wheel hub and dust caps and install front wheel static collectors. Remove any grease from hole center of spindle to make a good connection, bend cotter pin to clear static collector. (See Figure 59.) These cannot be used on the 1-1/2 and 2 ton models.

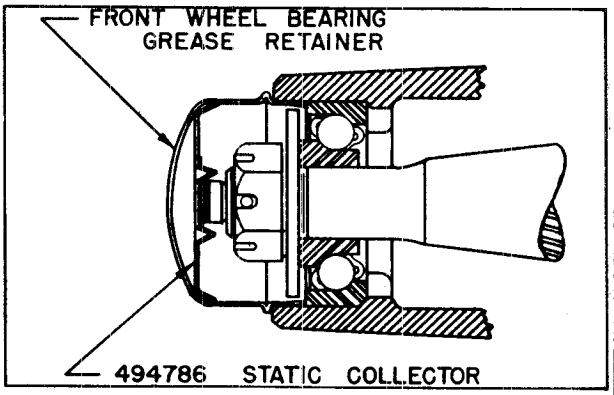


Figure 59

4. Install ignition coil condenser on ignition coil. (See Figure 60.)

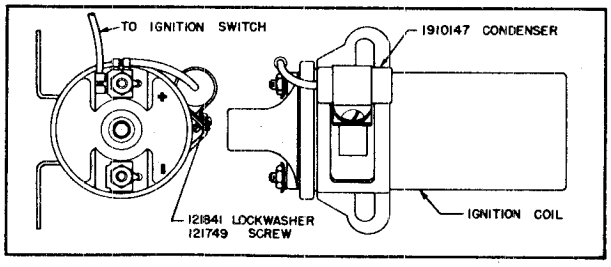


Figure 60

MODEL 986443,
Chevrolet Truck

5. Install voltage regulator condenser on voltage regulator. (See Figure 61.)

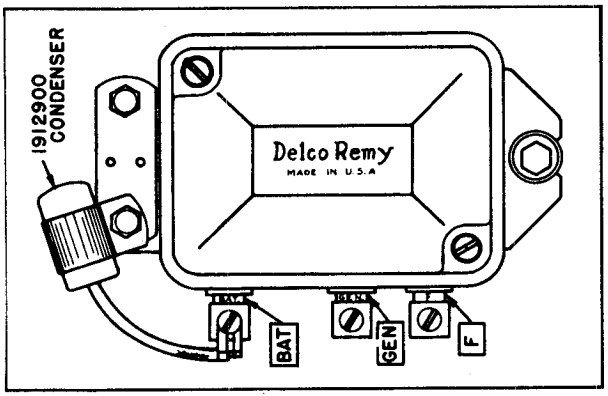


Figure 61

6. Install ammeter condenser and male fuse holder body to ammeter by first placing hex nut on discharge terminal of ammeter about 3/8." Connect one lug of ammeter condenser to same terminal and then assemble male portion of fuse holder to ammeter stud. Connect other end of ammeter condenser to instrument panel for ground. (See Figure 62.)

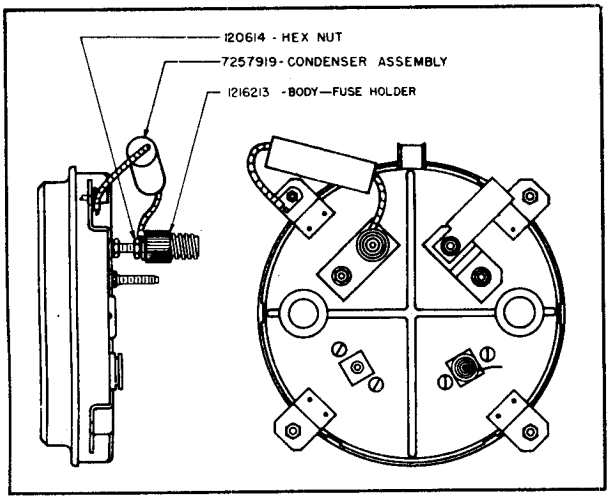


Figure 62

7. Remove the decorative plate, the two buttons from the center of the instrument panel and the black cardboard baffle from the rear side of the radio grille.

8. Assemble the two lower mounting spacers with the bolts, lockwashers and rubber washers, to the proper holes in lower flange of instrument panel, with the bolts just short of sticking through the spacers. (See Figure 63.)

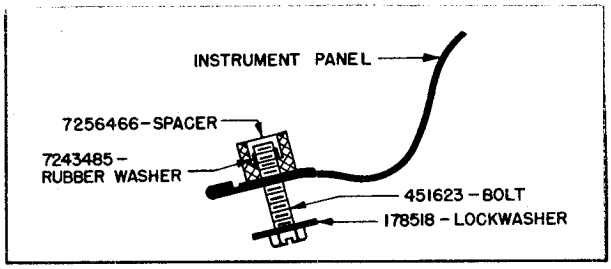


Figure 63

9. Assemble the two upper mounting spacers on the manual tuning control and volume control bushings. (See Figure 64.)

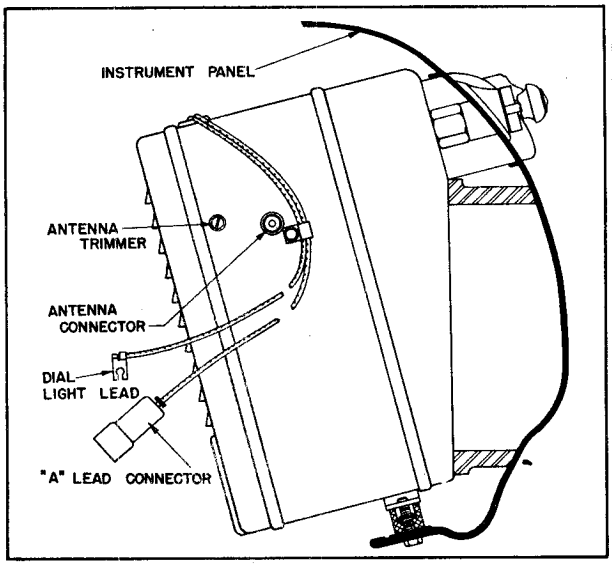


Figure 64

10. Open cowl ventilator. Place the receiver behind the instrument panel and insert the control bushings and dial escutcheon into the proper panel openings. (See Figure 65.)

11. Assemble one control bushing escutcheon and one hex nut on each control bushing. Tighten hex nuts. (See Figure 65.)

12. Assemble the two lower mounting bolts in the weld nuts in bottom of receiver and tighten securely. (See Figure 64.)

13. Install the tone control knob, felt washer and volume control knob on the left-hand shaft. Install the dummy knob, felt washer and manual tuning knob on the right-hand shaft. (See Figure 65.)

14. Insert fuse in male fuse holder on ammeter, connect female fuse holder on receiver

MODEL 986443,
Chevrolet Truck

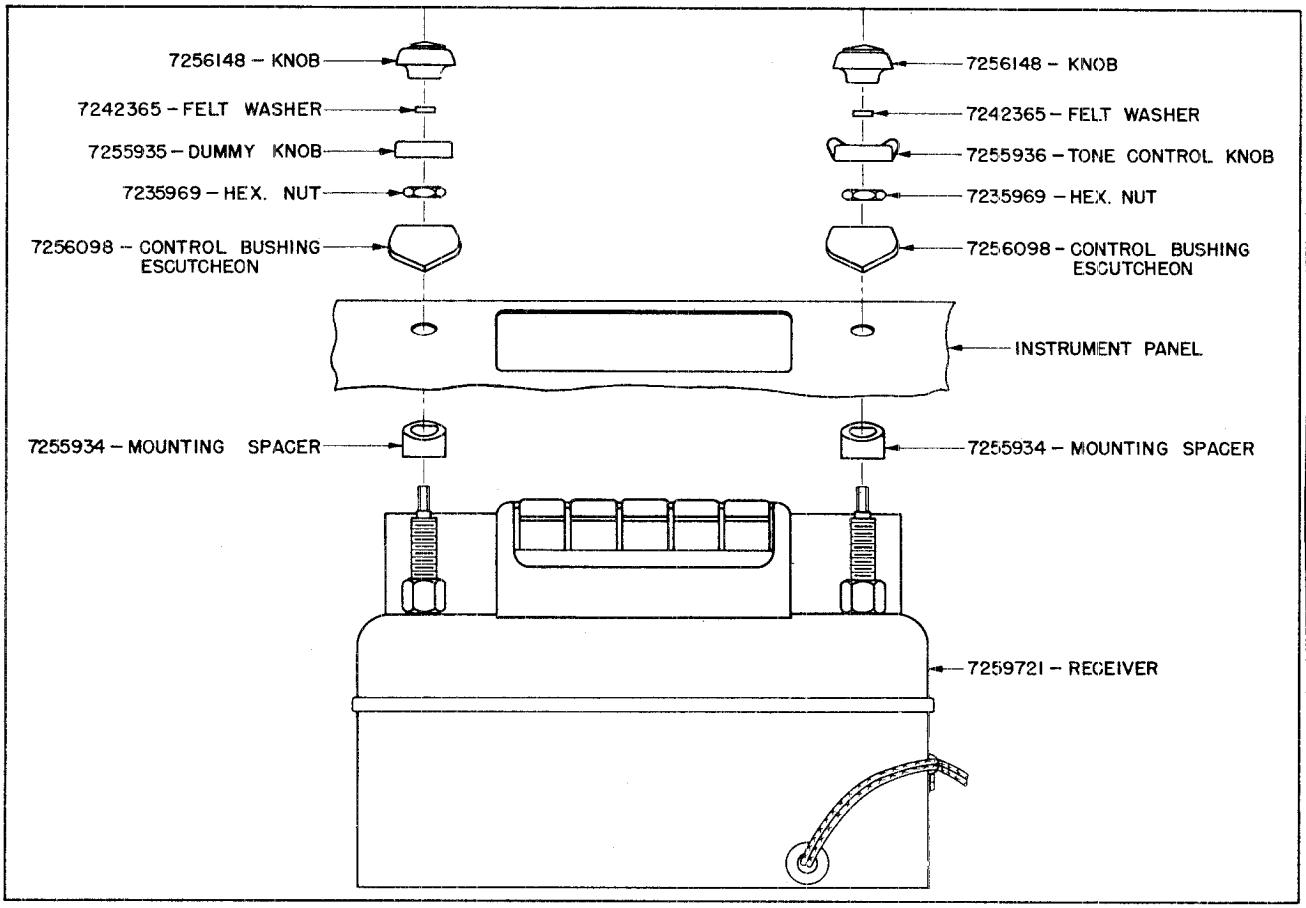


Figure 65

"A" lead to male fuse holder. (See Figure 64.)

15. Plug the antenna lead into the antenna socket on side of the receiver. (See Figure 64.)

16. Connect dial light lead to the instrument panel light terminal on the truck lighting switch. (See Figure 66.)

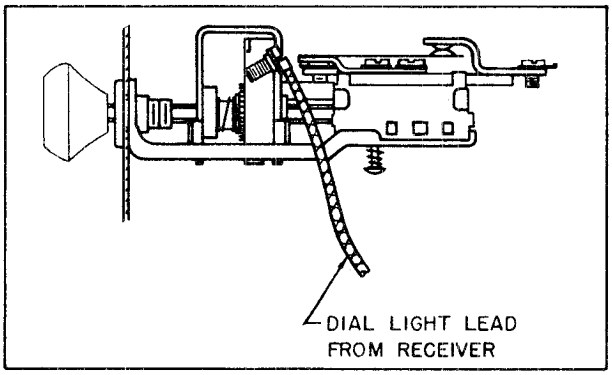


Figure 66

17. Raise antenna to full height and tune in a weak station near 140 on the dial, with volume turned to maximum position. Adjust antenna trimmer for maximum volume.

PROCEDURE FOR SERVICING 986443 TRUCK RADIO

The same procedure for operating radio test equipment as outlined for 986515

PROCEDURE FOR CHECKING VOLTAGES OF 986443 TRUCK RADIO

It will be necessary to remove the front cover of the receiver.

Hook-up radio on the service bench to a 6 volt power unit or a fully charged battery.

Now set the Master selector switch of the

MODEL 986443,
Chevrolet Truck

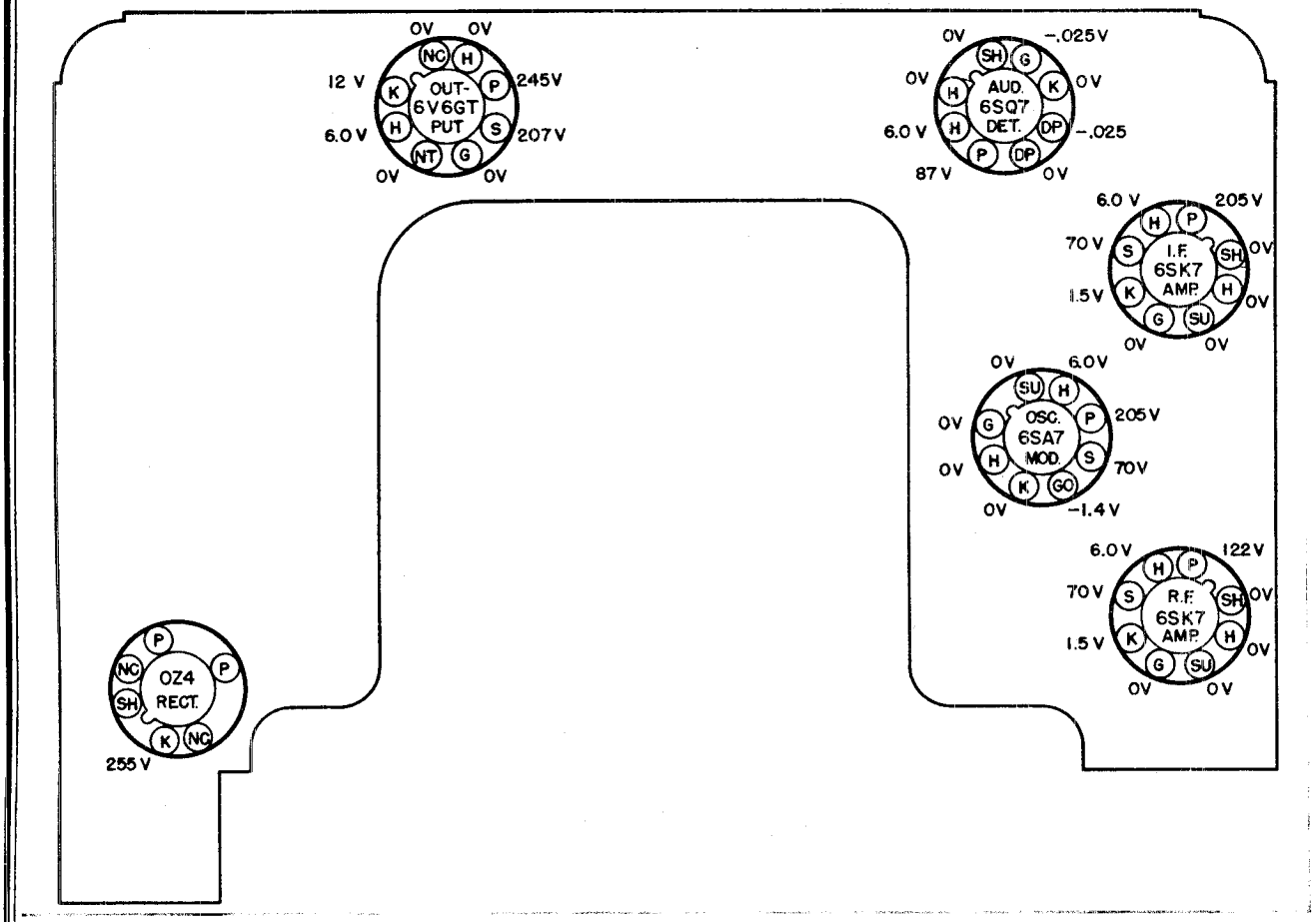


Figure 67

volt-ohm-milliammeter to the 12 position, set the voltage selector switch to D.C. 1K ~/V. position. Place test leads in jacks marked "Test leads," ground the "-" negative lead to the radio chassis for ground, with the red lead check all tube pins marked "H" which show a reading on the voltage chart. (See Figure 67.)

If no voltage or incorrect check or replace the following:

1. Check or replace On and Off switch. (Item 55C on circuit diagram and 55 on parts layout.)
2. Check or replace condensers. (Items 26A, 26B and 27 on circuit diagram and parts layout.)
3. Check or replace choke. (Item 10 on circuit diagram and parts layout.)
4. Check or replace condensers 26A, 26B and 27 on circuit diagram and parts layout.
5. Check for open or loose connection in the 6 volt circuit.

Now set the Master selector switch to 600 position and the voltage selector switch to A.C. 1K ~/V. position. With red lead check the OZ4 tube pins marked "P," each should read 270 to 280 volts A.C. If incorrect or no voltage check or replace the following:

1. Check or replace condenser. (Item 28 on circuit diagram and parts layout.)
2. Check or replace resistor. (Item 48 on circuit diagram and parts layout.)
3. Check or replace power transformer. (Item 60 on circuit diagram and parts layout.)
4. Check or replace vibrator. (Item 61 on circuit diagram and parts layout.)
5. Check or replace vibrator socket.

MODEL 986443,
Chevrolet Truck

Now change the Master selector switch to the 300 position and the voltage selector switch to D.C. 1K -∿-/V. position. Now check the voltage on tube pin marked "K" of the OZ4 tube. It should read 250 to 260 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace OZ4 tube.

2. Check or replace OZ4 tube socket.

Next check tube pin marked "P" of the 6V6GT tube. It should read 240 to 250 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace electrolytic condenser. (Item 20B on circuit diagram and Item 20 on parts layout.)

2. Check or replace audio output transformer. (Item 59 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6V6GT tube, should read 202 to 212 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace electrolytic condenser. (Item 20C on circuit diagram and Item 20 on parts layout.)

2. Check or replace resistor. (Item 49 on circuit diagram and parts layout.)

Next check tube pin marked "K" on 6V6GT tube, should read 10 to 14 volts D.C. If incorrect or no voltage, check or replace the following:

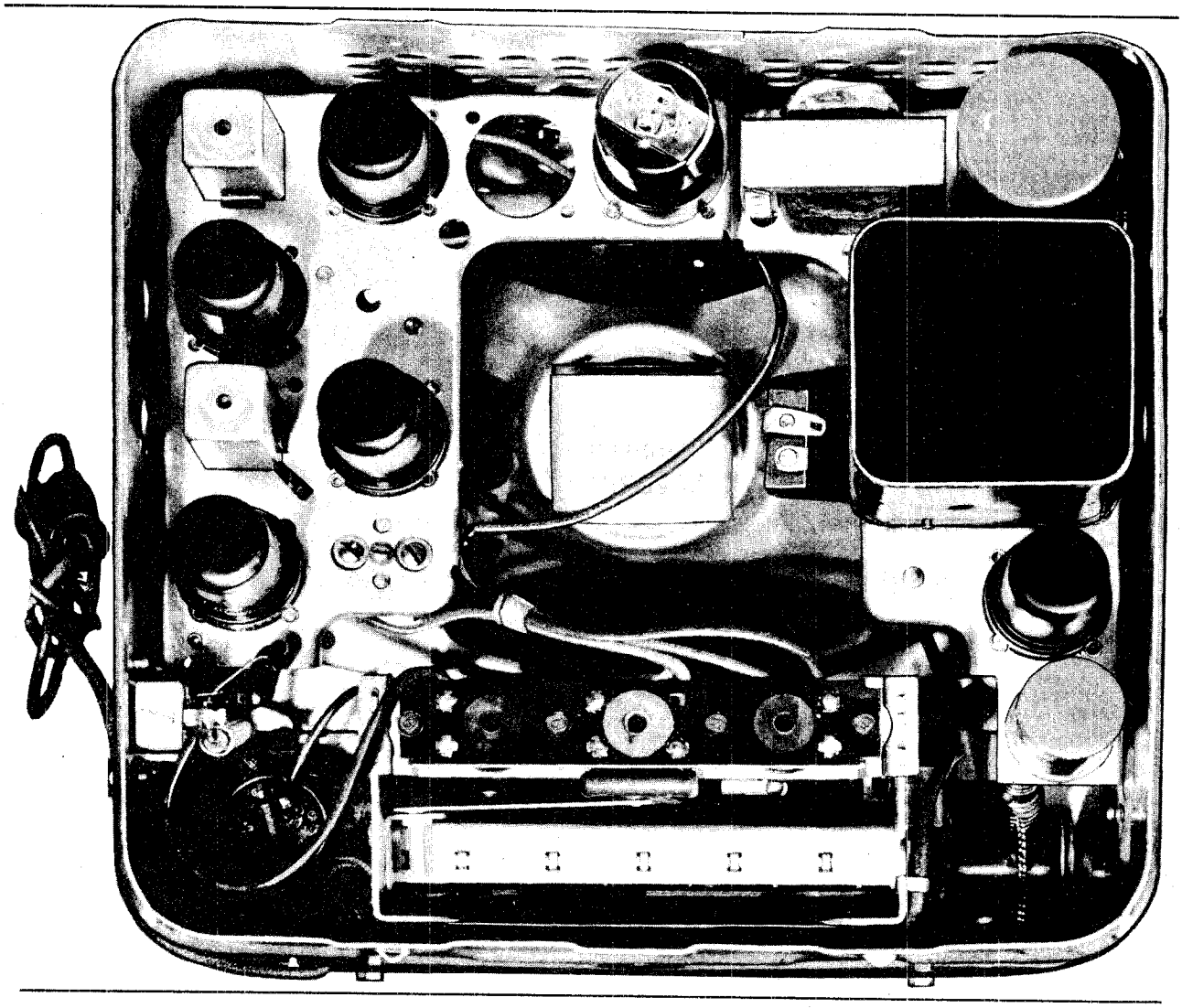


Figure 68

MODEL 986443,
Chevrolet Truck

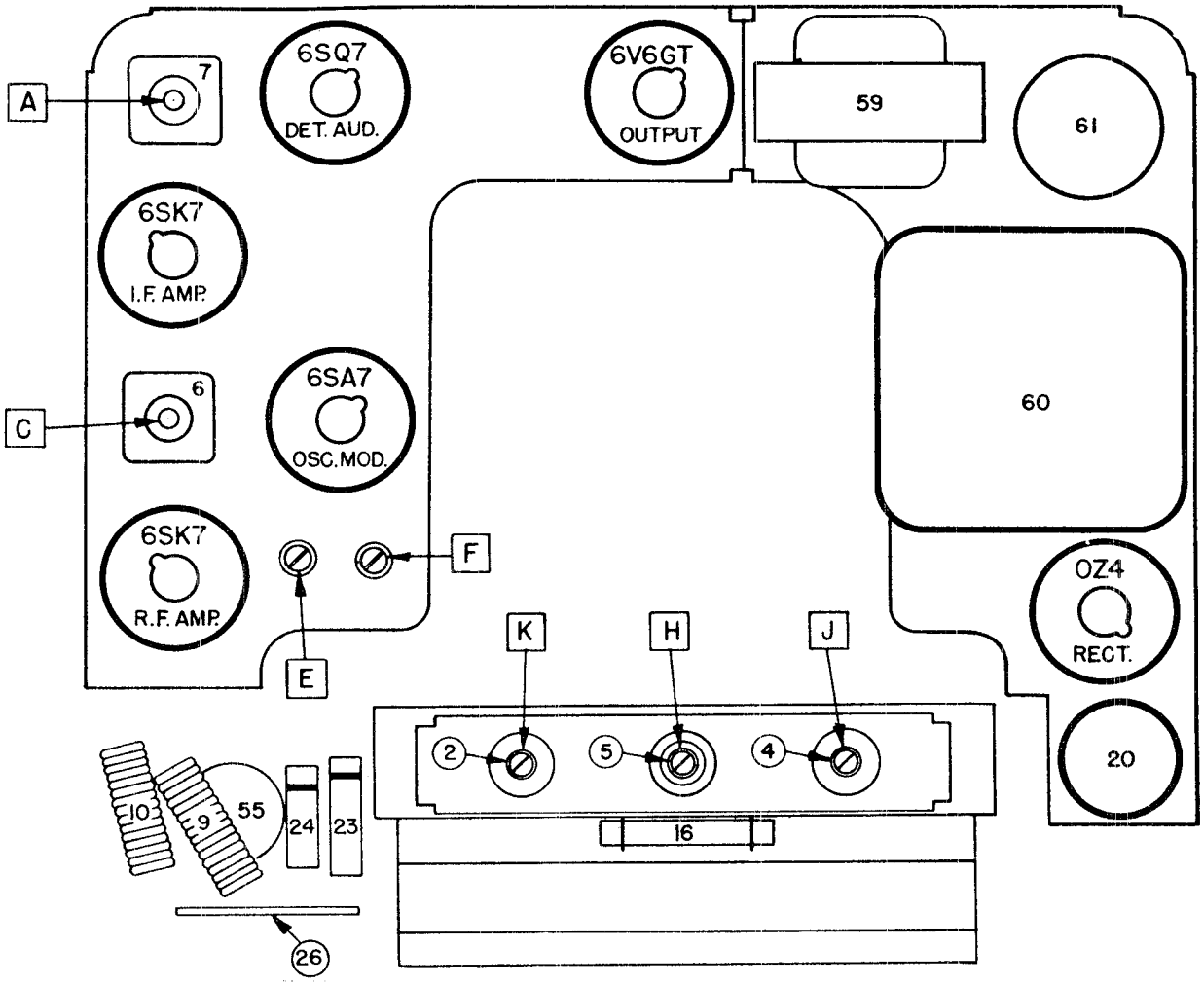


Figure 69

1. Check or replace electrolytic condenser. (Item 20A on circuit diagram and Item 20 of parts layout.)

2. Check or replace resistor. (Item 46 on circuit diagram and parts layout.)

Next check tube pin marked "P" on 6SQ7GT tube, should read 82 to 90 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace condensers. (Items 19, 21, 22, 23 and 24 on circuit diagram and parts layout.)

2. Check or replace resistor. (Item 44 on circuit diagram and parts layout.)

Next check tube pin marked "P" of the 6SK7 intermediate frequency amplifier tube, should read 200 to 210 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace intermediate frequency transformer. (Item 7 on circuit diagram and parts layout.)

Next check tube pin marked "S" of the 6SK7 I.F. amplifier tube, should read 65 to 75 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace resistor. (Item 37 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

Next check tube pin marked "P" of the 6SA7 tube, should read 200 to 210 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace intermediate frequency transformer. (Item 6 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6SA7 tube, should read 65 to 75 volts D.C. If incorrect or no voltage check or replace the following:

1. Check or replace resistor. (Item 37 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

Next check tube pin marked "P" on 6SK7 radio frequency amplifier tube, should read 117 to 127 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace resistor. (Item 38 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 13 on circuit diagram and parts layout.)

Next check tube pin marked "S" on 6SK7 R.F. amplifier tube, should read 65 to 75 volts D.C. If incorrect or no voltage, check or replace the following:

1. Check or replace resistor. (Item 37 on circuit diagram and parts layout.)

2. Check or replace condenser. (Item 12 on circuit diagram and parts layout.)

We have now checked the tubes, vibrator and

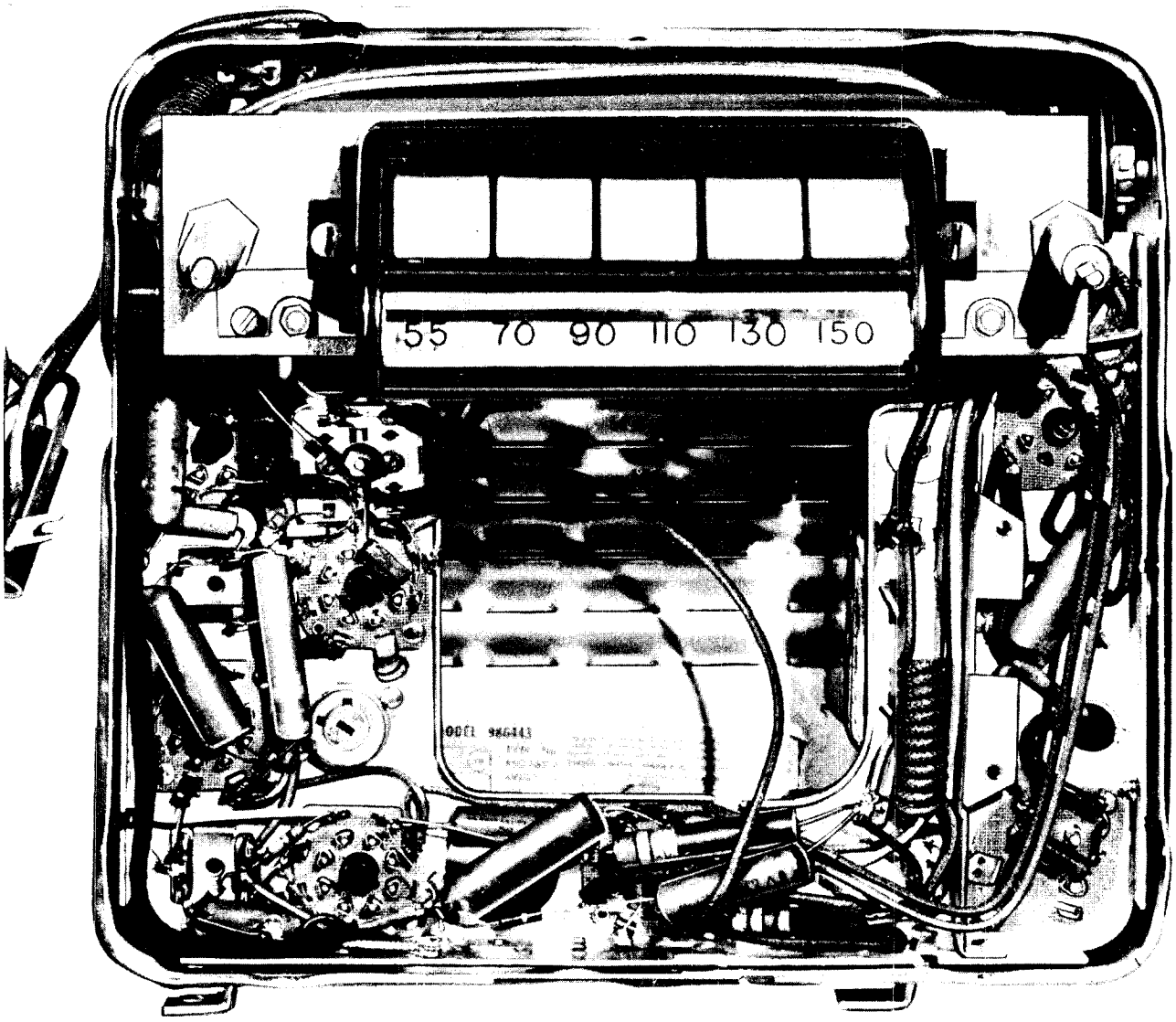


Figure 70

MODEL 986443,
Chevrolet Truck

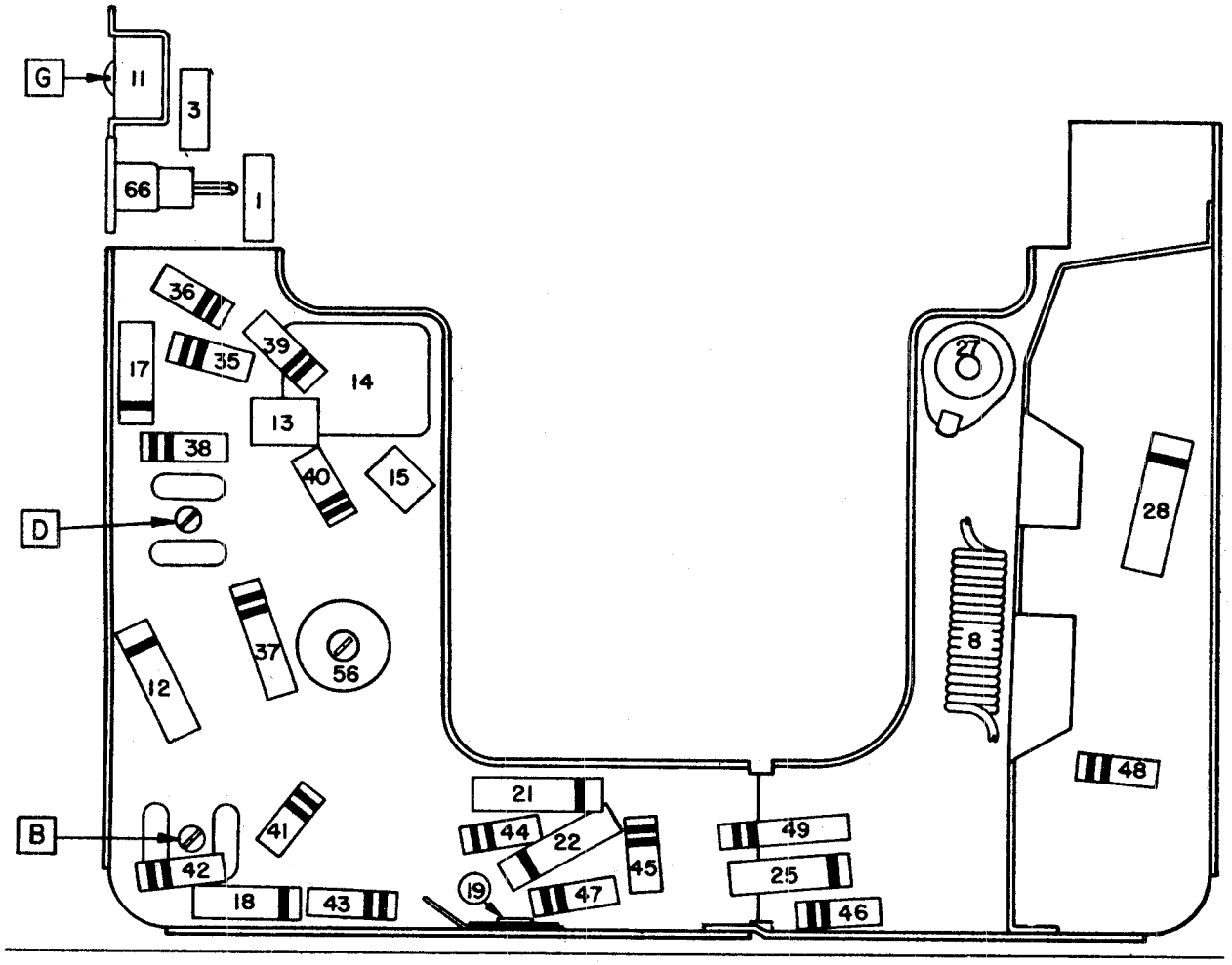


Figure 71

voltages of the receiver, with these being correct and radio does not play, the trouble will be in the grid circuit of the radio. To continue, it will be necessary to check the grid circuit by means of signal tracing.

PROCEDURE FOR SIGNAL TRACING
RADIO 986443

Turn on Signal Generator On and Off switch, place the modulation switch in the modulated position, set Signal Generator tone control to .5, place shielded lead assembly in jack marked "Audio." Ground the black lead to radio chassis for ground. Turn on radio receiver with volume to maximum position.

With red lead touch tube pin marked "P" of 6V6GT tube, if no signal, check or replace the following:

1. Check or replace condenser. (Item 25 on circuit diagram and parts layout.)

2. Check or replace audio transformer. (Item 59 on circuit diagram and parts layout.)

3. Check or replace speaker. (Item 58 on circuit diagram and parts layout.)

Next touch tube pin marked "G" of 6V6GT tube, if no signal, check or replace the following:

1. Check or replace 6V6GT tube.

2. Check or replace 6V6GT tube socket.

Next touch tube pin marked "P" of 6SQ7GT tube, if no signal, check or replace the following:

1. Check or replace condensers. (Items 19,

21, 22, 23 and 24 on circuit diagram and parts layout.)

2. Check or replace tone control. (Item 55B on circuit diagram and 55 on parts layout.)

Next touch tube pin marked "G" of 6SQ7GT tube, if no signal, check or replace the following:

1. Check or replace 6SQ7 tube.

2. Check or replace 6SQ7 tube socket.

3. Check or replace resistor. (Item 45 on circuit diagram and parts layout.)

Now change the Signal Generator shielded lead to the intermediate frequency "I.F." jack, then tune Signal Generator to exactly 262 kilocycles, set band switch on "A" position.

Turn the Signal Generator volume control about 1/3 open. Next touch tube pin marked "P" of 6SK7 intermediate frequency amplifier tube, if no signal, check or replace the following:

1. Check or replace intermediate frequency transformer. (Item 7 on circuit diagram and parts layout.)

2. Check or replace volume control. (Item 55A on circuit diagram and 55 on parts layout.)

3. Check or replace condenser. (Item 18 on circuit diagram and parts layout.)

4. Check or replace resistors. (Items 42 and 43 on circuit diagram and parts layout.)

Next touch tube pin marked "G" of 6SK7 I.F. amplifier tube, if no signal, check or replace the following:

1. Check or replace 6SK7 tube.

2. Check or replace 6SK7 tube socket.

3. Check or replace sensitivity control. (Item 56 on circuit diagram and parts layout.)

Next touch tube pin marked "P" of 6SA7 tube, if no signal, check or replace the following:

1. Check or replace intermediate frequency transformer. (Item 6 on circuit diagram and parts layout.

Next touch tube pin marked "G" of 6SA7 tube, if no signal, check or replace the following:

1. Check or replace 6SA7 tube.

2. Check or replace 6SA7 tube socket.

Now change the Signal Generator shielded lead to the radio frequency "R.F." jack, tune signal generator to exactly 1000 kilocycles, set band switch to "B" position.

Now tune radio receiver to 1000 kilocycles, then touch tube pin marked "P" of the 6SK7 radio frequency amplifier tube, if no signal, check or replace the following:

1. Check or replace radio frequency coil. (Item 4 on circuit diagram and parts layout.)

2. Check or replace oscillator coil. (Item 5 on circuit diagram and parts layout.)

3. Check or replace condensers. (Items 14A, 14B, 15 and 16 on circuit diagram and parts layout.)

4. Check or replace resistors. (Items 39 and 40 on circuit diagram and parts layout.)

Next touch tube pin marked "G" of 6SK7 radio frequency amplifier tube, if no signal, check or replace the following:

1. Check or replace 6SK7 tube.

2. Check or replace 6SK7 tube socket.

3. Check or replace resistor. (Item 35 on circuit diagram and parts layout.)

Now place a .000075 mfd. condenser on the end of red lead and plug in antenna socket, if no signal, check or replace the following:

1. Check or replace chokes. (Items 1 and 3 on circuit diagram and parts layout.)

2. Check or replace antenna coil. (Item 2 on circuit diagram and parts layout.)

3. Check or replace condenser. (Item 11 on circuit diagram and parts layout.)

4. Check or replace resistor. (Item 36 on circuit diagram and parts layout.)

MODEL 986443,
Chevrolet Truck

PROCEDURE FOR ALIGNMENT
986443 RADIO

All receivers are aligned at the factory and should require no further adjustments, unless the adjustments have been tampered with, or new coils, I.F. transformers or tuning cores have been installed. To properly align the receiver it will be necessary to have an output meter and Signal Generator. If any of the tuning coils or cores have been replaced, see "Capacity and Inductance Alignment Procedure." If only the adjustments have been tampered with or an I.F. transformer has been replaced, the receiver is aligned as follows:

Set the volt-ohm-milliammeter Master selector switch in the 30 position, the voltage selector switch in A.C. 1K ~ /V. position, and place the leads in the jacks marked "output meter," place the other end for the black lead to radio chassis for ground. Place the red lead to the terminal of the speaker to which the green lead of the audio output transformer is connected, as outlined in the 1950 Chevrolet Radio Service and Shop Manual. (Speaker Item 48, audio output transformer 59 on circuit diagram and parts layout.)

Turn on the Signal Generator On and Off switch and turn on the radio receiver, turn volume control to maximum position. Set modulation switch in the modulated position, turn the band selector to the "A" position and turn the Signal Generator to exactly 262 kilocycles. Place the Signal Generator shielded lead in the jack marked "I.F." and place the black lead to the radio chassis for ground. Place red lead to tube pin marked "G" on the 6SA7 tube.

Adjust the Signal Generator volume control so that the meter reads about 10 on the meter scale. Adjust in sequence trimmers A, B, C and D (on circuit diagram and parts layout) for maximum meter reading. Repeat adjustment to get best alignment. (Keep the Signal Generator volume turned down so that during adjustments the meter does not read more than 10 on the meter scale.)

Now place Signal Generator shielded lead in the jack marked "R.F.", set the band selector switch in "B" position, tune the Signal Generator to exactly 1615 kilocycles, place a .000075 mfd. condenser on the red lead and connect it to the antenna connector. Tune the radio receiver to the stop at the 1600 kilocycle end of the dial. (Keep the Signal Generator volume control adjusted so the meter reads about 10 on the meter scale.)

Now adjust trimmers "E, F and G" (on circuit diagram and parts layout) in sequence for maximum reading on the meter scale. Repeat for best alignment. Tune the Signal Generator and radio receiver to exactly 1000 kilocycles and repeat adjustments of trimmers "F and G" only for maximum meter reading.

After the receiver has been installed in the truck, tune in a weak station near 1000 kilocycles, with volume control turned to maximum position and antenna extended to full height, readjust trimmer "G" only for maximum volume.

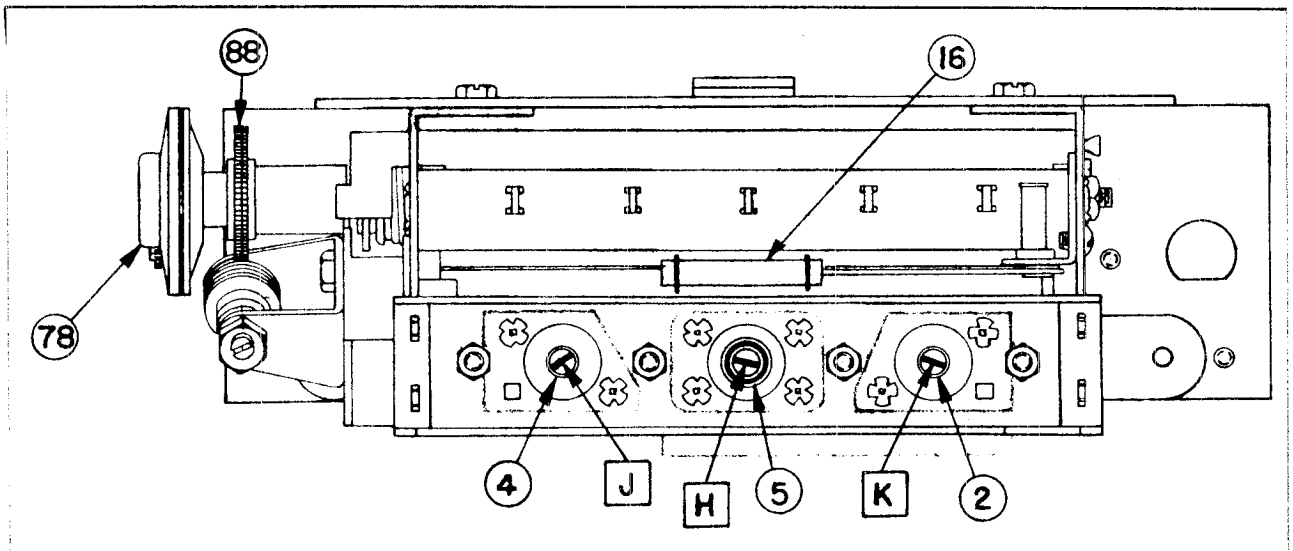


Figure 72

MODEL 986443,
Chevrolet Truck

CAPACITY AND INDUCTANCE ALIGNMENT PROCEDURE

This alignment procedure is to be used only when any of the following parts have been replaced in the radio; antenna coil, radio frequency coil, oscillator coil or any of the tuning cores.

The intermediate frequency alignment at 262 kilocycles is the same as outlined in "Alignment Procedure" on page 18. After completing the alignment at 262 kilocycles for the intermediate frequency transformers "A, B, C and D" proceed as follows:

Connect Signal Generator red lead to a .000075 mfd. condenser and connect to antenna connector.

Mechanically align iron cores "H, J and K" (on circuit diagram and parts layout) to measure 1-25/32 inches in coil forms from rear mounting edge of coil forms. (See Figure 72.) Now set Signal Generator to exactly 1615 kilocycles, set band switch to "B" position, tune radio receiver to the stop on the 1600 kilocycle end of the dial. Have output meter hooked up as outlined in "Alignment Procedure." Now adjust iron cores "H, J and K" (on circuit diagram and parts layout) in sequence for maximum meter reading.

Now adjust trimmers "E, F and G" (on circuit diagram and parts layout) in sequence for maximum reading on meter scale. Now tune Signal Generator and radio receiver to 1000 kilocycles, and readjust iron cores "J and K" only for maximum reading on meter scale. DO NOT READJUST IRON CORE "H" ON THIS ADJUSTMENT.

Repeat the adjustment of iron cores "J" and "K" only at 1000 kilocycles for maximum reading on meter scale.

Reset Signal Generator to 1615 kilocycles and tune radio receiver to stop on 1600 kilocycle end of dial, then readjust trimmers "F and G" only until no further increase in the meter reading can be obtained. After the radio receiver is installed in the truck, tune in a weak station near 1000 kilocycles, with volume control turned to maximum position and antenna extended to full height, readjust trimmer "G" only for maximum volume.

SERVICE PARTS LIST 986443

Illus. No.	Service Part No.	Description
		COILS
1	7255738	Antenna Choke
2	7258914	Antenna
3	7240251	Antenna Spark Choke
4	7258914	R.F.
5	7258911	Oscillator
6	1218725	1st I.F.
7	1218726	2nd I.F.
8	7241708	Hash Choke
9	1217846	"A" Spark Choke
10	1217846	"A" Spark Choke
		CONDENSERS
11	7257959	Antenna Trimmer & Bracket
12	7230592	.05 mfd. 600V. Tubular
13	1212359	.000068 mfd. Mica
14A	7242454	Dual Trimmer - R.F.
14B	7242454	Dual Trimmer - Oscillator
15	1217736	.000039 mfd. Mica
16	7257424	.000180 mfd. Compensating
17	7230592	.05 mfd. 600 V. Tubular
18	7230767	.004 mfd. 600V. Tubular
19	1217848	Chassis Plate Condenser
20	7240724	Electrolytic
20A		20 mfd. 25V.
20B		20 mfd. 400V.
20C		20 mfd. 400V.
21	1217790	.001 mfd. 600V. Tubular
22	7230592	.04 mfd. 600V. Tubular
23	7237836	.002 mfd. 600V. Tubular
24	7230767	.004 mfd. 600V. Tubular
25	7233243	.004 mfd. 800V. Tubular
26	7258332	Spark Plate Condenser
26A		Pilot Light Section
26B		"A" Lead Section
27	1217848	Chassis Plate Condenser
28	7240906	.005 mfd. 1600V. Tubular
		RESISTORS
35	7237835	220 ohms 1/2W. Insulated
36	1214563	2.2 megohms 1/2W. Insulated
37	7233653	15,000 ohms 2W. Insulated
38	7237595	15,000 ohms 1W. Insulated
39	1214557	330,000 ohms 1/2W. Insulated
40	1214550	22,000 ohms 1/2W. Insulated
41	1213282	1 megohm 1/2W. Insulated
42	1214553	47,000 ohms 1/2W. Insulated
43	1215563	6.8 megohm 1/2W. Insulated
44	1214555	220,000 ohms 1/2W. Insulated

MODEL 986443,
Chevrolet Truck

Illus. No.	Service Part No.	Description
45	1214555	220,000 ohms 1/2W. Insulated
46	7233773	330 ohms 1W. Wire Wound
47	1213282	1 megohm 1/2W. Insulated
48	7237994	220 ohms 1W. Insulated
49	USE	7242844 - 2700 ohms 2W. 7240918 - 5600 ohms 1W. in Parallel
		TUBES
	7237751	6SK7 - Radio Frequency Amplifier
	7237752	6SA7 - Oscillator Modulator
	7237751	6SK7 - Intermediate Frequency Amplifier
	1214293	6SQ7GT Detector - A.V.C. - 1st Audio
	1213793	6V6GT - Output
	1211924	OZ4 - Cold Cathode Rectifier
		MISC. ELECTRIC PARTS
55	7256188	Control - Volume, Tone & Switch
55A		Volume Control
55B		Tone Control
55C		Switch
56	7242204	Control - Sensitivity
57	125588	Lamp - Dial Light
58	7259381	Speaker 6" x 9" P.M.
59	7256009	Transformer - Output
60	7255881	Transformer - Power
61	7239124	Vibrator
		MECHANICAL PARTS
65		"A" Lead & Fuse Holder
	1216212	Fuse Holder (Female)
	1216213	Fuse Holder (Male)
	1219181	Ferrule, Spring, Bushing
66	7256742	Connector - Antenna
67	1219619	Socket - Dial Light
	7236279	Socket - Octal Tube
	7239125	Socket - Vibrator
		TUNER PARTS
75	7255941	Backplate - Pointer
	147481	Ball Bearing
76	7258491	Bushing & Drive Shaft Assembly
77	7258525	Manual Drive Shaft Assembly
78	7258072	Clutch - Disc-Driven
79	7258203	Connecting Link
80	7258211	Core Guide Bar - Parallel
81	7256271	Connecting Link - Pointer
82	7255992	Spring - Connecting, Link, Pointer
83	7258468	Core Assembly (Iron)
84	7259759	Escutcheon Assembly
85	7259764	Dial
86	7255940	Dial Backplate - Upper
87	7256163	Dial Backplate - Lower
88	7256102	Gear & Bushing - Clutch
89	7259755	Gear & Bracket - Worm
	7237172	Grommet - Oscillator Coil Mounting
	7244021	Grommet - Ant. & R.F. Coil Mounting
	7251168	Grommet - "A" Lead
90	7256175	Pointer Assembly
	1219618	Pointer Tip
91	1217837	Push Button & Slide Assembly
92	7258756	Spring - Clutch
93	7257415	Spring - Core Bar Connecting Link
94	7255984	Spring - Slide Return
		INSTALLATION PARTS
	1218058	Installation Package consists of the following:
	7257919	Condenser - Ammeter
	1910147	Condenser - Generator
	1910147	Condenser - Ignition Coil
	1912900	Condenser - Voltage Regulator
	7256098	Escutcheon - Control Bushing
	147685	Fuse - 14 Amperes
	7256148	Knob - Control
	7255935	Knob - Dummy
	7255936	Knob - Wing
	7256466	Spacer - Radio Mounting, Lower
	7255934	Spacer - Radio Mounting, Upper
	494786	Static Collector - Flint
	1887829	Suppressor - Distributor
	1888204	Nipple - Rubber

MODEL 986443,
Chevrolet Truck

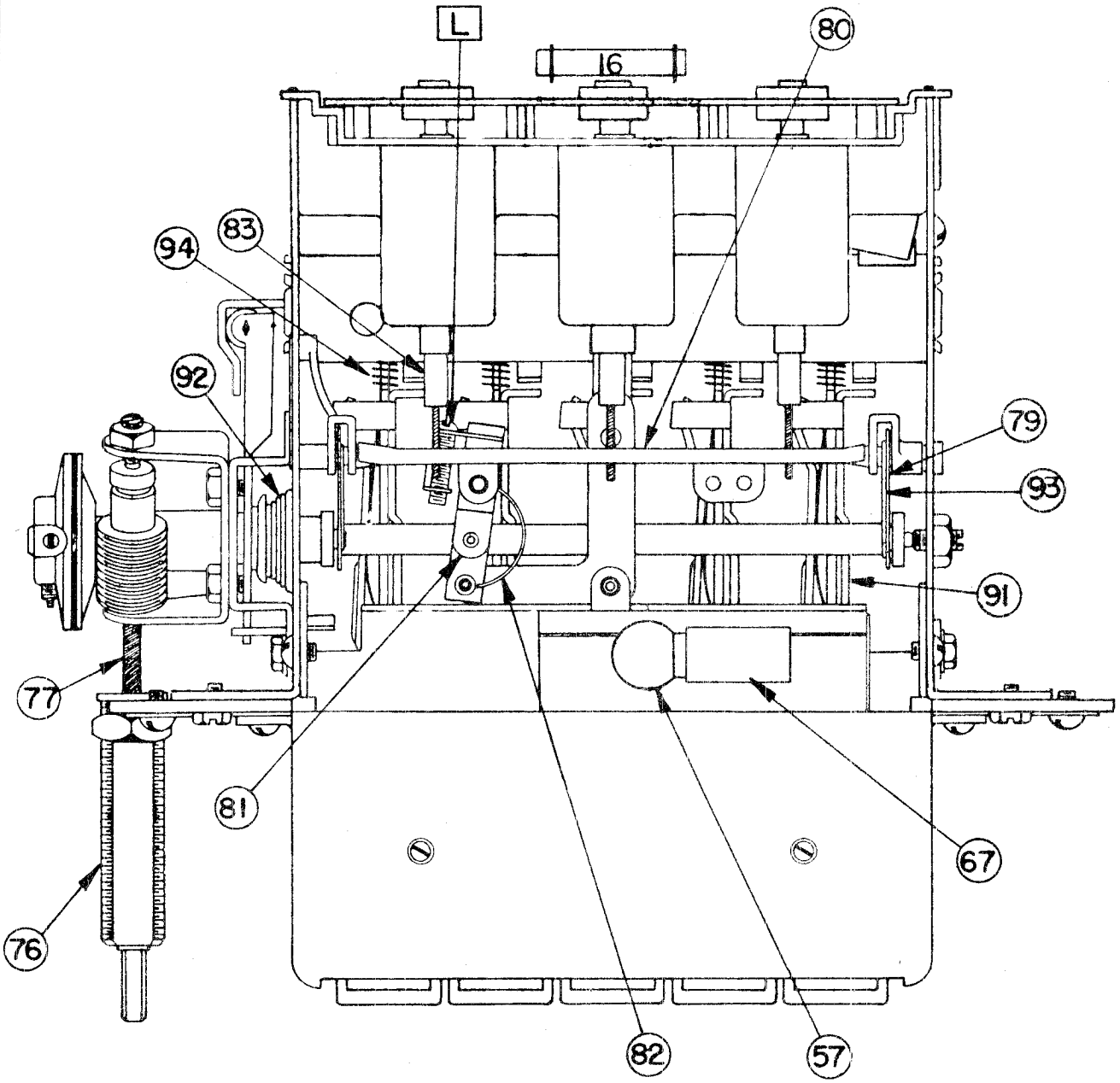


Figure 73

Tuner Unit - Top View

MODEL 986443,
Chevrolet Truck

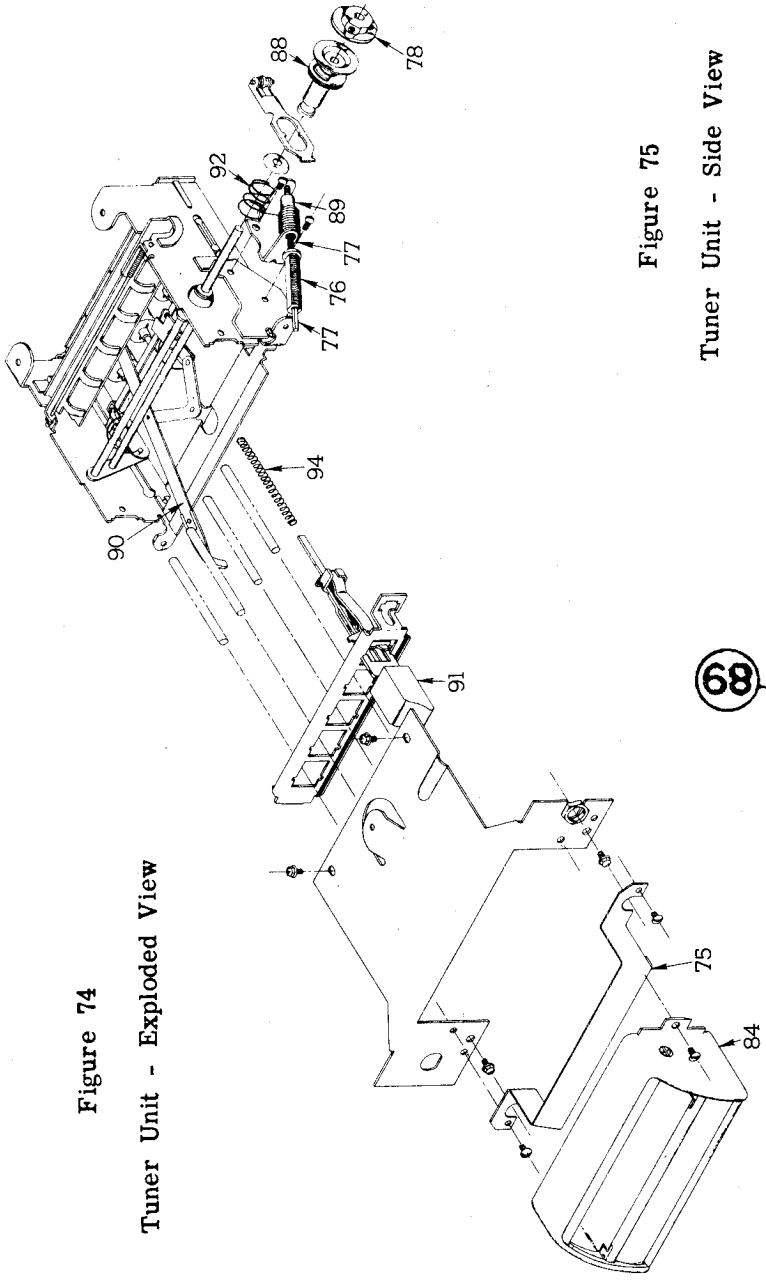


Figure 74

Tuner Unit - Exploded View

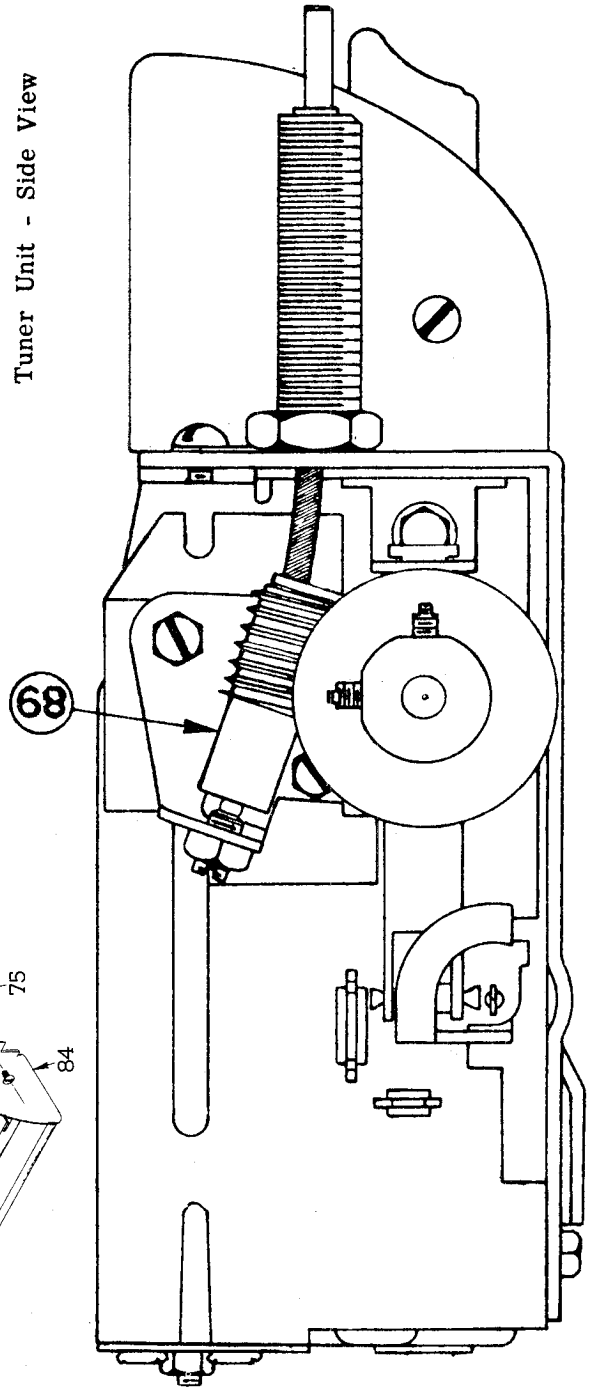
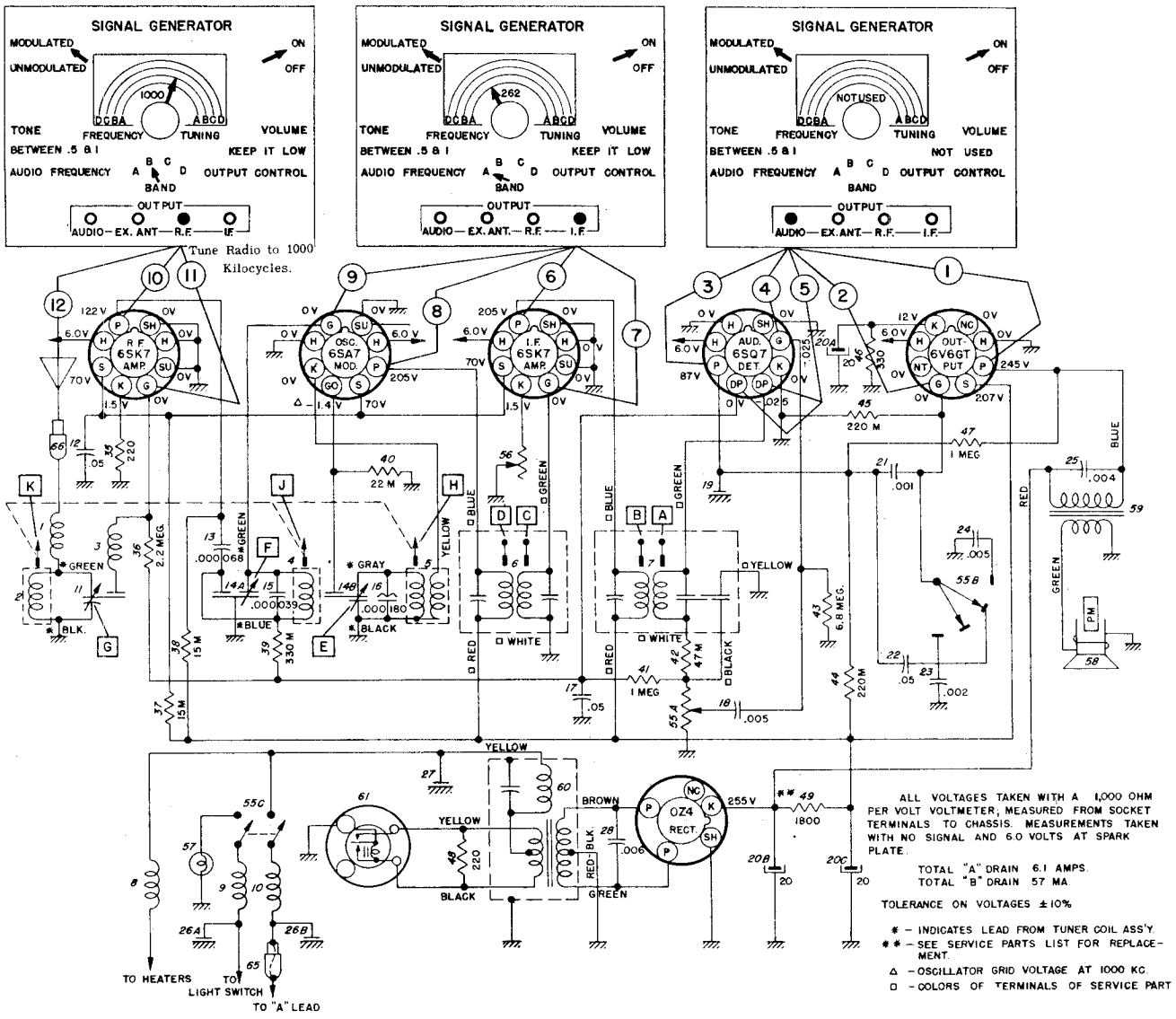


Figure 75

Tuner Unit - Side View

MODEL 986443,
Chevrolet Truck



POINT SIGNAL STOPS - CHECK OR REPLACE ITEMS LISTED

No signal at point 1 - check or replace - items 25-58-59.	No signal at point 7 - check or replace - 6SK7 tube or tube socket.
No signal at point 2 - check or replace - 6V6GT tube or tube socket	No signal at point 8 - check or replace - item 6
No signal at point 3 - check or replace - items 21-22-23-24-55B.	No signal at point 9 - check or replace - 6SA7 tube or tube socket.
No signal at point 4 - check or replace - 6SQ7 tube or tube socket.	No signal at point 10 - check or replace - items 4-5-13-14A-14B-15-16-39.
No signal at point 5 - check or replace - 6SQ7 tube or tube socket.	No signal at point 11 - check or replace - 6SK7 tube or tube socket.
No signal at point 6 - check or replace - items 7-18-42-43-55A.	No signal at point 12 - check or replace - items 1-2-3-11-17-36-41

Figure 76

Signal Tracing Procedure 986443 Truck Radio

MODEL 986443,
Chevrolet Truck

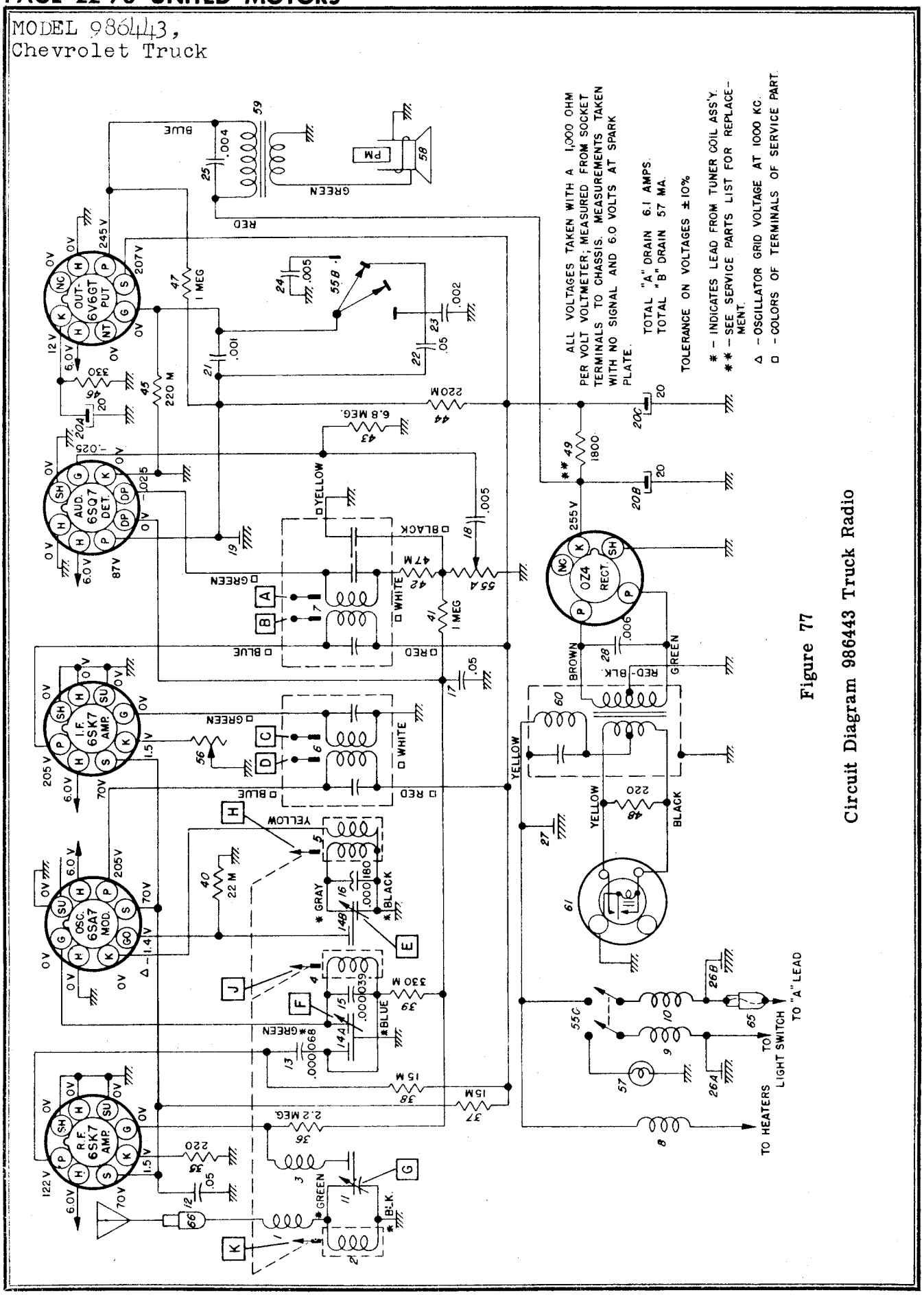


Figure 77
Circuit Diagram 986443 Truck Radio

MODELS 7260405, 7260905, 1951 Cadillac

GENERAL

MOUNTING—Model 7260405 - All 1951 Cadillac Sedans. Model 7260905 - All 1951 Cadillac Convertibles.

TUBES—Seven, plus Rectifier and Trigger.

SPEAKER — 6" x 9" Elliptical, Permanent Magnet.

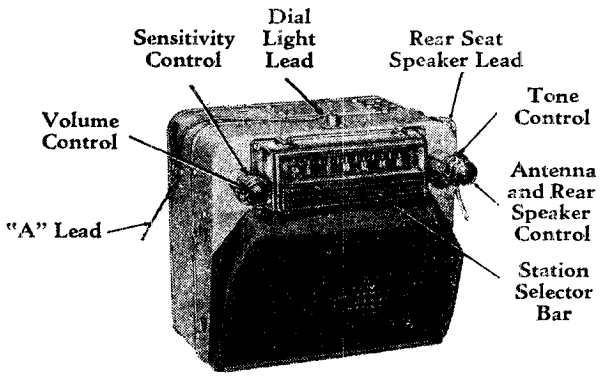
TUNING—Electronic.

ANTENNA TRIMMER COMPENSATION — 0.000060 - 0.000085 Mfd.

TUNING RANGE—540 - 1600 KC.

PUSHBUTTON SET-UP

No pushbutton set-up is necessary. However, the number of stations on which the tuner will stop can be controlled by the use of the Sensitivity Control.



MODEL 7260405

SIGNAL SEEKING TUNER ALIGNMENT PROCEDURE:

NOTE: When aligning the signal seeker tuner type radio, be sure to use a vacuum tube voltmeter as indicated and be sure to follow the alignment sequence given—(Notice that the primary of the 2nd I.F. is aligned first.)

Output Meter Connection ..... VTVM From [2] To Chassis (see parts layout page 2)
Generator Return ..... Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control ..... Maximum Volume
Sensitivity Control ..... Maximum Sensitivity
Tone Control ..... Treble
Generator Output ..... Not To Exceed 2 Volts at VTVM

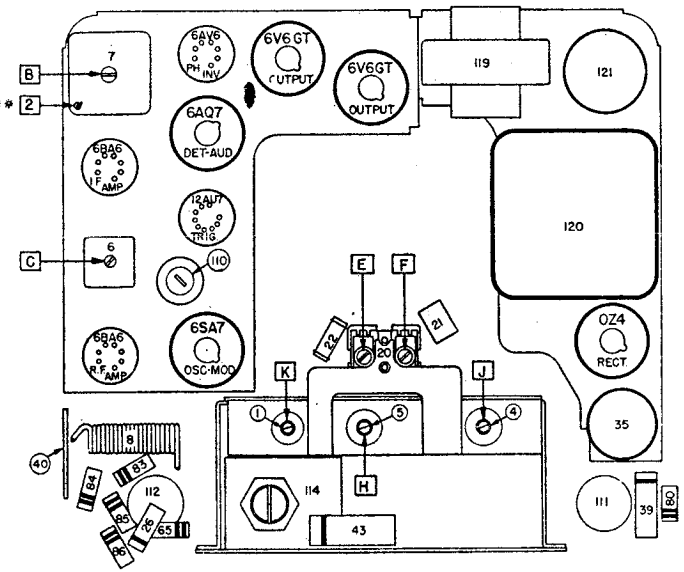
Step	Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust in Sequence for Max. Output
1	0.1 mfd	6SA7 Grid (Pin 8)	260 KC	*High Frequency Stop	A, B, C, D
2	0.000068 mfd	Antenna Connector	1615 KC	High Frequency Stop	**E, F, G
3	0.000068 mfd	Antenna Connector	600 KC	Signal Gen. Signal	J, K
4	0.000068 mfd	Antenna Connector	1615 KC	Signal Gen. Signal	F, G
5	0.000068 mfd	Antenna Connector	1000 KC	Signal Gen. Signal	***L

*To tune to high frequency, put a 0.070" feeler gauge (or bare #13 wire) in slot against the high frequency stop. (See tuner picture). Depress station selector bar and allow the planetary arm to run against the feeler gauge. Turn the radio off and then on.

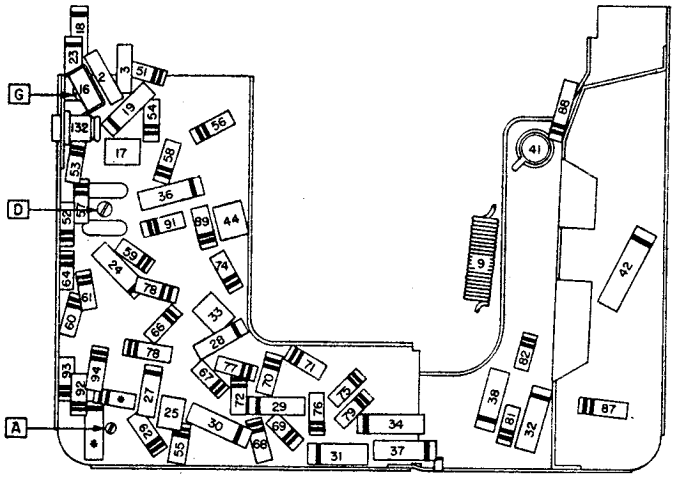
**Before making this adjustment, check the setting of oscillator core "H." The rear of the core should be $1\frac{55}{64}$" from the mounting end of the coil form. This measurement is readily made by inserting a suitable plug in the mounting end of the coil form. The core adjustment is made from the mounting end of the coil form with an insulated screwdriver. (It will be necessary to steady the core guide bar by applying a downward pressure at the antenna core end of the bar while making these adjustments.) If this adjustment is necessary, first dissolve the glyptal seal on the core stud and be sure to re-seal after making the adjustment.

***"L" is the pointer adjustment screw on the end of the core guide bar—adjust so pointer reads 1000 KC.

With the radio installed and the antenna plugged in, adjust antenna trimmer "G" (See sticker on case) for maximum volume with the radio tuned to a weak station between 600 and 1000 KC.



PARTS LAYOUT — TUBE VIEW

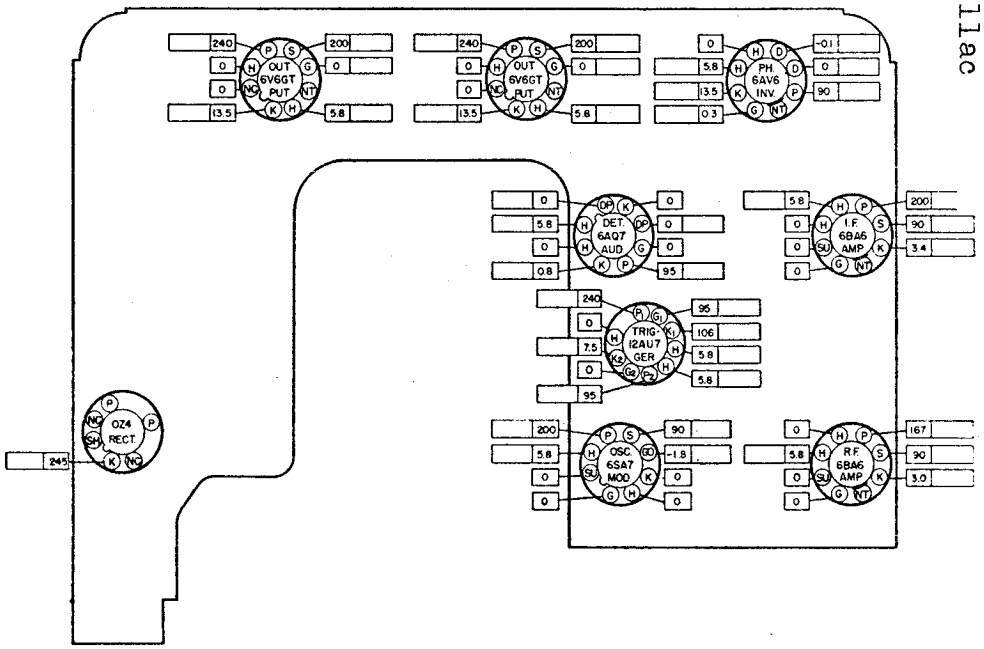


PARTS LAYOUT — CHASSIS VIEW

*Condenser and resistor are included in the 2nd I.F. Coil Assembly.

**Connect a VTVM from this point to ground for output indications during alignment.

TUBE SOCKET VOLTAGE CHART



The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram, are shown above. The blank spaces are provided so that the serviceman may fill in actual voltage eadings as taken with his own equipment. A normal operating radio should be used for these measurements.

Voltmeter resistance ..... Ohms Per Volt.

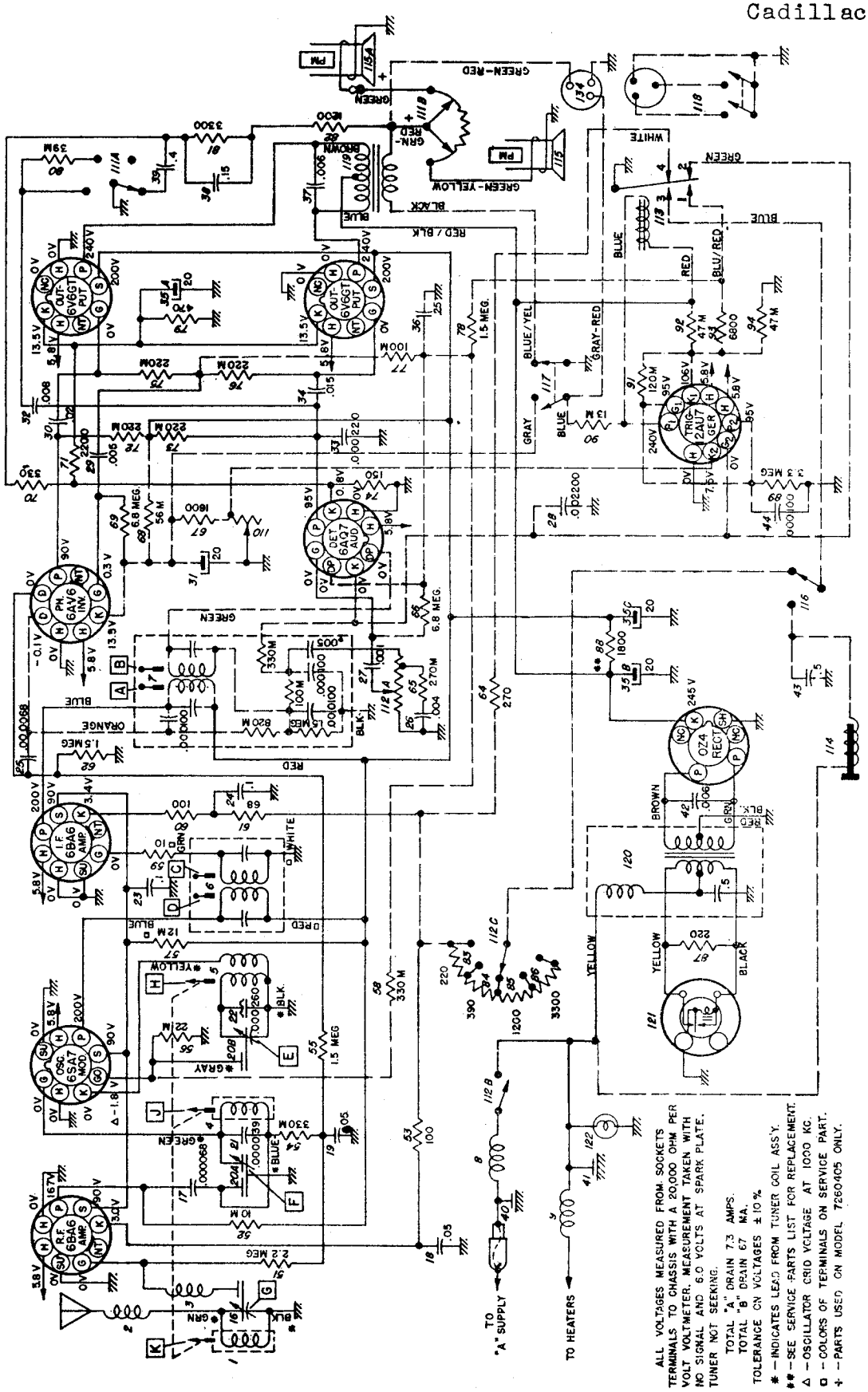
Readings taken with ..... Volts at Spark Plate.

All voltages measured from socket terminals to chassis.

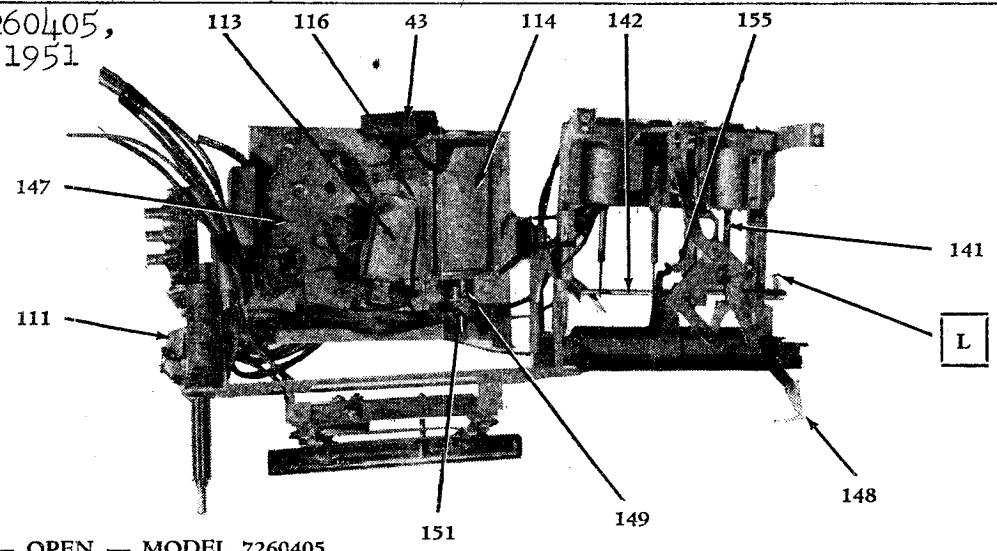
TUNER ADJUSTMENT PROCEDURE:

NOTE: For all tuner adjustments, see Bulletin 6D-620.

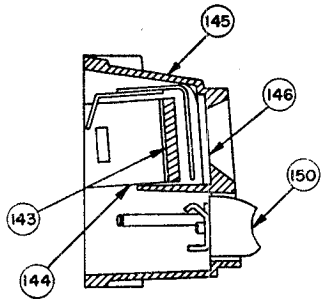
MODELS 7260405,
7260905, 1951
Cadillac



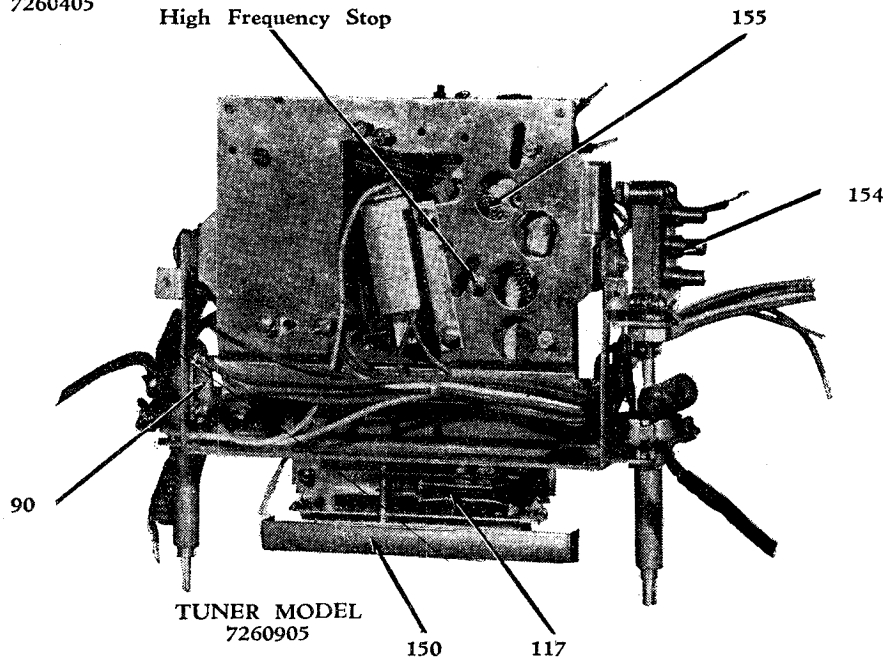
MODELS 7260405, 7260905, 1951 Cadillac



TUNER — OPEN — MODEL 7260405



ESCUTCHEON CROSS-SECTION



TUNER MODEL 7260905

NOTE: For complete service information on the Signal Seeking Tuner see Bulletin 6D-620

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7257979	7257979	Antenna
2	7255738	7255738	Antenna Series Choke
3	7240251	7240251	Antenna Spark Choke
4	7257979	7257979	R.F.
5	7259184	7259184	Oscillator
6	7259790	1219508	1st I.F. Assy.
7	7259290	1219602	2nd I.F. Assy.
8	7241118	1217846	"A" Spark Choke
9	7256931	1217846	Hash Choke
			Condensers
*16	7259988	*7259988	Antenna Trimmer & Brkt.
17	1219550	G 680	.000068 mfd Molded
18	1210697	6537	.05 mfd 200V Tubular
19	1210697	6537	.05 mfd 200V Tubular
20	7242454	7242454	Dual Trimmer
20A			R.F. Section
20B			Oscillator Section
21	7258221	G 390	.000039 mfd Ceramic
22	7257567	7257567	.000260 mfd Compensating
23	7238788	6539	.1 mfd 400V Tubular

SERVICE PARTS LIST

MODELS 7260405, 7260905, 1951 Cadillac

Illus No.	Production Part No.	Service Part No.	Description
			Condensers (Continued)
24	7238789	6539	.1 mfd 200V Tubular
25	1219550	G 680	.000068 mfd Molded
26	1218969	E 402	.004 mfd 600V Tubular
27	1218883	6527	.001 mfd 600V Tubular
28	1219553	1219553	.0022 mfd 600V Tubular
29	7230767	6531	.005 mfd 600V Tubular
30	7233770	6534	.02 mfd 600V Tubular
31	1219660	1219660	20 mfd 50V Electrolytic
32	1219463	1219463	.008 mfd 600V Tubular
33	7238792	G 221	.000220 mfd. Molded
34	7237719	7237719	.015 mfd 600V Tubular
35	7240724	M 908	Electrolytic
35A			20 mfd 25V
35B			20 mfd 400V
35C			20 mfd 400V
36	1209817	E 254	.25 mfd 200V Tubular
†37	†1219084	†H 602	†.006 mfd 800V Tubular
**37	**1219594	**H 802	**.008 mfd 800V Tubular
38	1218880	1218880	.15 mfd 100V Tubular
†39	†1218882	†1218882	†.4 mfd 100V Tubular
**39	**1211202	**1211202	**.25 mfd 200V Tubular
40	1219768	1219768	Spark Plate Assy.
41	1217848	1217848	Chassis Plate Condenser
42	7240906	H 602	.006 mfd 1600V Tubular
43	7259954	7259954	.5 mfd 100V Tubular
44	1219499	G 101	.000100 mfd Molded
			Resistors
51	1211147	A 225	2.2 Megohms ½W Insulated
52	1211085	B 103	10,000 ohms 1W Insulated
53	1213217	A 101	100 ohms ½W Insulated
54	7240732	A 334	330,000 ohms ½W Insulated
55	1213283	A 155	1.5 Megohms ½W Insulated
56	1211192	A 223	22,000 ohms ½W Insulated
57	1212491	1212491	12,000 ohms 2W Insulated
58	1214557	A 334	330,000 ohms ½W Insulated
59	1219755	A 100	10 ohms ½W Insulated
60	1213217	A 101	100 ohms ½W Insulated
61	1215558	1215558	68 ohms ½W Insulated
62	1211142	A 155	1.5 Megohms ½W Insulated
63	1211118	A 104	100,000 ohms ½W Insulated
64	1214542	A 271	270 ohms ½W Insulated
65	1214556	A 274	270,000 ohms ½W Insulated
66	7241937	A 685	6.8 Megohms ½W Insulated
67	1219504	1219504	1600 ohms ½W Insulated
68	1213509	1213509	56,000 ohms 1W Insulated
69	7241937	A 685	6.8 Megohms ½W Insulated
70	1213224	A 331	330 ohms ½W Insulated
71	1214545	A 222	2200 ohms ½W Insulated
72	1214555	A 224	220,000 ohms ½W Insulated
73	1214555	A 224	220,000 ohms ½W Insulated
74	1213220	A 151	150 ohms ½W Insulated
75	1214555	A 224	220,000 ohms ½W Insulated
76	1214555	A 224	220,000 ohms ½W Insulated
78	1211142	A 155	1.5 Megohms ½W Insulated
79	1216150	B 471	470 ohms 1W Insulated
80	1213480	A 393	39,000 ohms ½W Insulated
81	1213481	A 332	3300 ohms ½W Insulated
82	1213236	1213236	1200 ohms ½W Insulated
83	1218969	A 221	220 ohms ½W Insulated
84	1219763	A 391	390 ohms ½W Insulated
85	1219764	1213236	1200 ohms ½W Insulated
86	1219765	A 332	3300 ohms ½W Insulated
87	1219738	B 221	220 ohms 1W Insulated
88	1214573	C 272 B 562	1800 ohms Wire Wound (Replace with 2700 ohms 2W and 5600 ohms 1W in parallel)
89	1211150	A 335	3.3 Megohms ½W Insulated
90	7231539	7231539	13,000 ohms 1W Insulated
91	1213271	1213271	120,000 ohms ½W Insulated
92	1216157	B 473	47,000 ohms 1W Insulated
93	1216154	1216154	6800 ohms 1W Insulated
94	1216157	B 473	47,000 ohms 1W Insulated
			Tubes
	1217690	5252	6BA6
	7237752	5222	6SA7
	1218506	5262	6AV6
	1219484	5278	6AQ7GT

† Use with 7258488 and 7259675 Speakers
** Use with 7260502 Speaker

MODELS 7260405, 7260905, 1951 Cadillac

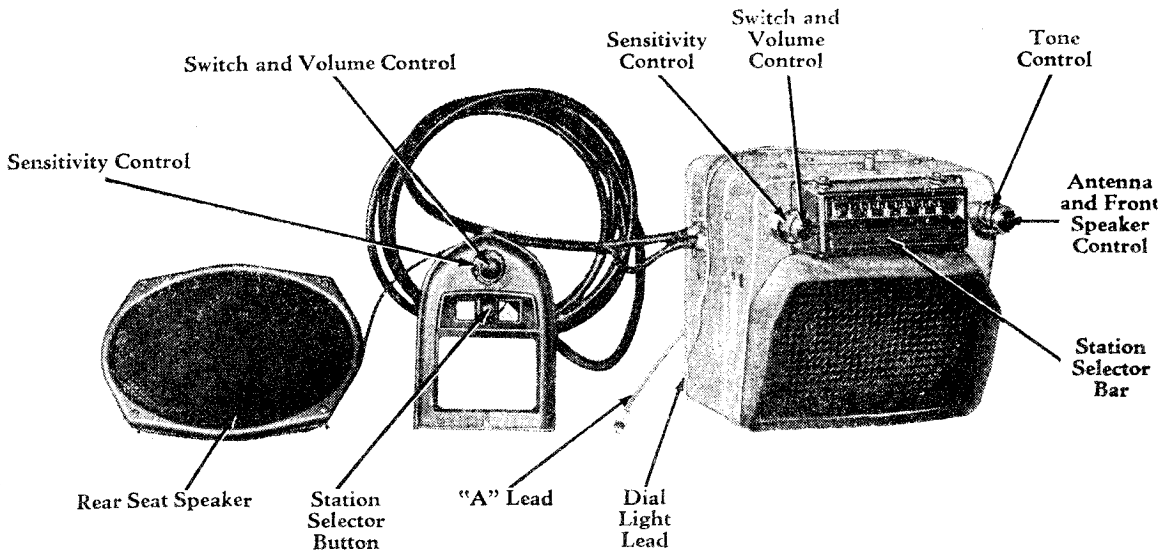
SERVICE PARTS LIST

	Production Part No.	Service Part No.	Description
		Tubes (Continued)	
	1213793	5241	6V6GT
	1211924	5003	0Z4
	1219485	5328	12AU7
		Miscellaneous Electrical Parts	
	7260328	*7260328	"A" Lead Assy. and Fuse Connector
110	7259408	7259408	Adjuster - Cathode Delay
*111	7260682	*7260682	Control - Tone, Speakers (Model 7260405 only)
111A			Tone Control
111B			Speakers Control
	7259239	7259239	Control - Tone (Model 7260905 only)
112	7259240	7259240	Control - Volume, Sensitivity and Switch
112A			Volume Control
112B			Switch
112C			Sensitivity Control
113	7259009	7259009	Relay
114	1219661	1219661	Solenoid
115	7258488	7258488	Speaker - Front Seat
*115	7260502	*7260502	Speaker - Front Seat (Alternate)
*115A	7260849	*7260849	Speaker - Rear Seat (Model 7260405 only)
116	7259011	7259011	Switch - Tuner Return
117	7259012	7259012	Switch - Station Selector
*118	7260629	*7260629	Switch - Foot Station Selector
119	7259336	7259336	Transformer - Output
120	7259375	7255881	Transformer - Power
121	7239124	8542	Vibrator
122	125588	55	Lamp - Dial Light
		MECHANICAL PARTS	
		Chassis	
132	7258520	7258520	Antenna Connector
	7236279	7236279	Socket - Octal Tube
	7259307	7259307	Socket - 9 Pin Miniature Tube
	7258073	7258073	Socket - 7 Pin Miniature Tube
	7239125	7239125	Socket - Vibrator
133	1219603	1219603	Socket - Dial Light
*134	7260698	*7260698	Socket - Foot Switch
	7260677	*7260677	Socket and Wire Assy. - to R. S. Speaker Plug
		Tuner	
141	7259201	7259201	Core - Iron Tuning
142	7259178	7259178	Core - Guide Bar
143	7259319	7259319	Dial Calibrated
*144	7260806	*7260806	Dial Backplate Assy.
	187189	44	Pilot Light
*145	7260808	*7260808	Escutcheon Assy.
146	7258236	7258236	Dial Glass
	7258232	7258232	Dial Glass Retainer (2)
147	1219610	1219610	Motor Gear Train
*148	1219847	*1219847	Pointer Tip Pkg.
149	7259164	7259164	Plunger Solenoid
150	1219604	1219604	Station Selector Bar Pkg.
			Station Selector Bar
	7259125	7259125	Switch Operating Collar
			Toggle Plate
	7259111	7259111	Spring (2)
	7256121	7256121	"C" Washer
151	7259100	7259100	Spring Clip
	7257361	7257361	Spring - Vacuum Valve Anti-Rattle
	7258239	7258239	Spring - Calibrated Dial Retainer
*154	7260675	*7260675	Vacuum Valve (Model 7260405 Only)
	7258260	7258260	Vacuum Valve (Model 7260905)
	7260676	*7260676	Vacuum Valve Shaft (Model 7260405 Only)
	7259264	7259264	Vacuum Valve Shaft (Model 7260905)
155	7259055	7259055	Spring - Motor Power
		INSTALLATION PARTS	
	7240138	6013	Static Collector
	1911095	6030	Condenser - Generator
	1910147	6030	Condenser - Ignition Coil
	1917580	6030	Condenser - Regulator
	5289849	5289849	Connector - Dial Light Lead
	7259510	7259510	Escutcheon - Sensitivity Control
	7259509	7259509	Escutcheon - Tone Control
	147685	147685	Fuse - 14 Amperes
	1219822	1219822	Fuse Holder Pkg.
	7259369	7259369	Knob - Control
	7259508	7259508	Knob - Sensitivity Control
	7259507	7259507	Knob - Tone Control
	7259514	7259514	Spring - Knob Retainer

* Parts First Used in 1951

MODELS 7260705,
7261005, Cadillac

This Model Same as Model 7260905, Bulletin 6D-1064, Except as Indicated by This Bulletin



MODELS 7260705 and 7261005

GENERAL

MOUNTING—1951 Cadillac 75 Series Cars.

TUBES—Seven, Plus Rectifier and Trigger.

SPEAKER—6″ x 9″ Elliptical, Permanent Magnet, Front — 6″ x 9″ Elliptical, Permanent Magnet, Rear.

TUNING—Electronic.

ANTENNA TRIMMER COMPENSATION—0.000060 - 0.000085 Mfd.

TUNING RANGE—540 - 1600 KC.

PUSHBUTTON SET-UP—No pushbutton set-up is necessary. However, the number of stations on which the tuner will stop can be controlled by the use of the Sensitivity Controls.

ALIGNMENT PROCEDURE—Alignment procedure same as that of Model 7260905, Bulletin 6D-1064.

FUNCTIONAL OPERATION

The Cadillac remote control signal seeker type radio has all the controls of the Cadillac Syncro-Matic Model 7260905 Radio for front seat operation and in addition has a control head mounted in the left or right rear seat arm rest for rear seat operation. This remote control head has a switch, volume control, and station selector button.

After the rear seat control switch is turned on, only the rear controls operate the radio. The radio cannot be operated from the front seat again until the rear control switch is turned off. Two controls that are always operated at the receiver are the tone control and the antenna control.

This radio operates from the front instrument panel in exactly the same manner as the 7260905 Model except for a front speaker switch on the right hand control knob. This switch is used only when the rear control is in operation, and it gives the front seat occupants the choice of listening at a reduced volume from normal output to the stations selected by the person operating the rear selector button or completely disconnecting the front speaker.

THEORY OF OPERATION

The energizing of relays, illustration numbers 125 and 126, is accomplished by turning the rear control switch (123C) to the "on" position. When this switch is turned on, the "A" voltage is applied across the relays, energizing the relays and closing the contacts to the rear controls. With the relays 125 and 126 energized, the rear seat controls are operative and not the front seat controls.

Once these relays are energized, the "A" supply is connected to the power transformer center-tap through contacts 1-2 and 3-4 of relay 126, regardless of the position of the front switch (112B); therefore the radio cannot be turned off until the relays are de-energized by turning off the rear switch (123C). With the relays in the de-energized position, all controls are operative at the receiver, while all remote controls in the rear arm rest are inoperative.

MODELS 7260705,
7261005, Cadillac

SCHEMATIC DATA

All voltages measured from sockets terminals to chassis with a 20,000 Ohm per volt voltmeter. Measurements taken with no signal and 6.0 volts at spark plate. Oscillator grid voltage taken with the set tuned to 1000 KC. Tuner not seeking and remote controls in "off" position.

Total "A" Drain 7.3 Amps.

Total "B" Drain 67MA.

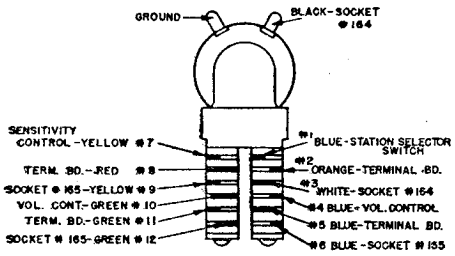
Tolerance on voltages ± 10%.

*—Indicates lead from tuner coil assy.

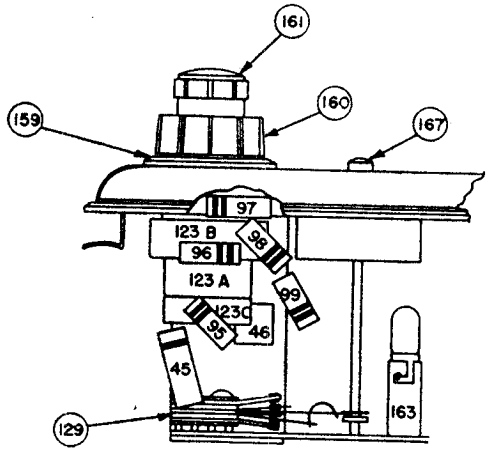
□—Colors of terminals on service part.

Note the red and black circuits are exactly the same as those of Model 7260905. The blue circuit has been added so that the tuner can be controlled from the rear seat location. This circuit is switched in or out of control by the relays which are energized from the rear seat.

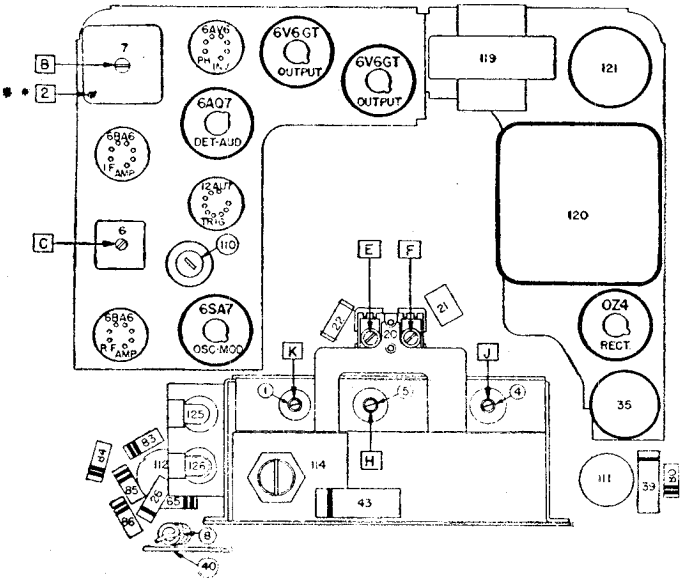
Relay leads' destinations and colors are to the respective contacts as numbered on the schematic.



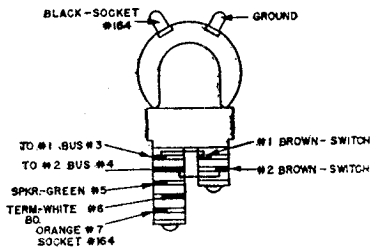
RELAY 125



PARTS LAYOUT — REAR CONTROL



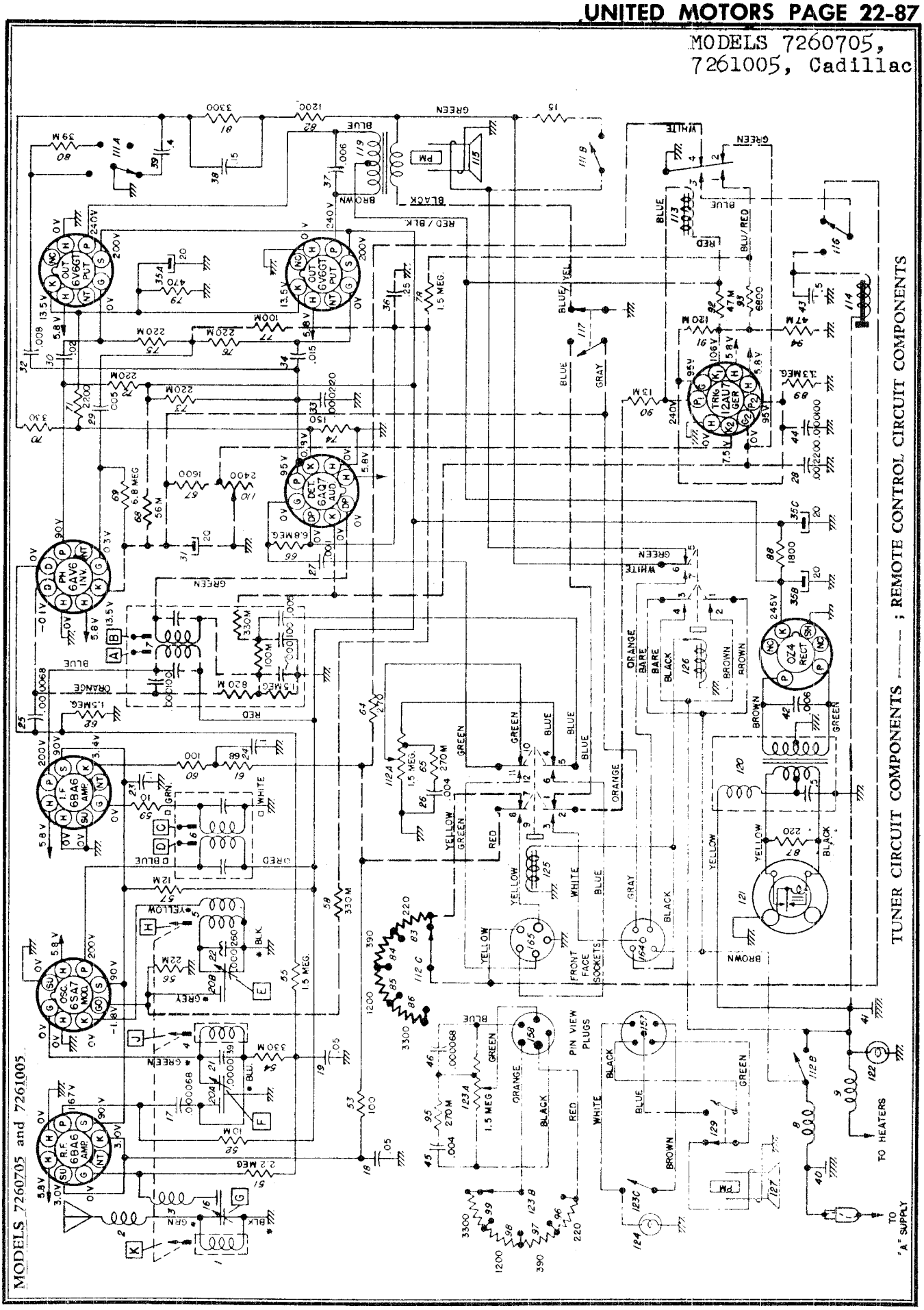
PARTS LAYOUT — TUBE VIEW



RELAY 126

**Connect a VTVM from this point to ground for output indications during alignment.

MODELS 7260705, 7261005, Cadillac



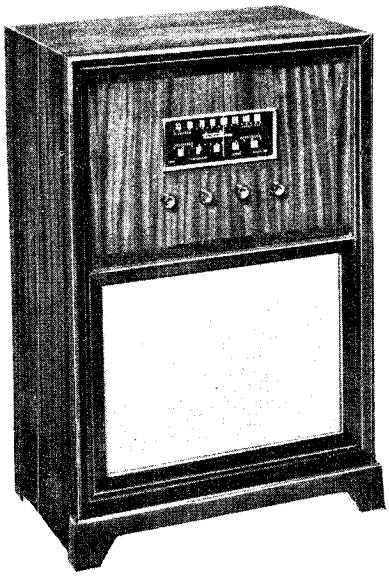
MODELS 7260705, 7261005, Cadillac

CADILLAC REMOTE CONTROL SYNCROMATIC MODEL SERVICE PARTS LIST

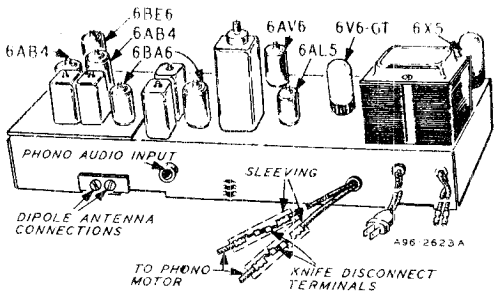
The Service Parts List of the Cadillac Remote Control Syncromatic Radios are identical to the Cadillac Syncromatic Radio, Model 7260905, except for the illustration numbers and parts listed below: Those parts marked with a cross (†) are changed from Model 7260905—the others are added parts.

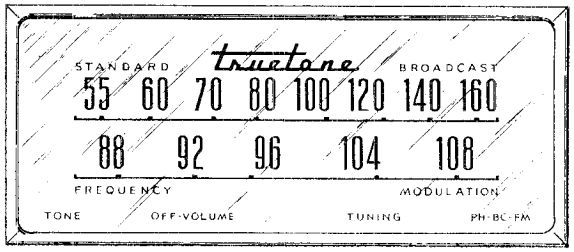
Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Capacitors
45	1218969	E-402	.004 mfd 600V Tubular
46	1219550	G 680	.000068 mfd Molded
			Resistors
95	1214556	A-274	270,000 ohms ½W Insulated
96	7237835	A 221	220 ohms ½W Insulated
97	1213482	A 391	390 ohms ½W Insulated
98	1213236	1213236	1200 ohms ½W Insulated
99	1213481	A 332	3300 ohms ½W Insulated
			Miscellaneous
†*111	7260703	*7260703	Tone and Front Speaker Control
111A			Tone Control
111B			Front Speaker Switch
†118	7260629	7260629	Foot Switch Assembly (Omitted)
123	7259947	7259947	Control - Volume, Sensitivity, and Switch—Remote Unit
123A			Volume
123B			Sensitivity
123C			Switch
124	187189	44	Lamp - Remote Dial Light
125	7259951	7259951	Relay - 4 Section
126	7259952	7259952	Relay - 3 Section
*127	7260849	*7260849	Speaker 6 x 9 Elliptical P. M. Rear
129	7259012	7259012	Switch - Station Selector - Remote Unit
			MECHANICAL PARTS
			Chassis
†134	7260698	7260698	Foot Switch Socket (Omitted)
			Remote Control
	7259946	7259946	Cable - Rear Seat - Model 7260705
*	7260870	*7260870	Cable - Rear Seat - Model 7261005
157	1219682	1219682	Plug and Shell Pkg.
158	1219679	1219679	Plug and Shell Pkg.
*	4599418	*4599418	Escutcheon - Arm Rest
159	7259510	7259510	Escutcheon - Sensitivity Control
160	7259508	7259508	Knob - Sensitivity Control
161	7259369	7259369	Knob - Control
163	1219686	1219686	Socket Pkg. - Dial Light
164	7259944	7259944	Socket - Cable
165	7259943	7259943	Socket - Cable
167	1219687	1219687	Station Selector Button Pkg.
			Push Button Assy.
	7259125	7259125	Retaining Ring
			Washer
	7256121	7256121	Felt Washer
			"C" Washer

* Parts First Used in 1951.



GENERAL INFORMATION





TONE CONTROL

Use this knob to adjust the tone of the receiver. When turned clockwise the high notes will predominate and when turned counterclockwise a deep bass effect will result.

ON-OFF SWITCH AND VOLUME CONTROL

The On-Off switch and Volume control are operated by the same knob. To turn the radio on, turn the knob clockwise until a click is heard. Allow approximately 30 seconds for the tubes to heat. Then continue to turn the knob clockwise to increase the volume.

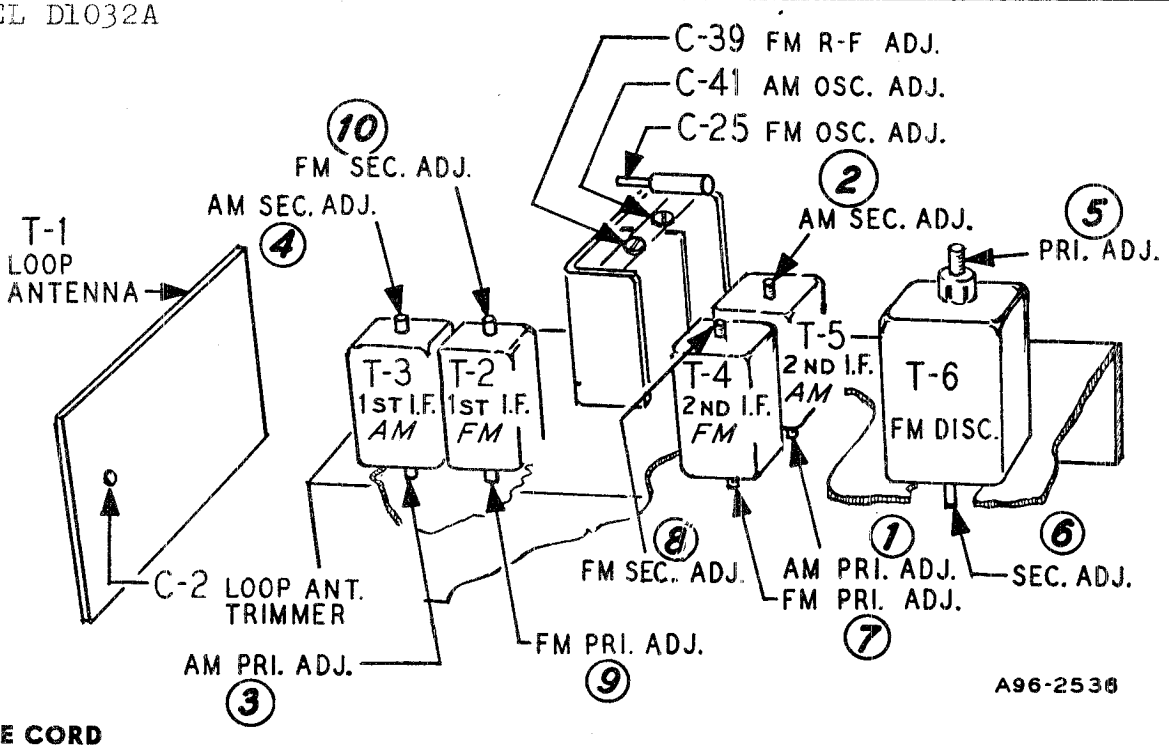
TUNING KNOB

Use this control to tune in the desired station. Turn the knob until the station is heard. Then slowly rotate it back and forth until the signal is clearest and strongest. If signal is too strong, reduce it by means of the volume control, not by using the tuning knob.

BAND AND PHONO RADIO SWITCH

This control has three positions, FM, Broadcast and Phono. In the Phono position, the electrical circuits are connected for the reproduction of records played on the external record player.

MODEL D1032A



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed Then install the string as shown, winding three turns counter-clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.

When television programs become available in your community, the audio amplifier and speaker of this radio may be used in conjunction with a Television Picture Receiver and sound converter to reproduce the sound portion of the television programs. Simply insert the connector on the cable of the Television Converter into the socket marked PHONO and operate the receiver in the same manner as described in the foregoing paragraph.

RECORD PLAYER AND TELEVISION SOUND CONNECTIONS

For models not equipped with built-in record player, a socket marked PHONO is provided on the back of the chassis for connection to an external record player or automatic record changer. When it is desired to play records through the radio, insert the connector on the cable of any standard record player into this socket. Turn the band switch to the phono position and use the volume control to adjust the sound level.

ELECTRICAL SPECIFICATIONS

Power Output—
117 volts AC—40 watts
50-60 cycles

Power Output—
1.9 watts maximum
.8 watts 10% distortion

Speaker—8 inch PM dynamic

Frequency Ranges—
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency—
AM 455 KC — FM 10.7 MC

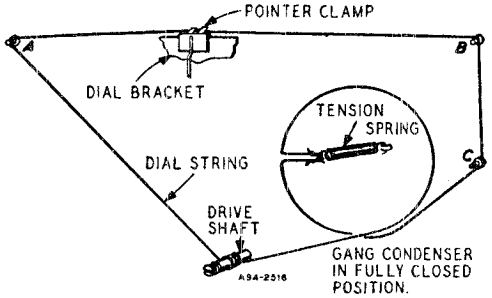
Selectivity — AM — 45 KC broad at 1000 times signal, measured at 1000 KC

I.F. FM—200 KC broad at 2 times down

I.F. FM—950 KC broad at 200 times down

AM Sensitivity—(For .5 watt output with external antenna)
25 microvolts average

FM Sensitivity—(For .5 watt output)
25 microvolts average



MODEL D1032A

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator		Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Deflection Maximum
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

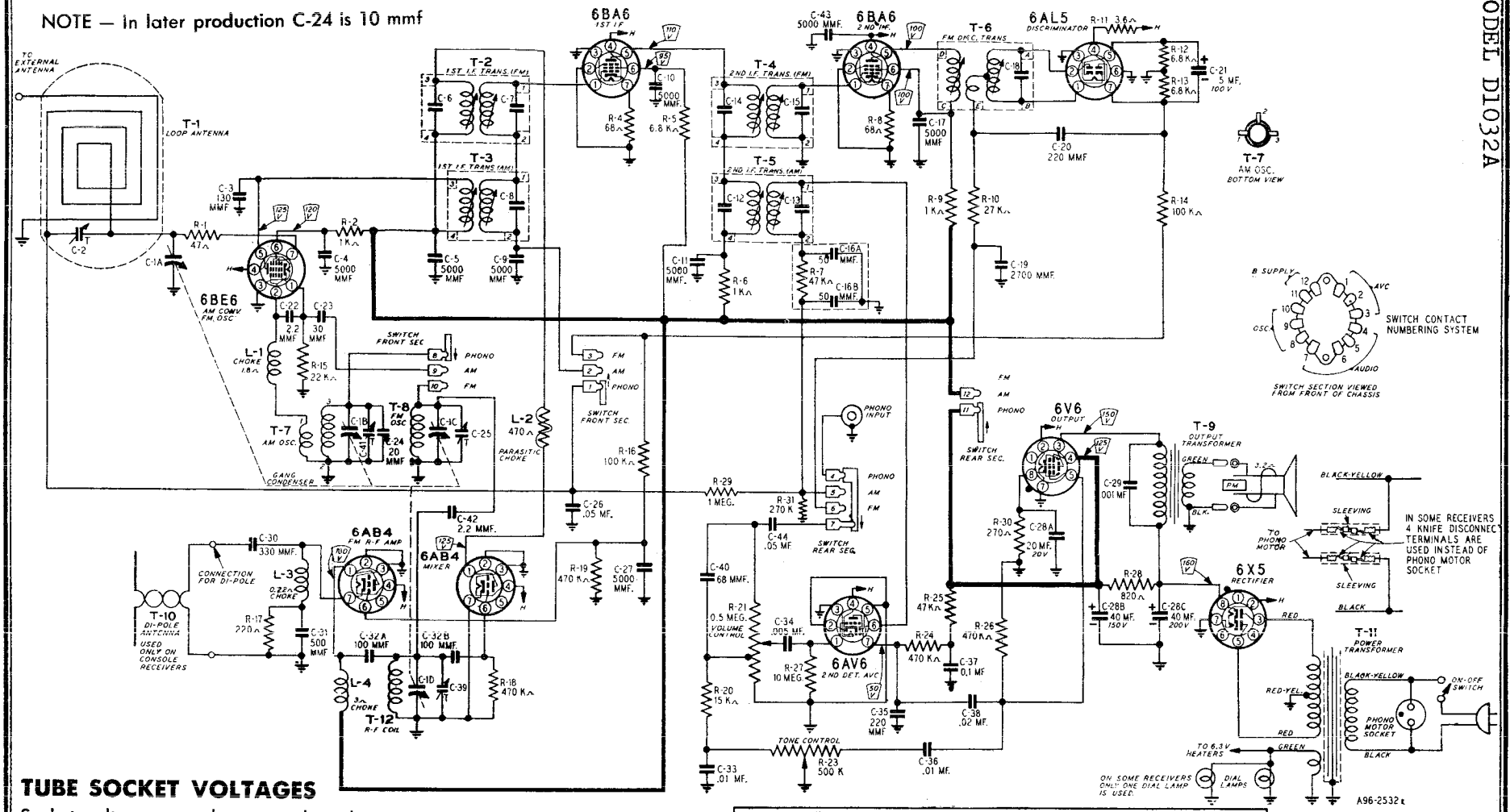
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

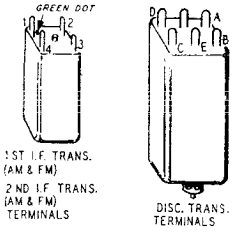
NOTE — In later production C-24 is 10 mmf

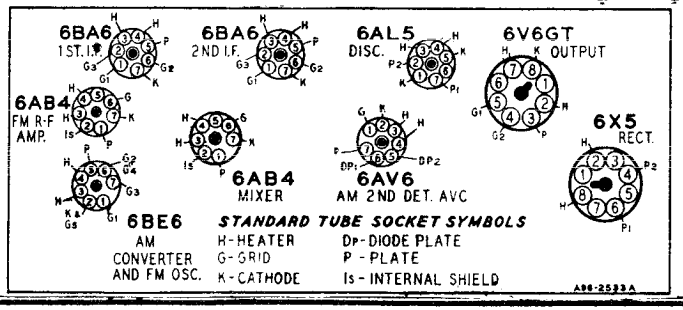


TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ±10% is usually permissible.





REPLACEMENT PARTS LIST

RESISTORS

		Ohms	Watts	
R-1	B85470	47	0.5	Carbon..
R-2, R-6, R-9	B85102	1000	0.5	Carbon.....
R-4, R-8	B84680	68	0.5	Carbon.....
R-5, R-12, R-13	B84682	6800	0.5	Carbon.....
R-7, R-25	B85473	47 K	0.5	Carbon.....
R-10	B85273	27 K	0.5	Carbon.....
R-11	43X233	3.6	0.5	Wirewound...
R-14, R-16	B85104	100 K	0.5	Carbon.....
R-15	B85223	22 K	0.5	Carbon.....
R-17	B84221	220	0.5	Carbon.....
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon.....
R-20	B85153	15 K	0.5	Carbon.....
R-21	36X372	.5 meg.		Volume Control
R-23	40X310	.5 meg.		Tone Control
R-27	B85106	10 meg.	0.5	Carbon.....
R-28	D84821	820	2.0	Carbon.....
R-29	B85105	1 meg.	0.5	Carbon.....
R-30	B84271	270	0.5	Carbon.....
R-31	B84274	270 K	0.5	Carbon.....

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke
L-2	9A2103	Parasitic Choke
L-3	35A9	Insulated Choke
L-4	35A8	Insulated Choke
T-1	9A1972	"B" Range Loop Antenna
T-2	9A2060	1st I-F Trans. (FM)
T-3	9A2062	1st I-F Trans. (AM)
T-4	9A2061	2nd I-F Trans. (FM)
T-5	9A2063	2nd I-F Trans. (AM)
T-6	9A2161	Discriminator Transformer
T-7	9A2065	Oscillator Coil (AM)
T-8	9A2067	Oscillator Coil (FM)
T-9	51X134	Output Transformer
T-10	9A2005	Dipole Antenna
T-11	53X291	Power Transformer
T-12	9A2066	Antenna Coil (FM)

DIAL AND DRIVE ASSEMBLY

58X742	Dial Glass
15X251	Pointer
19X192	"C" Washer (Mtg. Drive Shaft)
6X66	Rubber Grommet
25X1616	Dial Bracket
28X113	Drive Cord Tension Spring
7A103	No. 47 Pilot Light
7A199	Pilot Light Socket Assembly
10X38	Drive Cord Assembly
26X486	Drive Shaft

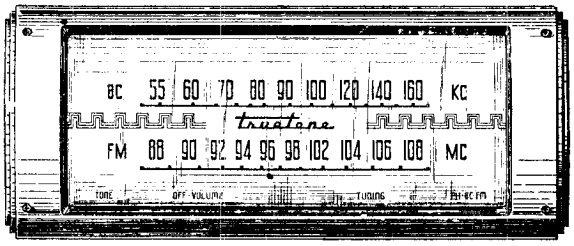
MISCELLANEOUS

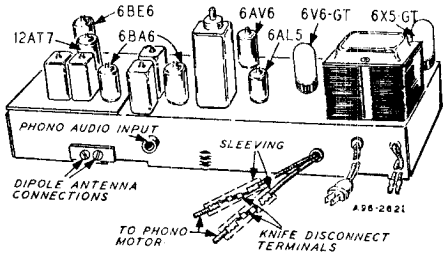
12A477	8" P.M. Speaker
4X1082	Escutcheon
10A759	Knob
13X546	Line Cord & Plug Assembly
2A393	Band Change Switch
3A435	Molded Octal Tube Socket
3A305	Phono Socket
3A426	Tube Socket (1st 6BA6)
3A427	Tube Socket
3A439	Tube Socket (Miniature)
	Cabinet No. 052

CAPACITORS

C-1	14A209	Gang Condenser Assembly		
C-2	17A256	2-24 mmf		Trimmer.....
C-3	47X559	130 mmf		Ceramic.....
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf		Ceramic.....
C-6, C-7	Part of T-2 (1st I-F Trans. FM)			
C-8	Part of T-3 (1st I-F Trans. AM)			
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)			
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)			
C-16A, C-16B	47X112	50-50 mmf		Dual Mica....
C-18	Part of T-6 (Discriminator Trans.)			
C-19	47X492	2700 mmf		Molded Mica..
C-20, C-35	47X468	220 mmf		Ceramic.....
C-21	45X361	5 mf	100 V	Dry Electrolytic
C-22, C-42	47X557	2.2 mmf		Ceramic.....
C-23	47X558	30 mmf		Ceramic.....
C-24	47X523	10 mmf		Ceramic.....
C-25	17A255	1-8 mmf		Trimmer.....
C-26, C-44	B66503	.05 mf	200 V	Tubular.....
C-28A		20 mf	20 V	
C-28B, C-28C	45X360	40 mf 40 mf	150 V 200 V	Dry Electrolytic
C-29	H66102	.001 mf	800 V	Tubular.....
C-30	47X470	330 mmf		Molded Mica..
C-31	47X508	500 mmf		Ceramic.....
C-32A, C-32B	76X4	100 mmf		Dual Ceramic..
C-33, C-36	B66103	.01 mf	200 V.	Tubular.....
C-34	D66502	.005 mf	400 V.	Tubular.....
C-37	D66104	.1 mf	400 V	Tubular.....
C-38	D66203	.02 mf	400 V	Tubular.....
C-39, C-41	Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic.....

MODEL D1046D



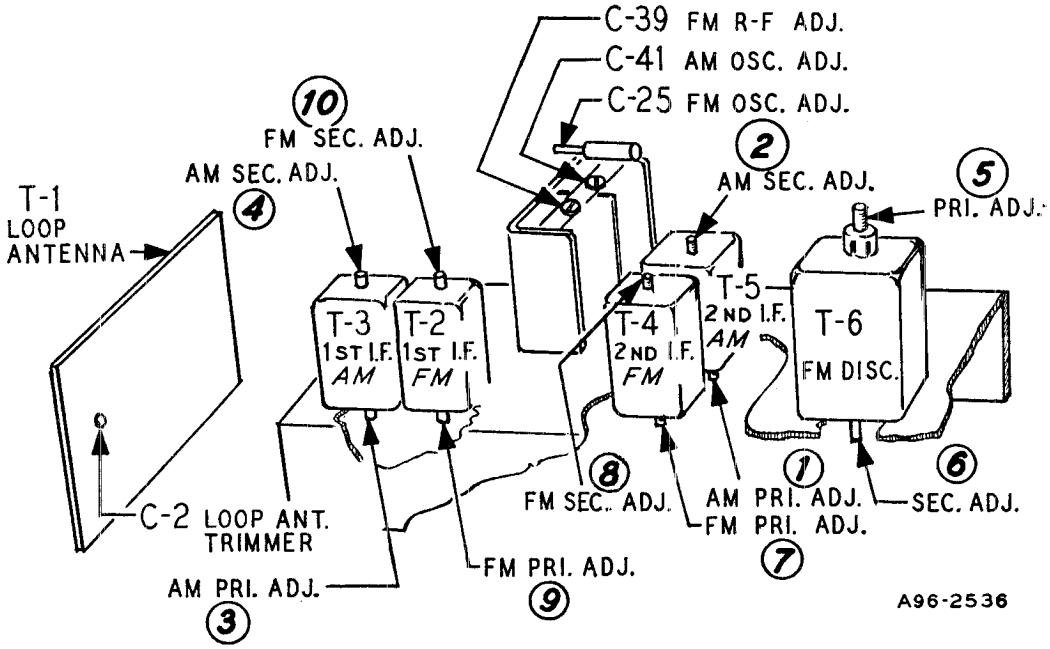


TONE CONTROL

ON-OFF SWITCH AND VOLUME CONTROL

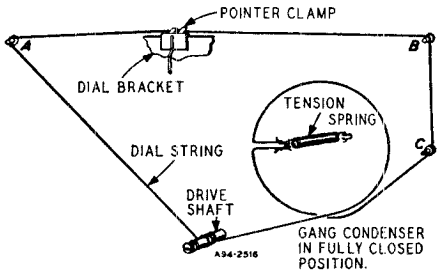
TUNING KNOB

BAND AND PHONO RADIO SWITCH



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns counter-clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



ELECTRICAL SPECIFICATIONS

Power Output—
117 volts AC—40 watts
60 watts phono operating

Power Output—
1.9 watts maximum
.8 watts 10% distortion

Speaker—8 inch PM dynamic

Frequency Ranges—
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency—
AM 455 KC — FM 10.7 MC

Selectivity — AM — 45 KC broad at 1000 times signal, measured at 1000 KC

I.F. FM—200 KC broad at 2 times down

I.F. FM—950 KC broad at 200 times down

AM Sensitivity—(For .5 watt output with external antenna)
25 microvolts average

FM Sensitivity—(For .5 watt output)
25 microvolts average

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.
Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms
Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR						
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	Maximum Deflection
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

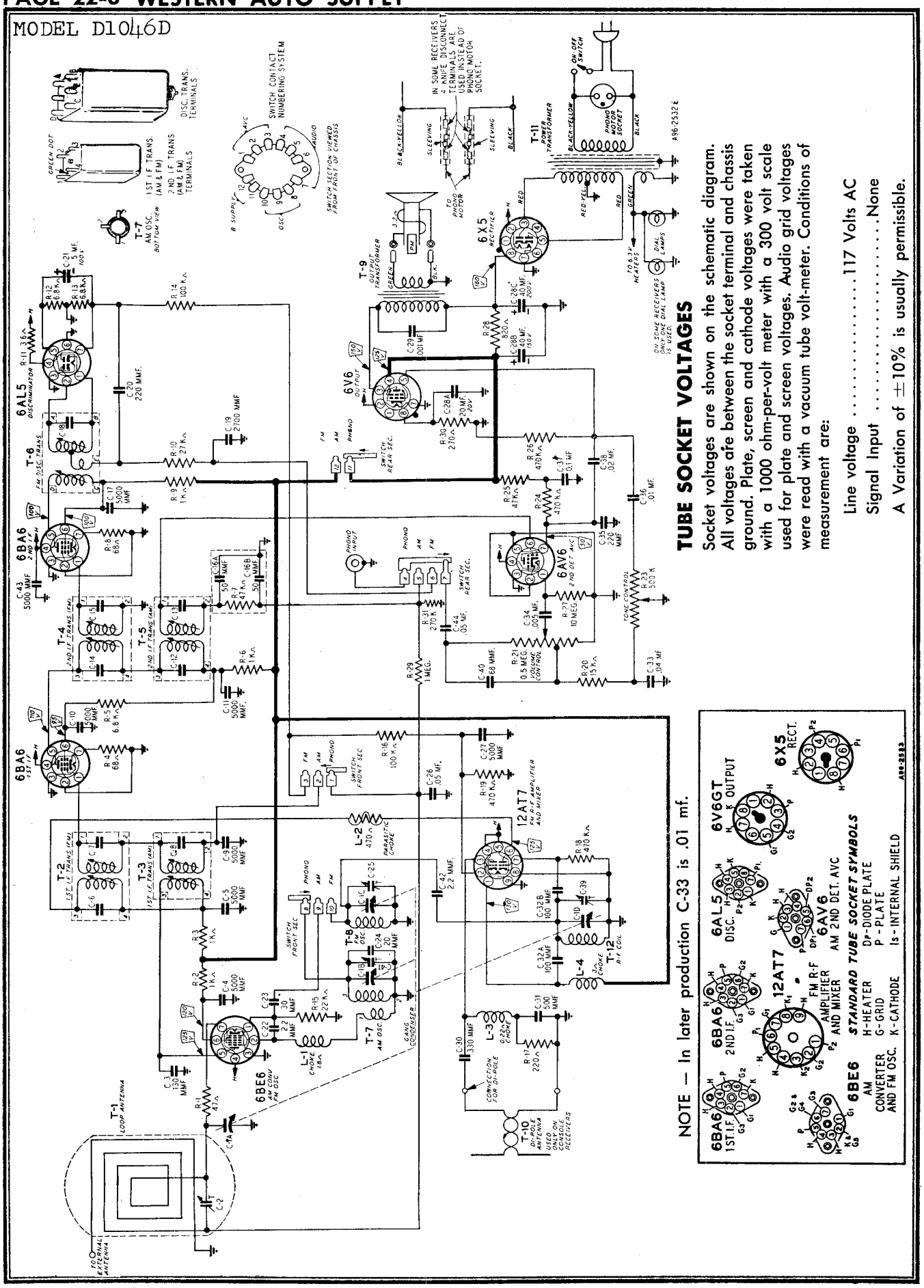
NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

MODEL D1046D



NOTE — In later production C-33 is .01 mf.

STANDARD TUBE SOCKET SYMBOLS

H-HEATER
G-GRID
P-PLATE
K-CATHODE
Dp-DIODE PLATE
Is-INTERNAL SHIELD

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None

A Variation of ±10% is usually permissible.

MODEL D1046D

PARTS LISTS

NOTICE: There is a model number label on the chassis. This label identifies the receiver as to chassis and issue letter. When ordering parts or writing, give ALL information on this label.

MISCELLANEOUS

12A477	8" P.M. Speaker	
4X1073	Escutcheon	
10A758	Knob	
13X546	Line Cord & Plug Assembly	
2A395	Band Change Switch	
3A435	Molded Octal Tube Socket	
3A305	Phono Socket	
3A426	Tube Socket (1st 6BA6)	
3A443	Tube Socket (12AT7)	
3A427	Tube Socket (6BE6)	
3A439	Tube Socket (Miniature)	
	Cabinet No. 952	

CAPACITORS

C-1	14A209	Gang Condenser Assembly		
C-2	17A256	2-24 mmf		Trimmer
C-3	47X559	130 mmf		Ceramic
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf		Ceramic
C-6, C-7	Part of T-2 (1st I-F Trans. FM)			
C-8	Part of T-3 (1st I-F Trans. AM)			
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)			
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)			
C-16A, C-16B	47X112	50-50 mmf		Dual Mica
C-18	Part of T-6 (Discriminator Trans.)			
C-19	47X492	2700 mmf		Molded Mica
C-20, C-35	47X468	220 mmf		Ceramic
C-21	45X361	5 mf	100 V	Dry Electrolytic
C-22, C-42	47X557	2.2 mmf		Ceramic
C-23	47X558	30 mmf		Ceramic
C-24	47X516	20 mmf		Ceramic
C-25	17A255	1-8 mmf		Trimmer
C-26, C-44	B66503	.05 mf	200 V	Tubular
C-28A		20 mf	20 V	
C-28B	45X360	40 mf	150 V	Dry Electrolytic
C-28C		40 mf	200 V	
C-29	H66102	.001 mf	800 V	Tubular
C-30	47X470	330 mmf		Molded Mica
C-31	47X508	500 mmf		Ceramic
C-32A, C-32B	76X4	100 mmf		Dual Ceramic
C-33, C-36	B66103	.01 mf	200 V.	Tubular
C-34	D66502	.005 mf	400 V.	Tubular
C-37	D66104	.1 mf	400 V	Tubular
C-38	D66203	.02 mf	400 V	Tubular
C-39, C-41	Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic

RESISTORS

		Ohms	Watts	
R-1	B85470	47	0.5	Carbon
R-2, R-3, R-6, R-9	B85102	1000	0.5	Carbon
R-4, R-8	B84680	68	0.5	Carbon
R-5, R-12, R-13	B84682	6800	0.5	Carbon
R-7, R-25	B85473	47 K	0.5	Carbon
R-10	B85273	27 K	0.5	Carbon
R-11	43X233	3.6	0.5	Wirewound
R-14, R-16	B85104	100 K	0.5	Carbon
R-15	B85223	22 K	0.5	Carbon
R-17	B84221	220	0.5	Carbon
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon
R-20	B85153	15 K	0.5	Carbon
R-21	36X381	.5 meg.		Volume Control
R-23	40X311	.5 meg.		Tone Control
R-27	B85106	10 meg.	0.5	Carbon
R-28	D84821	820	2.0	Carbon
R-29	B85105	1 meg.	0.5	Carbon
R-30	B84271	270	0.5	Carbon
R-31	B84274	270 K	0.5	Carbon

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke
L-2	9A2103	Parasitic Choke
L-3	35A9	Insulated Choke
L-4	35A8	Insulated Choke
T-1	9A1972	"B" Range Loop Antenna
T-2	9A2060	1st I-F Trans. (FM)
T-3	9A2062	1st I-F Trans. (AM)
T-4	9A2061	2nd I-F Trans. (FM)
T-5	9A2063	2nd I-F Trans. (AM)
T-6	9A2161	Discriminator Transformer
T-7	9A2065	Oscillator Coil (AM)
T-8	9A2067	Oscillator Coil (FM)
T-9	51X134	Output Transformer
T-10	9A2003	Dipole Antenna
T-11	53X291	Power Transformer
T-12	9A2066	Antenna Coil (FM)

DIAL AND DRIVE ASSEMBLY

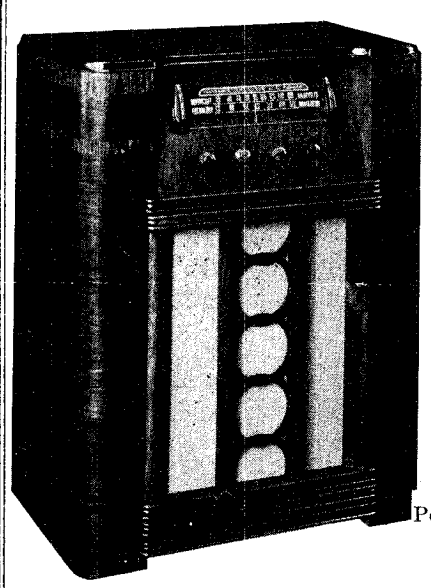
58X730	Dial Glass
15X251	Pointer
19X192	"C" Washer (Mtg. Drive Shaft)
6X66	Rubber Grommet
25X1610	Dial Bracket
28X113	Drive Cord Tension Spring
7A103	No. 47 Pilot Light
7A215	Pilot Light Socket Assembly
10X38	Drive Cord Assembly
26X510	Drive Shaft

TYPE G.I. -- 28A169 RECORD CHANGER PARTS

G.I. 69-73657	Tone Arm
G.I. 55-73613	Plastic Stabilizer
G.I. 28A755782	Idler Wheel Assembly
G.I. 56-76507	Motor, 3 speed, 60 cycles, 105-125 Volts A. C.
P-81	Crystal Cartridge, complete with needle *Needle only

*When ordering needles, specify part number and letter stamped on Cartridge.

MODEL D1846

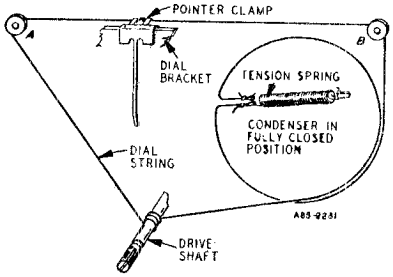


REMOVAL OF CHASSIS FROM CABINET

Before removing the chassis from the cabinet it will be necessary to detach the dial pointer from the dial string. To do this, spread the tabs on the pointer and pull the dial string off the pointer.

The dial lamp socket assembly may be disengaged from the cabinet mounting by squeezing together and pulling away from the cabinet mounting, the spring bracket to which the dial lamp socket is mounted. Take care not to bend or damage the large drive pulley on the gang condenser while doing this.

When replacing the chassis in the cabinet it will be necessary to tune in a station of a known frequency and move the dial pointer until that frequency is indicated on the dial and then attach the pointer to the dial string. Take care not to scuff or cut the dial string or bend the pointer during this operation.



ELECTRICAL SPECIFICATIONS

Power Consumption—
117 volts AC 60 watts normal
85 watts phono operating

Power Output—
4.5 watts maximum
2.5 watts 10% distortion

Speaker—8" PM dynamic

Frequency Ranges—
Broadcast 540-1600 KC
Frequency Modulation 88-108 MC

Intermediate Frequency—
AM 455 KC — FM 10.7 MC

Selectivity — AM — 45 KC broad at 1000 times signal, measured at 1000 KC

I.F. FM—200 KC broad at 2 times down

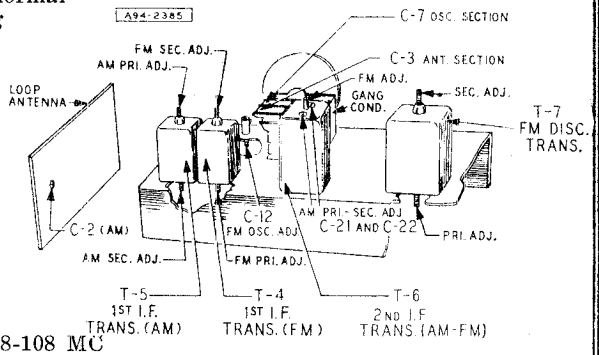
I.F. FM—950 KC broad at 200 times down

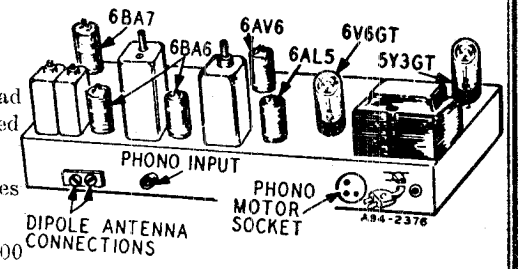
AM Sensitivity—(For .5 watt output with external antenna)
10 microvolts average

FM Sensitivity—(For .5 watt output)
100 microvolts average

DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.

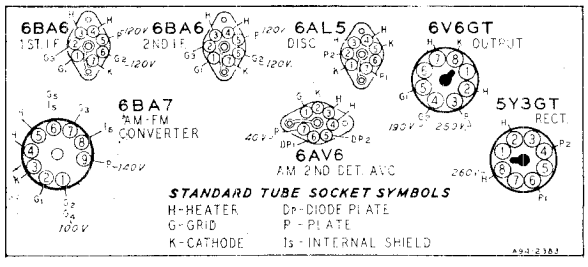




TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ±10% is usually permissible.



MODEL D1846

SERVICE DATA

ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR					
FREQUENCY SETTING	CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-21 & C-22
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BA7 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-7
1400 KC	External Antenna Lead	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-2

NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

FM STAGES

Allow chassis and signal generator to warm up for several minutes.

The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

	SIGNAL GENERATOR					
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Note C
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. and Note C
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. Note C
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. Note C
	RECHECK I-F ADJUSTMENTS IN ORDER GIVEN					
Oscillator	108.4 Note F	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-12
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3
	RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN					

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it to the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

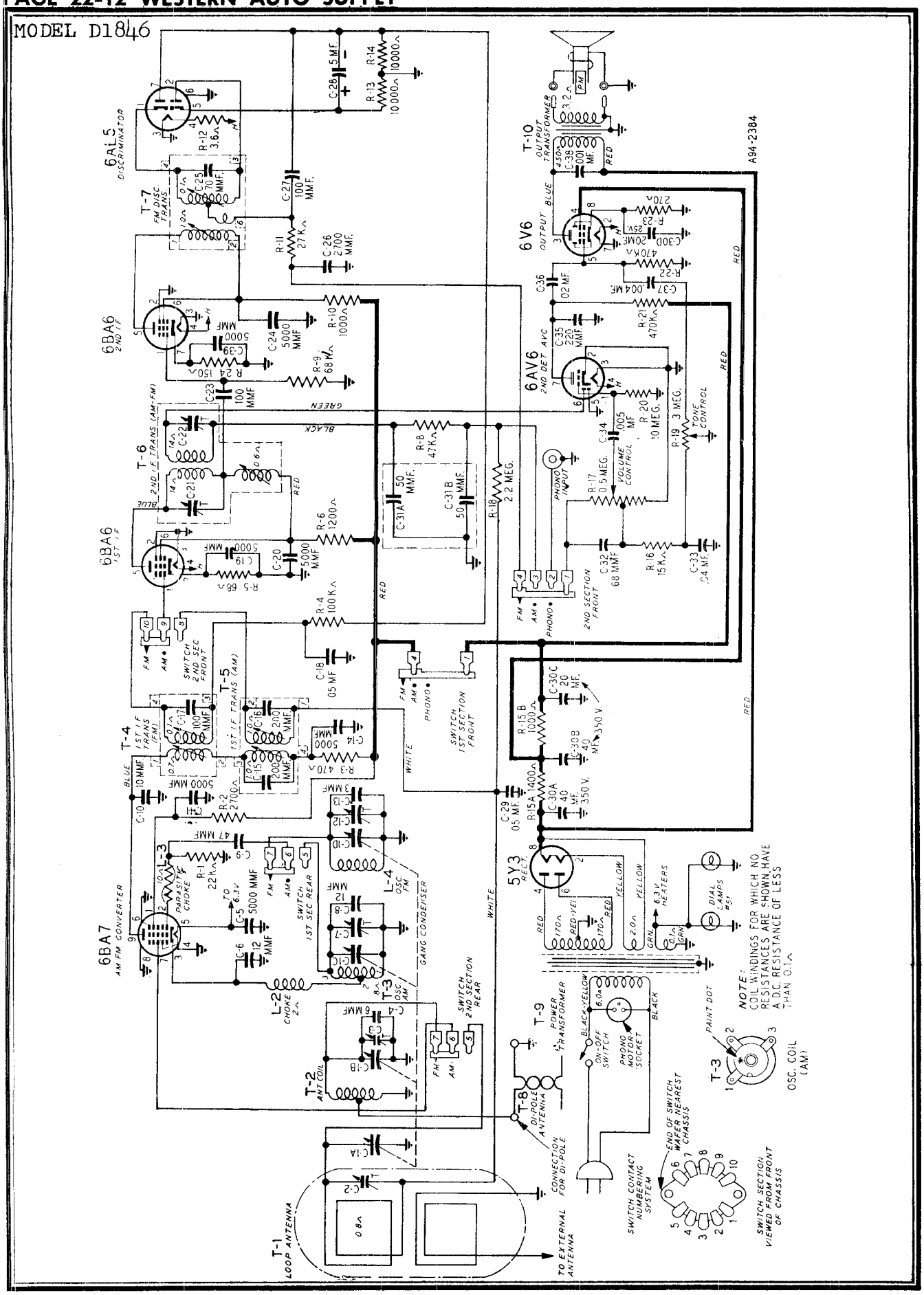
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F Trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

MODEL D1846



MODEL D1846

REPLACEMENT PARTS LIST

NOTICE: There is a Model Number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A477	8" PM Speaker
2A373	Band Change Switch
3A303	Molded Octal Tube Socket
3A304	Phono Motor Jack
3A305	Phono Input Jack
3A426	Miniature Tube Socket
3A443	Miniature Tube Socket (For AM-FM Converter Tube)
10A691	Knob (Tuning)
10A692	Knob (Off-On Volume)
10A693	Knob (Tone)
10A694	Knob (AM-FM Phono)
13X546	Line Cord and Plug
30X547	Line Cord Clamp

CAPACITORS

C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly		
C-2		Part of T-1 (Loop Antenna Assembly)		
C-3, C-7		Part of C-1 (Gang Condenser Assembly)		
C-4	47X521	6 mmf		Ceramic
C-5, C-11, C-14, C-19, C-20, C-24, C-39	47X507	5000 mmf		Silvered Ceramic
C-6, C-8	47X522	12 mmf		Ceramic
C-9	47X517	47 mmf		Ceramic
C-10	47X512	10 mmf		Ceramic
C-12	17A255	1-8 mmf		Trimmer
C-13	47X547	3 mmf		Ceramic
C-15, C-16		Part of T-5 (1st I.F. Transformer AM)		
C-17		Part of T-4 (1st I.F. Transformer FM)		
C-18, C-29	B66503	.05 mf	200 V	Tubular
C-21, C-22		Part of T-6 (2nd I.F. Transformer AM-FM)		
C-23	47X497	100 mmf		Ceramic
C-25		Part of T-7 (Discriminator Coil Assembly)		
C-26	47X492	2700 mmf		Molded
C-27	47X526	100 mmf		Molded
C-28	45X361	5 mf	100 V	Dry Electrolytic
C-30A		40 mf	350 V	
C-30B		40 mf	350 V	
C-30C	45X359	20 mf	350 V	Dry Electrolytic
C-30D		20 mf	25 V	
C-31A, C-31B	47X112	50-50 mmf		Dual Mica
C-32	47X471	68 mmf		Molded
C-33	B66403	.04 mf	200 V	Tubular
C-34	D66502	.005 mf	400 V	Tubular
C-35	47X468	220 mmf		Ceramic
C-36	D66203	.02 mf	400 V	Tubular
C-37	B66402	.004 mf	200 V	Tubular
C-38	H66102	.001 mf	800 V	Tubular

RESISTORS

		Ohms	Watts	
R-1	B84223	22 K	.5	Carbon
R-2	B83272	2700	.5	Carbon
R-3	B84471	470	.5	Carbon
R-4	B85104	100 K	.5	Carbon
R-5	B83680	68	.5	Carbon
R-6	B84122	1200	.5	Carbon
R-8	B85473	47 K	.5	Carbon
R-9	B85683	68 K	.5	Carbon
R-10	B84102	1000	.5	Carbon
R-11	B84273	27 K	.5	Carbon
R-12	43X233	3.6	.5	Wire Wound
R-13, R-14	B84103	10K	.5	Carbon
R-15A	43X224	1000	6.0	Wire Wound
R-15B		1400	4.0	
R-16	B84153	15 K	.5	Carbon
R-17	36X371	.5 meg		Volume Control
R-18	B85225	2.2 meg.	.5	Carbon
R-19	40X284	3 meg.		Tone Control
R-20	B85106	10 meg.	.5	Carbon
R-21, R-22	B85474	470 K	.5	Carbon
R-23	B84271	270	.5	Carbon
R-24	B84151	150	.5	Carbon

TRANSFORMERS AND COILS

L-2	35A1	Insulated Choke
L-3	9A1940	Parasitic Choke Assembly
L-4	9A2021	Oscillator Coil Assembly (FM)
T-1	9A1972	"B" Range Loop Antenna Assembly
T-2	9A1956	Antenna Coil Assembly
T-3	9A1997	Oscillator Coil (AM)
T-4	9A1932	1st I.F. Transformer (FM)
T-5	9A1998	1st I.F. Transformer (AM)
T-6	9A1999	2nd I.F. Transformer (AM-FM)
T-7	9A1970	Discriminator Coil Assembly
T-8	9A2003	Dipole Antenna Assembly
T-9	53X290	Power Transformer
T-10	51X134	Output Transformer

DIAL AND DRIVE ASSEMBLY

15X229	Pointer	
6X21	Rubber Grommet	Mtg. Gang Condenser
20X260	Condenser Cushion Stud	Mtg. Gang Condenser
58X717	Dial	
28X113	Drive Cord Tension Spring	
26X507	Drive Shaft	
19X192	"C" Washer (For drive shaft)	
10X66	Drive Cord Assembly	
7A215	Pilot Light Socket Assembly	
7A32	No. 51 Pilot Light	
25X1491	Pointer Bracket	
4X915	Escutcheon (Right)	
4X916	Escutcheon (Left)	
30X517	Dial Clamp	
25X1571	Idler Bracket	
4X931	Escutcheon Inserts	

TYPE O-28A144 RECORD CHANGER PARTS

O-7102-1	Phono motor, 60 cycle, 115 volt	
O-7583	Idler Pulley Kit	These parts can only be used with O-7102-1 Type motor
O-7103	Turntable	
O-7106-1	Phono Motor, 60 cycle, 115 volt	
O-7584	Idler Pulley Kit	These parts can only be used with O-7106-1 Type motor
O-7107	Turntable	
O-7101	Grommet	
O-4388-3	Fibre Washer	
O-7478-4	Motor on-off Switch	
O-7477-1	Switch Cover	
O-7810	Changer Blade Assembly	
O-4279	Tenite Cap	
O-4215-37	Set Screw (Mounting tenite cap)	
O-6699	Control Button	
O-7799	Tone Arm Assembly Less Cartridge	
	Cartridge Shure P93	
O-4298-3	Screw (for mtg. cartridge to tone arm)	
	Needle, Durpoint 15X	
O-7589	Needle Set Screw	

MODEL D4142A

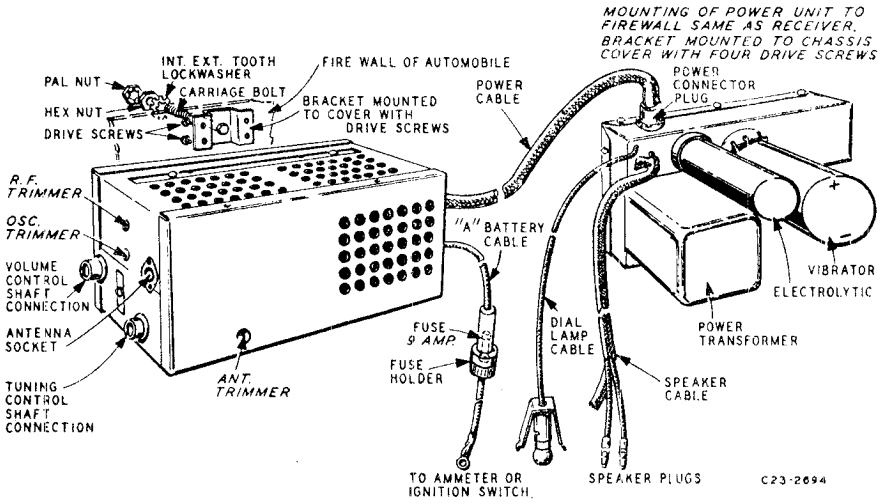


Fig. 1 — Receiver and Power Supply Units

RADIO INFORMATION

This automobile radio consists of three units, the receiver, the power supply and the speaker. The receiver and power supply have been designed to mount on the firewall of the car in an out-of-sight position by means of the mounting hardware provided with each radio. This will mean drilling one or two holes through the firewall to accommodate the mounting studs (in some cases it will be possible to take advantage of holes already drilled by the manufacturer). In some cars the best spot for installing the receiver unit may be found to be near the top of the firewall where the surface is curved, in which case, the following precaution should be observed. Refer to Fig. 2 and note the open space between the outer surface of the receiver unit and the surface of the firewall. This space should be filled in with several layers of heavy cardboard before tightening the nut on the mounting stud to prevent springing the case of the receiver unit. If the case of this unit is sprung its shielding effect may be lessened resulting in unsatisfactory performance. The tuning head, consisting of the dial plate, dial assembly and flexible shafts are put up in kit form for each make of automobile. The speaker baffle is also supplied in kit form. Instructions for installing these two items are supplied in each kit. Attention is called to the fact that the radio should be installed in a location where the control cables can be fastened to it without making any sharp bends. If this precaution is observed, the radio controls will operate freely and easily.

In some automobiles where it may be impractical to mount the receiver unit with the brackets supplied, it is suggested that the mounting be made with a 1/4-20 bolt attached through one of the ventilator holes on the side of the receiver case.

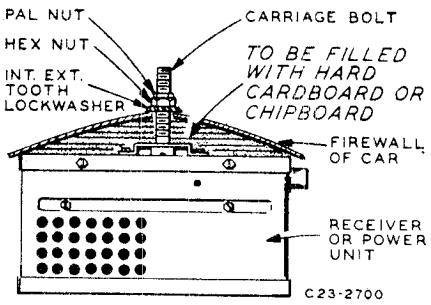


Fig. 2 — Unit Mounting

ANTENNA

A shielded antenna cable (30 mmf. capacity) with bayonet connector plug is required.

The plug on the antenna cable is inserted in the socket at the side of the radio case as shown in Fig. 1. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 40 to 200 mmf.

Types of Low Capacity Antennas — "Fishpole" type, such as door hinge and cowl; over-the-roof types which are short and are mounted quite a distance from the metal roof of the car.

Mount the antenna on the same side of the car as the radio.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (200 to 500 mmf. total capacity of antenna and shielded cable), a 24 inch shielded adapter extension cable is necessary. The adapter is inserted in the socket at the side of the radio case. Then the antenna cable plug is inserted in the socket at the other end of the adapter.

Types of High Capacity Antennas —Over-the-roof types which are long and are mounted close to the metal roof of the car; ordinary built-in roof antennas (not metal roof). Under-car antennas (these are usually high capacity) are not recommended for this radio.

ANTENNA CABLE

CAUTION—Be careful not to bend the antenna cable too sharply or to clamp it tightly as the small wire inside the cable may be broken.

Keep the antenna cable as far away from car wiring as possible and ground the pigtail of the antenna cable shield at the antenna end, otherwise ignition noise may be picked up. The length of the pigtail from the grounding point to the end of the antenna cable should be kept as short as possible, preferably not over one inch.

For the "fish pole" and over-the-roof type antennas, the antenna lead must be shielded the entire distance from the radio to the point where the lead goes through the car body to the outside.

When the antenna cable is connected to an antenna lead coming down the pillar post, the shielded cable should be pushed several inches up into the pillar post.

MODEL D4142A

MISCELLANEOUS DATA

Before Mounting Radio

Before mounting the radio to the fire wall, it is advisable in most cases to complete the wiring connections.

Battery Cable and Fuse

The battery connection is made at the ammeter. The end of the battery cable with the connecting lug is secured to one of the posts at the back of the ammeter in the instrument panel. The other end of the cable with the fuse receptacle connects to the battery cable from the radio after the fuse has been inserted. A 9 ampere fuse is used.

Dial Lamp Cable

Insert the dial lamp assembly in the receptacle. The dial lamp used in this unit is a 6-8 volt automobile type lamp (Bulb No. 51).

Inserting Vibrator Unit

IMPORTANT: — The vibrator unit can be inserted in two ways. The proper method of insertion will depend on which terminal of the car battery is grounded. If the POSITIVE (+) terminal of the car battery is grounded, insert the vibrator as shown in figure 1. If the NEGATIVE (—) terminal of the car battery is grounded, insert the vibrator so that the negative sign on the vibrator is towards the back flange of the power supply unit.

Adjusting Antenna Trimmer

After the antenna is connected, tune in a weak signal at approximately 1600 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna trimmer (C-2) in or out until maximum output is obtained. See Fig. 1 for location of this trimmer.

Calibrating The Radio

The radio must be calibrated before attaching the control cables to the radio. Set the dial pointer to the low end of the scale. Insert a screwdriver into the tuning control shaft connection and turn the tuning assembly all the way to the left (counter-clockwise). This adjustment matches the tuning of the receiver to the low end of the dial scale. Then attach the control cables to the radio.

Replacing Tubes And Vibrator

Remove the top cover of the radio receiver if tube replacement is necessary. The vibrator is located on the power supply unit and may be easily removed by pulling it straight up and out. Replacement vibrators may be purchased at any Western Auto Supply Company Store.

OPERATING THE RADIO

To Turn the Radio On

Turn the volume control knob to the right. A click will be heard and the dial lamp will light. Wait 30 seconds for the tubes to heat.

Tuning in a Station

Turn the volume on full by turning the volume control knob to the right as far as it will go. Next, slowly turn the tuning knob until a station is heard. Reduce the volume by means of the volume control knob to below the desired intensity.

Now turn the tuning knob very slowly back and forth until the station is clearest and strongest. IF THE STATION IS NOT CAREFULLY TUNED IN, THE RECEPTION WILL BE NOISY AND DISTORTED. Then adjust the volume control until the desired intensity is obtained. Always reduce the volume by means of the volume control knob and never by turning the tuning knob.

To Turn the Radio Off

Turn the volume control knob to the left as far as it will go. A click will be heard and the dial lamp will be off.

SERVICE DATA

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.
The following equipment is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antenna—.05 mf., See Note A.

SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	IRON CORE SETTING	ADJUST TUNING SLUGS (IF) AND TRIMMERS TO MAXIMUM (See Fig. 4)
I.F. 455 KC	Control Grid (prong No. 7) 6BE6 Mixer Tube	.05 mf.	Extreme Position out of Coil	1st I.F. Pri. (1) & Sec. (2) 2nd I.F. Pri. (3) & Sec. (4)
1605 KC	Antenna Cable See Note A	See Note A	Extreme Position out of Coil	Oscillator (C-7)
1605 KC	Antenna Cable	See Note A	Extreme Position out of Coil	R.F. (C-5) Ant. (C-2)

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1600 KC—Readjust Antenna Trimmer C-2 for maximum output.

SPECIFICATIONS

Power Consumption	5.5 Amperes at 6.6 Volts
Power Output (6.6 Volts)	2.2 Watts Undistorted 4.0 Watts Maximum
Sensitivity	3 Microvolts at 1 Watt Output
Selectivity	45 KC Broad at 1000 Times Signal
Tuning Frequency Range	540 to 1605 KC
Intermediate Frequency	455 KC
Speaker	6" PM Dynamic

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 30 mmf., use a 30 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio see article "Calibrating the Radio" on page 2.

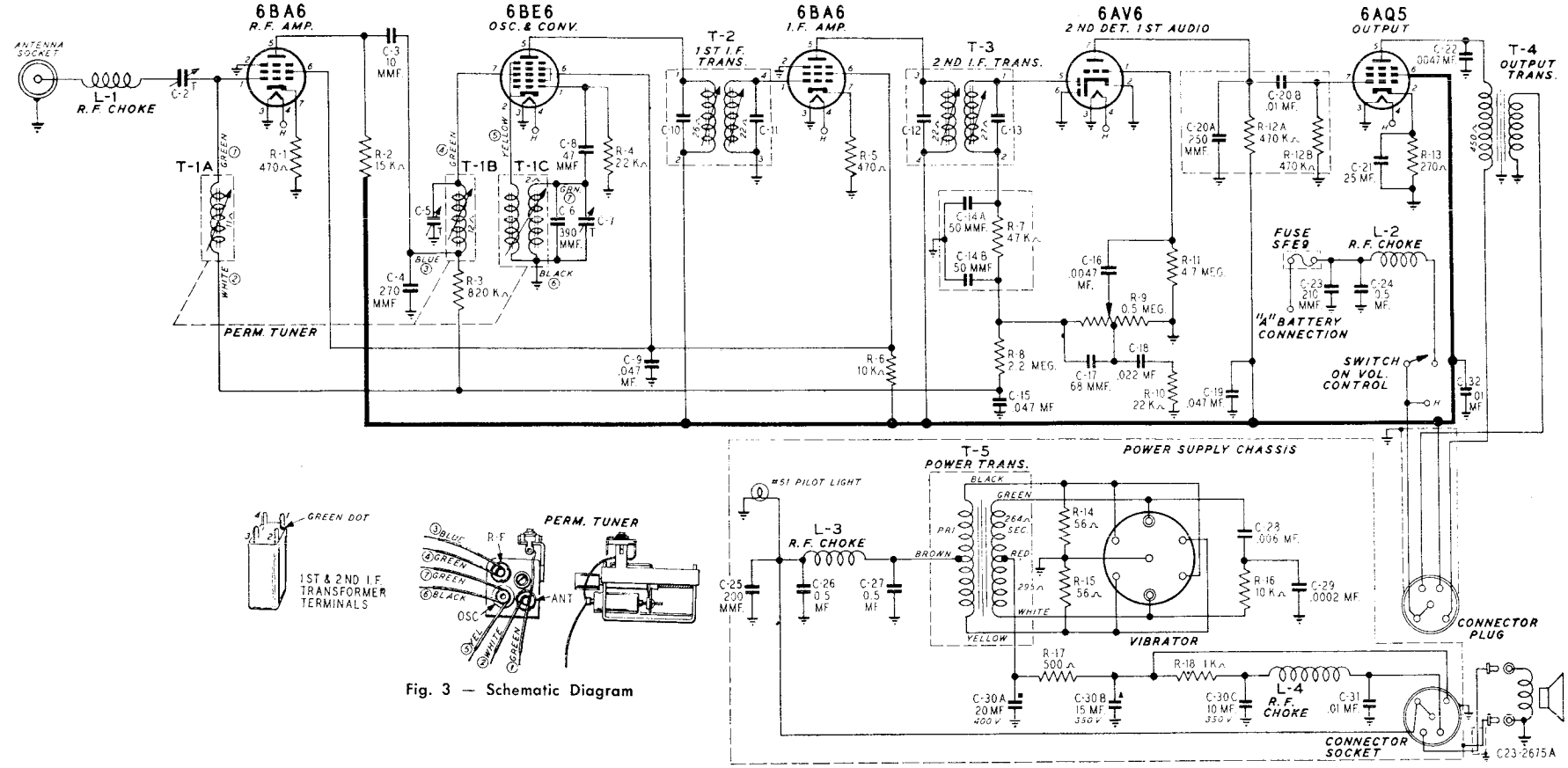


Fig. 3 — Schematic Diagram

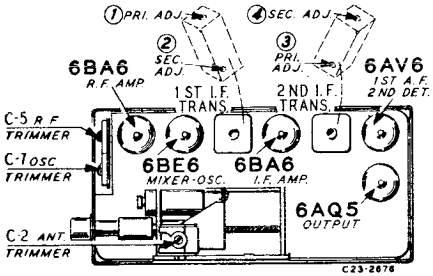


Fig. 4 — Tube Layout

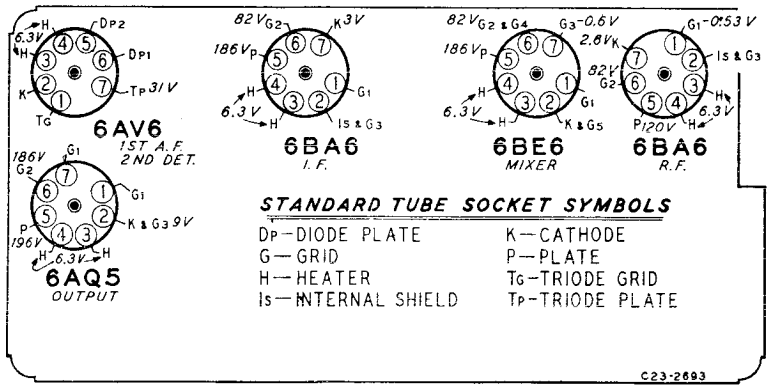


Fig. 5 — Socket Voltages — Bottom View

TUBE SOCKET VOLTAGES

Voltages were measured between the indicated terminals and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages, under the following conditions:

Battery voltage .....6.6 Volts
Signal Input .....None
Volume Control .....Maximum
Antenna .....Shorted to Ground

A variation of ±10% is usually permissible.

MODEL D4142A

SUPPRESSION OF MOTOR NOISE

The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order given. Additional procedure, which may be required in exceptional cases of motor noise, is not covered here and will be found by referring to current literature on this subject.

GENERATOR CONDENSER — A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator.The case and mounting strap connect the other side of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION—In cars with automatic regulators, it is important not to connect the condenser across the field terminal. Most manufacturers at the present time have a recommendation for the proper post at which to connect the condenser.

DISTRIBUTOR SUPPRESSOR—A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor. Insert a distributor suppressor and connect the wire to the other end of the suppressor (See Fig. 6). If this is not practical, cut the high tension lead close to the distributor and use a wood screw end type distributor suppressor in this line.

Withdraw Antenna Cable Plug

Turn on the radio and start the motor.

If motor noise is heard, proceed as follows:

BONDING CABLES, STEERING COLUMN, ETC.—Try grounding to the fire wall all cables and tubing which pass through it such as oil lines, gas lines, etc. It is also possible for the steering column, foot pedals, and brake lever to carry interference to the back of the fire wall at which point it may affect the radio. By means of a file, contact can be established between any of these parts and the fire wall or frame in order to determine whether such a ground will reduce the noise. To bond the parts to the fire wall or frame, clean the point of contact, wrap a length of one inch braided shielding around the part, and solder the connection. Then solder the end of the shielding to the fire wall or frame or ground it under a screw head if one is convenient.

Sufficient play should be left in the bonding shielding so that movement of the parts will not loosen this shielding.

Then Re-insert Antenna Cable Plug

If motor noise is heard when the antenna cable is reconnected, proceed as follows until the noise is satisfactorily reduced:

BYPASS CONDENSERS — Try a .5 mfd. bypass condenser from the ammeter to ground and see if interference is reduced, Install this condenser permanently if there is an improvement.

In like manner, try a .5 mfd. condenser from car fuse to ground, switch to ground, tail light and stop light connections to ground, windshield wiper and various other 6 volt connections to ground, noting what effect these condensers have on the noise pickup.

Try a .5 mfd. condenser between the point at which the dome light lead leaves the pillar post and ground.

Try a .5 mfd. condenser from the "Hot" side of the coil primary to ground.

The electric gauges used for oil, water, and gas are often a source of interference and bypass condensers should be tried. The condenser should usually be connected to the end of the line nearest the measuring device rather than at the instrument panel.

HIGH AND LOW TENSION LEADS—In some cases, the high and low tension leads between the coil and distributor are run close together. In some cars, they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the high and low tension leads as far apart from each other as possible. If separating the two leads is not sufficient, shield and ground the shield of the low tension lead.

GROUNDING MOTOR AND OTHER PARTS—The motor must, in every case, be well grounded to the frame of the car. If it is not, use a very heavy braided lead for this purpose, similar to a storage battery ground lead. In like manner, it may be necessary to check the grounding of the metal fire wall, instrument panel, transmission, radiator, hood, and muffler to the frame of the automobile. To obtain a good electrical connection, scrape off the paint, if necessary, at the point where ground contact is made.

PEENING ROTOR ARM — In extreme cases of motor noise, it is advisable to peen the distributor rotor arm, that is, increase the length of the arm by using a small machinist's hammer. This will lessen the gap between the rotor arm and the stationary contacts thus reducing the spark. Be sure, after peening the arm, that it does not strike the stationary contacts.

SPARK PLUG SUPPRESSORS—If motor noise persists, spark plug suppressors must be installed. One suppressor is put on each plug. These are not regularly supplied with the radio and must be purchased extra. Ninety-five percent of all cars will not require spark plug suppressors.

Care should be taken that a good mechanical and electrical connection is made between the spark plugs, suppressors, and plug wires.

WHEEL OR BRAKE STATIC—To determine if noise is being caused from this source, set the car in motion; then with the motor shut off and the clutch disengaged, apply the brakes. *If the noise* stops, the source of the static is in the wheels. The use of a front or rear wheel static eliminator will generally end the trouble.

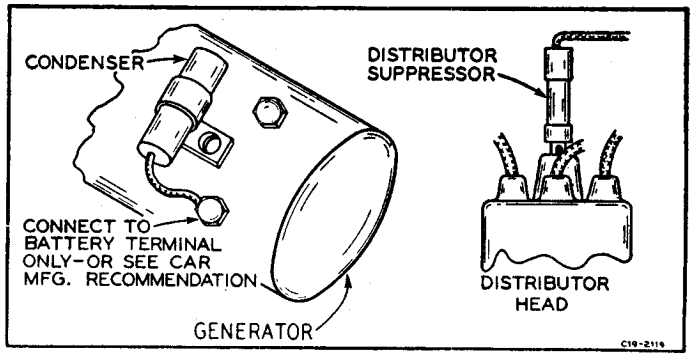


Fig. 6 — Generator Condenser and Distributor Suppressor

MODEL D4142A

REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the radio. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A503	6" P.M. Speaker
76X1	Diode Filter Assembly
76X5	Audio Couplate Assembly
3A426	Tube Socket
3A437	Antenna Connector
3A467	Connector Socket (Power Supply)
3A440	Vibrator Socket
19A42	Vibrator
34X555	Top Cover for Receiver Case
34X557	Bottom Cover for Receiver Case
34X554	Bottom Cover for Power Supply Case
20A101	Iron Core Tuning Assembly Complete with Coils, Trimmers, etc.
7A232	Pilot Light Socket Assembly
7A32	Pilot Light Bulb No. 51
16X26	Fuse (SFE9)
16X150	Fuse Holder Assembly
16X149	Fuse Retainer Knob Assembly
13X798	Shielded Cable & Plug Assembly
26A513	Nut & Bolt Kit Assembly
26A512	Universal Mtg. Hardware Assembly (Complete) Includes Bracket, Screws, Bolts, Lockwashers, Distributor Suppresser, Generator Condenser, etc.
25X1772	Mtg. Bracket (for Power Supply & Receiver)
21A6	Distributor Suppresser
48X27	Generator Condenser

TRANSFORMERS & COILS

L-1	35A10 R-F Choke
L-2	9A2222 R-F Choke
L-3	9A1958 R-F Choke
L-4	9A2219 R-F Choke
T-1A, T-1B, T-1C	Antenna, R-F, Oscillator Coils and Iron Cores are part of 20A101 Tuning Assembly. Entire Assembly must be ordered. (See Miscellaneous.)
T-2	9A2203 1st I.F. Transformer & Can Assembly
T-3	9A2204 2nd I.F. Transformer & Can Assembly
T-4	51X153 Output Transformer
T-5	53X321 Power Transformer

CAPACITORS

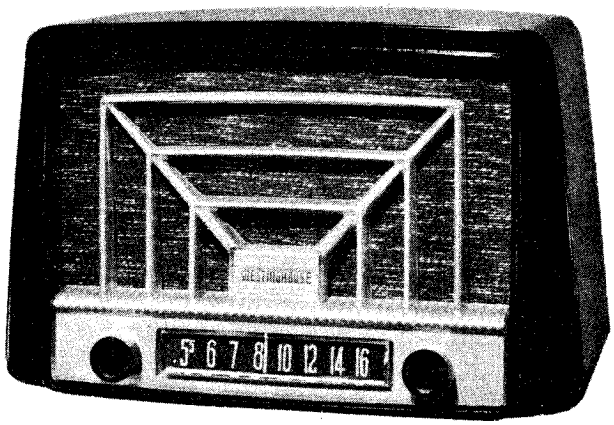
C-2	Part of Tuner (See Miscellaneous)		
C-3	47X523	10 mmf	Ceramic
C-4	RCM20D271K	270 mmf	Silver Mica
C-5, C-7	17A263	25-100 mmf	Trimmer Condenser
C-6	47X475	390 mmf	Mica
C-8	47X495	47 mmf	Ceramic
C-9, C-19	46X397	.047 mf	400 V Molded Tubular
C-10, C-11	Part of T-2 (1st I.F. Transformer)		
C-12, C-13	Part of T-3 (2nd I.F. Transformer)		
C-14A, C-14B	Part of 76X1 (See Miscellaneous)		
C-15	46X398	.047 mf	200 V Molded Tubular
C-16	46X400	.0047 mf	200 V Molded Tubular
C-17	47X471	68 mmf	Molded Mica
C-18	46X413	.022 mf	200 V Molded Tubular
C-20A, C-20B	Part of 76X5 (See Miscellaneous)		
C-21	45X388	25 mf	25 V Electrolytic
C-22	46X412	.0047 mf	1000 V Molded Tubular
C-23	47X602	210 mmf	Mica
C-24, C-26, C-27	46X425	.5 mf	100 V Paper Tubular
C-25	47X129	200 mmf	Mica
C-28	46X424	.006 mf	1600 V Buffer
C-29	47X520	.0002 mf	Ceramic
C-30A	45X387	20 mf	400 V
C-30B		15 mf	350 V Electrolytic
C-30C		10 mf	350 V
C-31, C-32	47X595	.01 mf	Ceramic

CAPACITORS (Con't.)

RESISTORS

		Ohms	Watts	
R-1, R-5	B83471	470	0.5	Carbon
R-2	C84153	15 K	1.0	Carbon
R-3	B85824	820 K	0.5	Carbon
R-4, R-10	B85223	22 K	0.5	Carbon
R-6	D84103	10 K	2.0	Carbon
R-7	Part of 76X1 (See Miscellaneous)			
R-8	B85225	2.2 meg.	0.5	Carbon
R-9	36X387	.5 meg.	Volume Control & Switch	
R-11	B85475	4.7 meg.	0.5	Carbon
R-12A, R-12B	Part of 76X5 (See Miscellaneous)			
R-13	C84271	270	1.0	Carbon
R-14, R-15	C84560	56	1.0	Carbon
R-16	C84103	10 K	1.0	Carbon
R-17	43X257	500	5.0	Wirewound
R-18	D84102	1 K	2.0	Carbon

MODEL H-327T6U,
Ch. V-2157-3U



SPECIFICATIONS

FREQUENCY RANGE: ..... 540 to 1615 kc.

INTERMEDIATE FREQUENCY: ..... 455 kc.

TUBE COMPLEMENT:

1	12BA6	R-F Amp.
1	12BE6	Converter
1	12BA6	I-F Amp.
1	12AV6	Det., AVC, and 1st A-F Amp.
1	35C5	Output Amp.
1	35W4	Rectifier

POWER OUTPUT:

Undistorted ..... 0.9 watt

Maximum ..... 1.5 watts

LOUDSPEAKER: ..... 4" PM

OPERATING VOLTAGE: ..... 105 to 120 volts, 50-60 cycles A-C or D-C

POWER CONSUMPTION: ..... 35 watts

ALIGNMENT

It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

Make certain that the dial pointer is correctly positioned.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial*	*Adjust for Maximum Output —*
1.	pin #7 of the 12BE6 through a 200 mmf capacitor	455 kc.	minimum capacity	top and bottom slugs of T2 and T1 in order given*
2.	stator of ant. tuning capacitor (A) through a 200 mmf capacitor	1615 kc.	minimum capacity	oscillator trimmer (F)
3.	same as step 2	1400 kc.	1400 kc.	R-F trimmer (D)
4.	radiated signal	1400 kc.	1400 kc.	antenna trimmer (B)

* It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot.

MODEL H-327T6U,
Ch. V-2157-3U

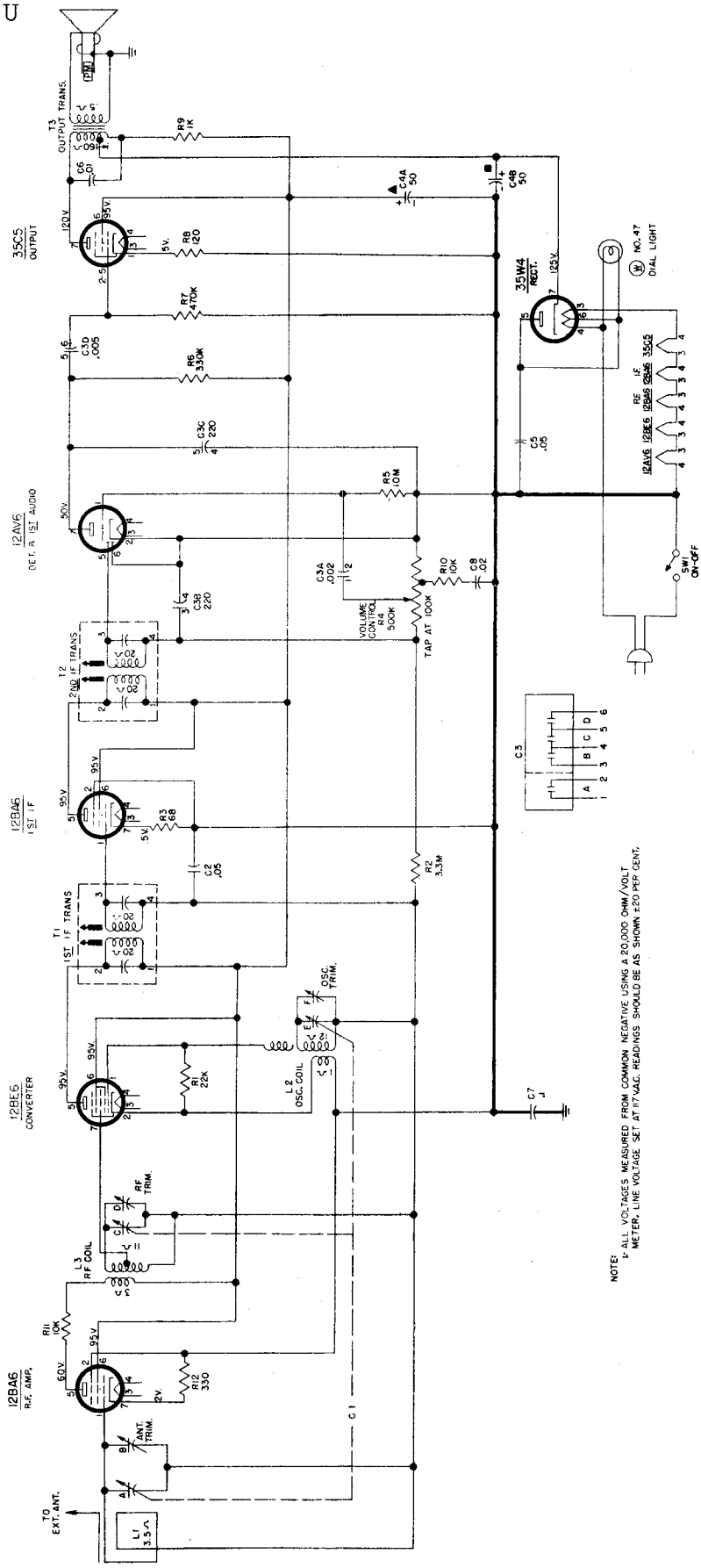


FIG. 1 - SCHEMATIC DIAGRAM OF V-2157-3U CHASSIS

MODEL H-327T6U,
Ch. V-2157-3U

PARTS LIST FOR MODEL H-327T6U

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS

Part No.	*Description*
V-6120-3	Background, dial
V-10017-4	Baffle and grille cloth assembly
V-1220-4	Cabinet (without baffle and grille cloth)
V-3219S-1	Cord, dial drive
V-10013-4	Grille
V-10009-2	Knob, volume, on-off and tuning
No. 47	Light, dial
V-10181-1	Pointer
V-9996-2	Shaft, tuning
V-9888-2	Socket, wafer (12BE6, 35W4, 35C5)
V-9888-3	Socket, wafer (12BA6, 12AV6)
V-9122-2	Socket, dial light
V-10079-2	Speaker, 4"PM (includes T3)
V-10076-1	Spring, dial drive

V-2157-3U CHASSIS

Ref. No.	*Part No.*	*Description*
C1	V-10189-1	Capacitor, variable
C2	RCP10W2503M	Capacitor, .05 mfd 200 v.
C3	V-9634-1	Capacitor, multiple
C4	V-10190	Capacitor, electrolytic, 50-50 mfd 150 v.
C5	RCP10W4503M	Capacitor, .05 mfd 400 v.
C6	RCP10W4103M	Capacitor, .01 mfd 400 v.
C7	RCP10W4104M	Capacitor, .1 mfd 400 v.
C8	RCP10W2203M	Capacitor, .02 mfd 200 v.
L1	V-10197-1	Loop, antenna
L2	V-10192	Coil, oscillator
L3	V-10191	Coil, RF
R1	RC20AE223M	Resistor, 22,000 ohms ½ w.
R2	RC20AE335M	Resistor, 3.3 megohms ½ w.
R3	RC20AE680M	Resistor, 68 ohms ½ w.
R4	V-9993-2	Control, volume, 500,000 ohms
R5	RC20AE106M	Resistor, 10 megohms ½ w.
R6	RC20AE334M	Resistor, 330,000 ohms ½ w.
R7	RC20AE474M	Resistor, 470,000 ohms ½ w.
R8	RC20AE121M	Resistor, 120 ohms ½ w.
R9	RC30AE102M	Resistor, 1000 ohms 1 w.
R10	RC20AE103M	Resistor, 10,000 ohms ½ w.
R11	RC20AE103M	Resistor, 10,000 ohms ½ w.
R12	RC20AE331K	Resistor, 330 ohms ½ w.
T1	V-9735-1	Transformer, IF
T2	V-9735-1	Transformer, IF
T3	V-10079-2	Transformer, audio (includes speaker)

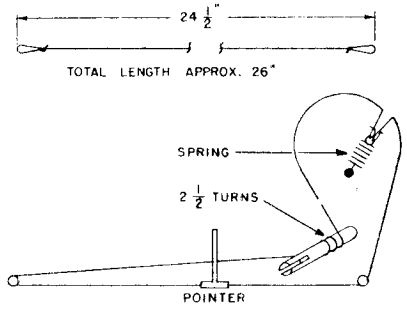


FIG. 2 – DIAL DRIVE

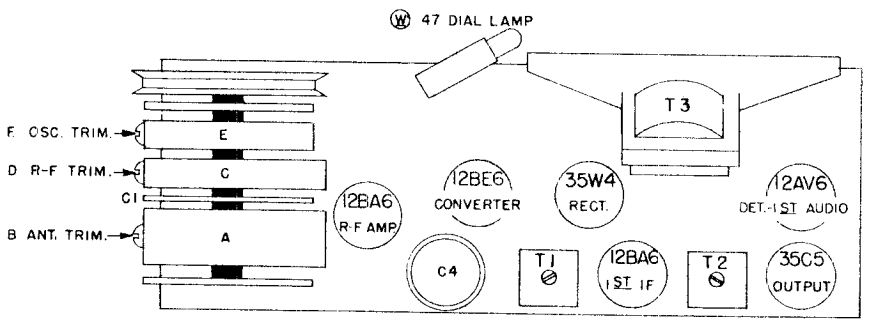


FIG. 3 – CHASSIS LAYOUT

MODEL H-328C7,
Ch. V-2136-4

SPECIFICATIONS

FREQUENCY RANGES:

Amplitude Modulation ..... 540 to 1615 kc.
Frequency Modulation ..... 88 to 108 mc.

INTERMEDIATE FREQUENCIES:

Amplitude Modulation ..... 455 kc.
Frequency Modulation ..... 10.7 mc.

TUBE COMPLEMENT:

1 12AT7 ..... R-F Amp. and Mixer (FM)
1 12BE6 ..... FM Osc. and AM Converter
1 12BA6 ..... I-F Amp.
1 6BJ6 ..... I-F Driver (FM)
1 12AL5 ..... Ratio Det. (FM)
1 12AV6 ... Det. and AVC (AM) and A-F Amp.
1 50L6GT ..... Output Amp.

POWER OUTPUT:

Undistorted ..... 2.5 watts
Maximum ..... 3.0 watts

LOUDSPEAKER: ..... 10" PM

OPERATING VOLTAGE:

..... 105 to 120 volts, 60 cycles AC

POWER CONSUMPTION: ..... 70 watts

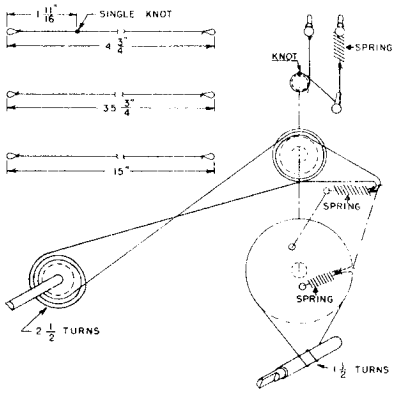


FIG. 3 — DIAL DRIVE

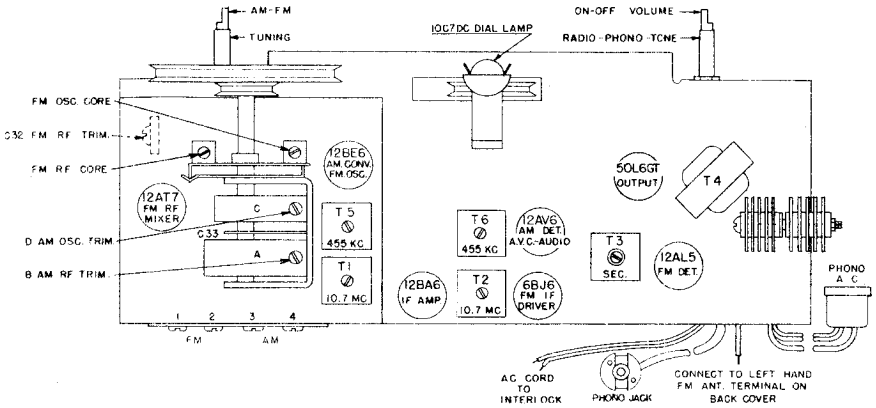
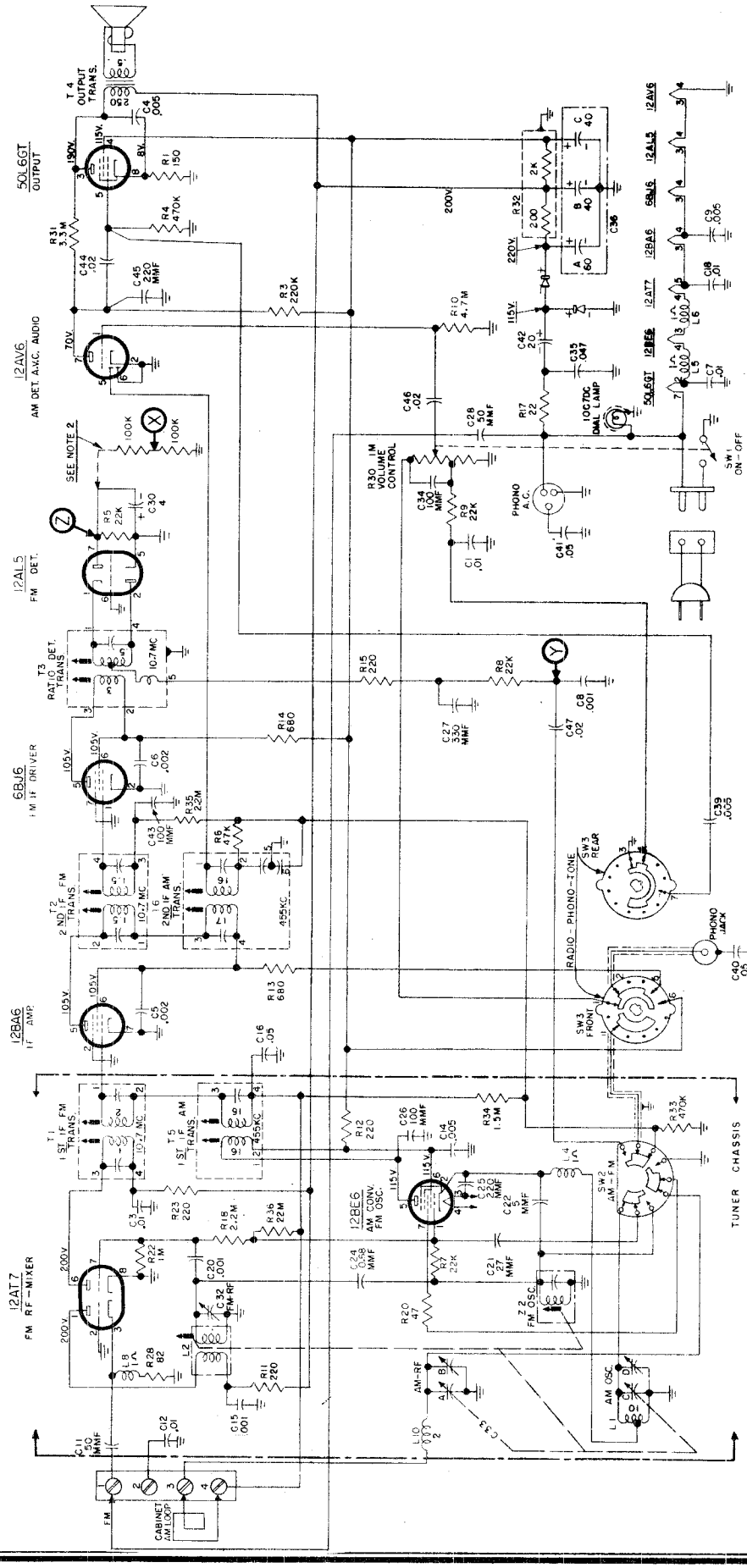


FIG. 2 — TOP VIEW OF CHASSIS

MODEL H-328C7,
Ch. V-2136-4



1. SELECTOR SWITCH SW2 IS SHOWN IN EXTREME CLOCKWISE POSITION OR AM BAND AS VIEWED FROM THE FRONT.
2. TO BE INSTALLED FOR ALIGNMENT ONLY.
3. SELECTOR SWITCH SW3 IS IN EXTREME CLOCKWISE POSITION OR PHONO TREBLE POSITION AS VIEWED FROM THE FRONT.
4. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
5. ALL VOLTAGES MEASURED FROM CHASSIS (GROUND) USING A 20,000 OHM / VOLT METER. LINE VOLTAGE SET AT 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.

FIG. 1 — SCHEMATIC DIAGRAM OF V-2136-4 CHASSIS

MODEL H-328C7,
Ch. V-2136-4

ALIGNMENT

BROADCAST BAND

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

	Connect Signal Generator to —	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to AM and the radio-phono-tone control to RADIO			
2	Stator of tuning capacitor (A) through a 0.1 mfd capacitor	455 kc.	minimum capacity	Pri. and sec. of T6 and T5 for max, output in order given

NOTE: If the I-F transformers are badly mis-aligned, it may be impossible to obtain sufficient output using the above system. In this event, it will be necessary to align each transformer separately. Start with the last I-F transformer and work forward, connecting the signal generator to the control grid of the tube preceding the transformer under alignment.

3	Radiated signal (no actual connection)	1615 kc.	Minimum capacity	AM osc. trimmer (D) for max. output
4	Radiated signal (no actual connection)	1400 kc.	tune to signal	AM R-F trimmer (B) for max. output (rock-in adjustment)

FM BAND

Do not align the FM circuits until all AM adjustments have been completed.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to FM			
2	Connect two 100,000 ohm resistors (the resistances must be equal within 5 per cent) between pin No. 7 of the 12AL5 tube and ground as shown on the schematic diagram.			
3	Connect a V.T.V.M. between points "X" and "Y" (see schematic diagram).			
4	Pin No. 7 of 12AT7 through a 0.1 mfd mica capacitor	10.7 mc.	minimum capacity	Sec. of T3 for *zero* (use medium strength signal)
5	Connect the V.T.V.M. between point "Z" and ground			
6	Same as step 4	10.7 mc.	minimum capacity	Pri. of T3 and pri. and sec. of T1 and T2 for max.
7	Reconnect the V.T.V.M. between points "X" and "Y" and increase the signal strength 10 times			
8	Same as step 4	10.7 mc.	minimum capacity	Recheck sec. of T3 for *zero* voltage
9	Reconnect the V.T.V.M. between point "Z" and ground			
10	Same as step 4	10.7 mc.	minimum capacity	Pri. of T3 for maximum voltage
11	Remove the two 100,000 ohm resistors that were inserted in step 2			
12	FM ant. terminal through a 300 ohm non-inductive resistor	98 mc.	98 mc.	FM osc. core for maximum voltage
13	Same as step 12	98 mc.	98 mc.	FM R-F trimmer (C32) for maximum voltage
14	Same as step 12	105 mc.	tune to signal	FM R-F core for maximum voltage
15	Same as step 12	90 mc.	tune to signal	FM R-F trimmer (C32) for maximum voltage (rock-in)
16	Recheck steps 14 and 15 for tracking			

WARNING: The chassis of this receiver is connected directly to one side of the power line. When making repairs or adjustments, it is recommended that the chassis be isolated from the line by means of an isolation transformer. Otherwise, serious shock may result if the radio chassis and ground are contacted at the same time.

It should be noted that the interlock plug, which must be released from the cabinet to allow removal of the chassis, is incorporated for customer protection. Additional protection is provided by soldering the speaker cord to the terminal board on the output transformer and using closed-end lugs on the wires that extend from the back cover to the FM antenna terminals. These protective measures are in accordance with Underwriters Laboratories requirements and should not be altered in any way.

MODEL H-328C7,
Ch. V-2136-4

PARTS LIST FOR MODEL H-328C7

When ordering parts, specify model number of set in addition to part number and description of part.

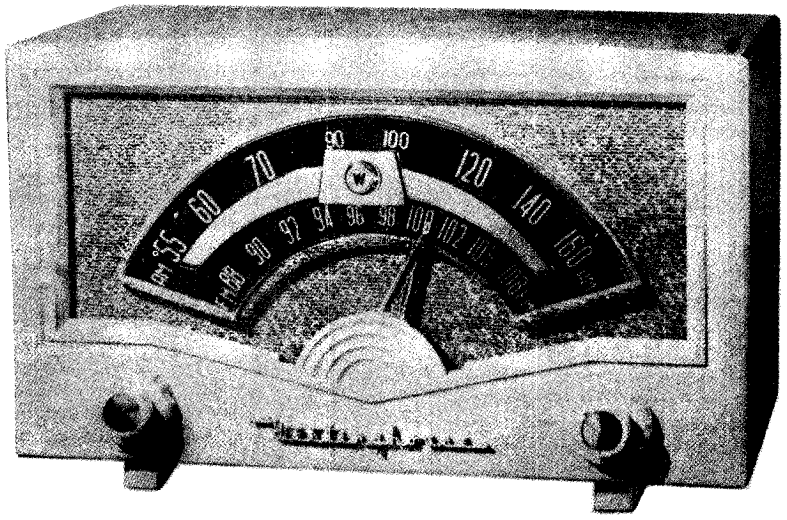
CABINET AND MISCELLANEOUS

Part No.	Description
V-5982-6	Antenna assembly (A.M. loop)
V-10307-1	Baffle and grille cloth assembly
V-1230-1	Cabinet, complete
V-9833-1	Cable assembly, phono A-C (male)
V-6415-4	Cable, phono
V-4898-1	Catch, bullet
V-3254S	Connector, phono (female)
V-3219S-1	Cord, dial drive (spool 100')
V-9845-1	Cover, back (record changer)
V-10311-1	Cover assembly, back (radio)
V-10308-1	Dial
V-8576	Doors, matched pair (less hardware)
V-8577	Drawer, record changer
V-10309-1	Escutcheon
V-9091-1	Hinge (L.H.)
V-9091-2	Hinge (R.H.)
V-10338-1	Hub, pointer
V-10347-1	Interlock bracket assembly
V-10408-2	Knob, off-on volume
V-10408-1	Knob, A.M. - F.M. selector
V-9861-2	Knob, radio - phono (rear)
V-9104-9	Knob, tuning (rear)
10C7DC	Lamp, pilot
V-3990-2	Medallion
V-10318-2	Nameplate, Westinghouse
V-10310-1	Pointer
V-10342-2	Pulley and shaft assembly, pointer
V-10357-1	Pulley, tuning gang
V-4967	Pull, door
V-10472-1	Shield, pilot lamp
V-9770-2	Speaker, 10 " PM
V-3248S	Spring, dial drive -- 1 3/32" long overall
V-6795-3	Spring, dial drive -- 3/4" long overall
V-9680-1	Sleeve, tuning drive
V-10366-1	Socket, pilot lamp
V-5556-1	Socket (12AT7)
V-4292S-2	Socket (12BE6
V-4292-1	Socket (12BA6, 6BJ6, 12AL5, 12AV6)
V-3246S	Socket (50L6GT)

V-2136-4 CHASSIS

C1	RCP10W2103M	Capacitor, .01 mfd 200 v.
C3	RCP10W4103M	Capacitor, .01 mfd 400 v.
C4	RCP10W4502M	Capacitor, .005 mfd 400 v.
C5	RCP10W6202M	Capacitor, .002 mfd 600 v.
C6	RCP10W6202M	Capacitor, .002 mfd 600 v.
C7	RCP10W4103M	Capacitor, .01 mfd 400 v.
C8	RCP10W6102M	Capacitor, .001 mfd 600 v.
C9	V-5596	Capacitor, .005 mfd
C11	V-5658-10	Capacitor, 50 mmf
C12	RCP10W2103M	Capacitor, .01 mfd 200 v.
C14	V-5596	Capacitor, .005 mfd
C15	V-9863-1	Capacitor, .001 mfd
C16	RCP10W2503M	Capacitor, .05 mfd 200 v.
C18	RCP10W4103M	Capacitor, .01 mfd 400 v.
C20	V-9863-1	Capacitor, .001 mfd
C21	R2CC30UK270K	Capacitor, 27 mmf
C22	R2CC30UK050D	Capacitor, 5 mmf
C24	V-5658-4	Capacitor, .68 mmf
C25	R5CC20ZY221M	Capacitor, 220 mmf
C26	RCM20D101J	Capacitor, 100 mmf
C27	RCM20A331M	Capacitor, 330 mmf
C28	V-5658-10	Capacitor, 50 mmf
C30	V-4637	Capacitor, 4 mfd, 50 v.
C32	V-9670	Capacitor, trimmer (FM-RF)
C33	V-9671-2	Capacitor, tuning
C34	RCM20A101M	Capacitor, 100 mmf
C35	V-10157-4473M	Capacitor, .047 mfd 400 v.
C36	V-9919	Capacitor, 60-40-40 mfd 250 v.
C39	RCP10W4502M	Capacitor, .005 mfd 400 v.
C40	RCP10W2503M	Capacitor, .02 mfd 200 v.
C41	RCP10W2503M	Capacitor, .02 mfd 200 v.
C42	V-9823	Capacitor, Elec. 20 mfd 200 v.
C43	RCM20A101M	Capacitor, 100 mmf
C44	RCP10W2203M	Capacitor, .02 mfd 200 v.
C45	RCM20A221M	Capacitor, 220 mmf
C46	RCP10W2203M	Capacitor, .02 mfd 200 v.
C47	RCP10W2203M	Capacitor, .02 mfd 200 v.
L1	V-9672	Coil, A.M. osc.
L2	V-9674	Coil, F.M. RF
L4	V-9099-1	Reactor, RF (1.1 microhenries)
L5	V-9099-1	Reactor, RF (1.1 microhenries)
L6	V-9099-1	Reactor, RF (1.1 microhenries)
L8	V-9099-1	Reactor, RF (1.1 microhenries)
L10	V-6157-1	Coil, antenna loading
R1	RC30AE151K	Resistor, 150 ohms 1 w.
R3	RC20AE224M	Resistor, 220,000 ohms ½ w
R4	RC20AE474M	Resistor, 470,000 ohms ½ w
R5	RC20AE223K	Resistor, 22,000 ohms ½ w.
R6	RC20AE473M	Resistor, 47,000 ohms ½ w.
R7	RC20AE223M	Resistor, 22,000 ohms ½ w.
R8	RC20AE223M	Resistor, 22,000 ohms ½ w.
R9	RC20AE223M	Resistor, 22,000 ohms ½ w.
R10	RC20AE475M	Resistor, 4.7 megohms ½ w.
R11	RC20AE221M	Resistor, 220 ohms ½ w.
R12	RC20AE221M	Resistor, 220 ohms ½ w.
R13	RC20AE681M	Resistor, 680 ohms ½ w.
R14	RC20AE681M	Resistor, 680 ohms ½ w.
R15	RC20AE221M	Resistor, 220 ohms ½ w.
R17	V-6067-7	Resistor, 22 ohms 3 w.
R18	RC20AE225M	Resistor, 2.2 meg. ½ w.
R20	RC20AE470M	Resistor, 47 ohms ½ w.
R22	RC20AE105M	Resistor, 1 meg. ½ w.
R23	RC20AE221M	Resistor, 220 ohms ½ w.
R28	RC20AE820K	Resistor, 82 ohms ½ w.
*R30	V-10359-1	Control, volume (includes radio-phono-tone switch and SW 1)
R31	RC20AE335M	Resistor, 3.3 meg. ½ w.
R32	V-10054-1	Resistor, 200 ohms and 2,000 ohms
R33	RC20AE474M	Resistor, 470,000 ohms ½ w.
R34	RC20AE155M	Resistor, 1.5 meg. ½ w.
R35	RC20AE225M	Resistor, 2.2 meg. ½ w.
R36	RC20AE226M	Resistor, 22 meg. ½ w.
	V-9640	Rectifier, selenium
*SW1	V-10359-1	Switch, on-off (includes R30, SW3)
SW2	V-9681-1	Switch, A.M. - F.M. selector
*SW3	V-10359-1	Switch, radio-phono-tone (includes R30 and SW1)
T1	V-9688	Transformer, 1st F.M. IF
T2	V-9642	Transformer, 2nd F.M. IF
T3	V-9828	Transformer, ratio detector
*T4	V-9770-2	Transformer, output (includes speaker)
T5	V-9649-1	Transformer, 1st A.M. IF
T6	V-10350-1	Transformer, 2nd A.M. IF
Z2	V-9675	Coil
	V-9676-1	Core, F.M. tuning

MODELS H-334T7U, H-335T7U, Ch. V-2136-5U



SPECIFICATIONS

FREQUENCY RANGES:

Amplitude Modulation ..... 540 to 1615 kc.
Frequency Modulation ..... 88 to 108 mc.

INTERMEDIATE FREQUENCIES:

Amplitude Modulation ..... 455 kc.
Frequency Modulation ..... 10.7 mc.

TUBE COMPLEMENT:

1 12AT7 ..... R-F Amp. and Mixer (FM)
1 12BE6 ..... FM Osc. and AM Converter
1 12BA6 ..... I-F Amp.
1 6BJ6 ..... I-F Driver (FM)
1 12AL5 ..... Ratio Det. (FM)
1 12AV6 .. Det. and AVC (AM) and A-F Amp.
1 50C5 ..... Output Amp.

POWER OUTPUT:

Undistorted ..... 1.0 watts
Maximum ..... 1.9 watts

LOUDSPEAKER: ..... 5" PM

OPERATING VOLTAGE:

..... 105 to 120 volts, DC or 60 cycles AC

POWER CONSUMPTION: ..... 35 watts

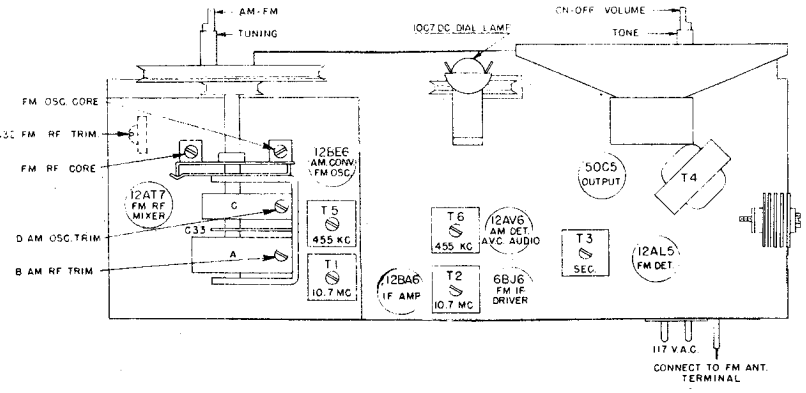


FIG. 3 — TOP VIEW OF CHASSIS

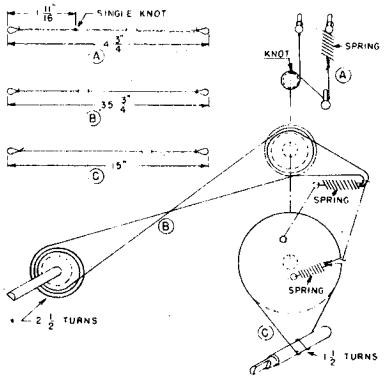


FIG. 4 — DRIVE MECHANISM

MODELS H-334T7U, H-335T7U, Ch. V-2136-5U

ALIGNMENT

BROADCAST BAND

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Check the dial pointer position by meshing the tuning capacitor plates completely and seeing that the dial pointer is set on the end mark of the dial scale.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to AM			
2	Stator of tuning capacitor (A) through a 0.1 mfd capacitor	455 kc.	minimum capacity	Pri. and sec. of T6 and T5 for max. output in order given
	NOTE: If the I-F transformers are badly mis-aligned, it may be impossible to obtain sufficient output using the above system. In this event, it will be necessary to align each transformer separately. Start with the last I-F transformer and work forward, connecting the signal generator to the control grid of the tube preceding the transformer under alignment.			
3	Radiated signal (no actual connection)	1615 kc.	minimum capacity	AM osc. trimmer (D) for max. output
4	Radiated signal (no actual connection)	1400 kc.	tune to signal	AM R-F trimmer (B) for max. output (rock-in) adjustment)

FM BAND

Do not align the FM circuits until all AM adjustments have been completed.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to FM			
2	Connect two 100,000 ohm resistors (the resistances must be equal within 5 per cent) between pin No. 7 of the 12AL5 tube and ground as shown on the schematic diagram.			
3	Connect a V.T.V.M. between points "X" and "Y" (see schematic diagram).			
4	Pin No. 7 of 12AT7 through a .01 mfd mica capacitor	10.7 mc.	minimum capacity	Sec. of T3 for *zero* (use medium strength signal)
5	Connect the V.T.V.M. between point "Z" and ground.			
6	Same as step 4	10.7 mc.	minimum capacity	Pri. of T3 and pri. and sec. of T1 and T2 for maximum voltage
7	Reconnect the V.T.V.M. between points "X" and "Y" and increase the signal strength 10 times.			
8	Same as step 4	10.7 mc.	minimum capacity	Recheck sec. of T3 for *zero* voltage
9	Reconnect the V.T.V.M. between point "Z" and ground.			
10	Same as step 4	10.7 mc.	min. cap.	Pri. of T3 for maximum voltage
11	Remove the two 100,000 ohm resistors that were inserted in step 2.			
12	FM ant. terminal through a 300 ohm non-inductive resistor	98 mc.	98 mc.	FM osc. core for maximum voltage
13	Same as step 12	98 mc.	98 mc.	FM R-F trimmer (C32) for maximum voltage
14	Same as step 12	105 mc.	tune to signal	FM R-F core for maximum voltage
15	Same as step 12	90 mc.	tune to signal	FM R-F trimmer (C32) for maximum voltage (rock-in)
16	Recheck steps 14 and 15 for tracking.			

ANTENNA INFORMATION

An external AM antenna can be coupled to the set by taping the lead-in wire to the outside of the rear cover as shown in Fig. 2. The wire should be dressed in the position shown and can be held in place with adhesive tape or other similar material.

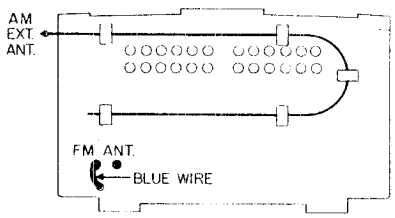


FIG. 2 — ANTENNA COUPLING

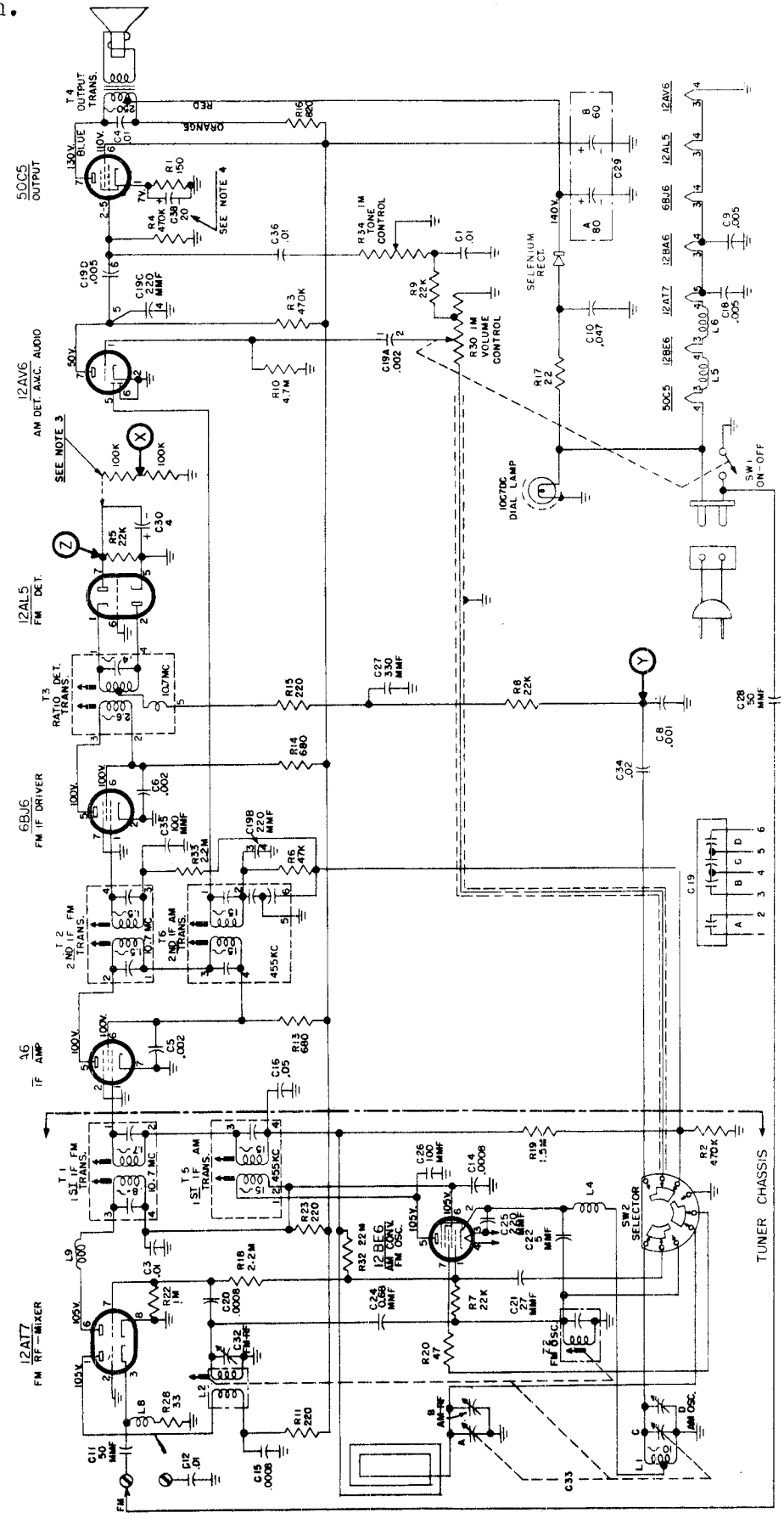
The blue wire emerging from the hole in the rear cover is a "line" antenna for FM reception. It should be connected to the left antenna terminal as shown in Fig. 2. If an external FM antenna is to be used, disconnect the blue wire and connect the transmission line to the two terminals.

MODELS H-334T7U, H-335T7U, Ch. V-2136-5U

WARNING

When making repairs or adjustments, it is recommended that the chassis be isolated from the line by means of an isolation transformer. Otherwise, *serious shock may result* if the radio chassis and ground are contacted at the same time.

The chassis is connected directly to one side of the power line.



NOTES :
1. SELECTOR SWITCH SW2 IS SHOWN IN EXTREME CLOCKWISE POSITION OR AM BAND. EXTREME COUNTER CLOCKWISE POSITION IS FM BAND.
2. ALL VOLTAGES MEASURED FROM CHASSIS (GROUND) USING A 20,000 OHM/VOLT METER. LINE VOLTAGE SET AT 117V A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 PER CENT.
3. TO BE INSTALLED FOR ALIGNMENT ONLY.
4. C38 MAY OR MAY NOT BE PART OF C29.
5. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

FIG. 1 — SCHEMATIC DIAGRAM OF V-2136-5U CHASSIS

MODELS H-334T7U, H-335T7U, Ch. V-2136-5U

PARTS LIST

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS

Part No.	*Description*
V-10364-2	Baffle and Grille Cloth Assy. .....
V-1233-1	Cabinet (brown) .....
V-1233-2	Cabinet (ivory) .....
V-5426	Clip, I-F mounting .....
V-3219S-1	Cord, dial drive (100' spool) .....
V-9636-3	Cover Assy., back .....
V-9651-2	Cover, back .....
V-10308-1	Dial .....
V-10309-1	Escutcheon .....
V-9637-1	Foot, mounting .....
V-10408-1	Knob, band (brown) .....
V-10408-3	Knob, band (ivory) .....
V-10408-2	Knob, off-on-volume (brown) .....
V-10408-4	Knob, off-on-volume (ivory) .....
V-9104-9	Knob, tuning, rear (brown) .....
V-9104-11	Knob, tuning, rear (ivory) .....
V-9104-10	Knob, tone, rear (brown) .....
V-9104-12	Knob, tone, rear (ivory) .....
10C7DC	Lamp, pilot .....
V-9653	Loop, antenna .....
V-3990-2	Medallion .....
V-10318-2	Nameplate, Westinghouse .....
V-9661	Plug, AC power (male) .....
V-10310-1	Pointer .....
V-10357-1	Pulley Assy., gang .....
V-10342-1	Pulley and Shaft Assy., pointer ...
V-9655	Shell, interlock .....
V-10472-1	Shield, lamp .....
V-9706-2	Shield, miniature tube, spring .....
V-9654	Socket, interlock .....
V-5556-1	Socket, miniature wafer (12AT7) ..
V-4292S-2	Socket, miniature molded (12BE6)
V-4292-1	Socket, miniature molded (12BA6, 6BJ6, 12AL5, 12AV6) .....
V-6878-2	Socket, miniature wafer (50C5) ....
V-10366-1	Socket, pilot lamp .....
V-10466-1	Speaker, 5" PM .....
V-3248S	Spring, dial drive .....
V-6795-3	Spring, FM tuner & gang drive .....

V-2136-5U CHASSIS

Ref. No.	*Part No.*	*Description*
C1	RCP10W4103M	Capacitor, .01 mfd 400 v.
C3	RCP10W4103M	Capacitor, .01 mfd 400 v.
C4	RCP10W4103M	Capacitor, .01 mfd 400 v.
C5	RCP10W6202M	Capacitor, .002 mfd 600 v.
C6	RCP10W6202M	Capacitor, .002 mfd 600 v.
C8	RCP10W6102M	Capacitor, .001 mfd 600 v.
C9	V-5596	Capacitor, .005 mfd
C10	V-10157-4473M	Capacitor, .047 mfd 400 v.
C11	V-5658-10	Capacitor, 50 mmf
C12	RCP10W2103M	Capacitor, .01 mfd 200 v.
C14	V-9863-1	Capacitor, .0008 mfd
C15	V-9863-1	Capacitor, .0008 mfd
C16	RCP10W2503M	Capacitor, .05 mfd 200 v.
C18	V-5596	Capacitor, .005 mfd
C19	V-9634-1	Capacitor, multiple ceramic, .002 mfd, 220 mmf, 220 mmf, .005 mfd.
C20	V-9863-1	Capacitor, .0008 mfd
C21	R2CC30UK270K	Capacitor, 27 mmf
C22	R2CC30UK050D	Capacitor, 5 mmf
C24	V-5658-4	Capacitor, .68 mmf
C25	R5CC20ZY221M	Capacitor, 220 mmf
C26	RCM20D101J	Capacitor, 100 mmf
C27	RCM20A331M	Capacitor, 330 mmf
C28	V-5658-10	Capacitor, 50 mmf
C29	V-9920	Capacitor, electrolytic, 80 mfd 150 v., 60 mfd 150 v.
C30	V-4637	Capacitor, electrolytic, 4 mfd 50 v.
C32	V-9670	Capacitor, trimmer (FM RF)
C33	V-9671-2	Capacitor, variable tuning (consists of A,B,C, and D)
C34	RCP10W2203M	Capacitor, .02 mfd 200 v.
C35	RCM20A101M	Capacitor, 100 mmf
C36	RCP10W4103M	Capacitor, .01 mfd 400 v.
C38	V-3236	Capacitor, 20 mfd 25 v.
L1	V-9672	Coil AM osc.
L2	V-9674	Coil, FM RF
	V-9676-1	Core, FM RF and osc. tuning
L4	V-9099-1	Choke, 1.1 microhenries
L5	V-9099-1	Choke, 1.1 microhenries
L6	V-9099-1	Choke, 1.1 microhenries
L8	V-9099-1	Choke, antenna input
L9	V-4886-12	Choke, RF
	V-9640	Rectifier, selenium
R1	RC30AE151K	Resistor, 150 ohms 1 w.
R2	RC20AE474M	Resistor, 470,000 ohms ½ w.
R3	RC20AE474M	Resistor, 470,000 ohms ½ w.
R4	RC20AE474M	Resistor, 470,000 ohms ½ w.
R5	RC20AE223K	Resistor, 22,000 ohms ½ w.
R6	RC20AE473M	Resistor, 47,000 ohms ½ w.
R7	RC20AE223M	Resistor, 22,000 ohms ½ w.
R8	RC20AE223M	Resistor, 22,000 ohms ½ w.
R9	RC20AE223M	Resistor, 22,000 ohms ½ w.
R10	RC20AE475M	Resistor, 4.7 megohms ½ w.
R11	RC20AE221M	Resistor, 220 ohms ½ w.
R13	RC20AE681M	Resistor, 680 ohms ½ w.
R14	RC20AE681M	Resistor, 680 ohms ½ w.
R15	RC20AE221M	Resistor, 220 ohms ½ w.
R16	V-6984-10	Resistor, 820 ohms 5 w.
R17	RC30AE220K	Resistor, 22 ohms 1 w.
R18	RC20AE225M	Resistor, 2.2 megohms ½ w.
R19	RC20AE155M	Resistor, 1.5 megohms ½ w.
R20	RC20AE470M	Resistor, 47 ohms ½ w.
R22	RC20AE105M	Resistor, 1 megohm ½ w.
R23	RC20AE221M	Resistor, 220 ohms ½ w.
R28	RC20AE330M	Resistor, 33 ohms ½ w.
*R30	V-10330-1	Control, volume, 1 megohm (assy consists of R30, R34 and SW1)
R32	RC20AE226M	Resistor, 22 megohms ½ w.
R33	RC20AE225M	Resistor, 2.2 megohms ½ w.
*R34	V-10330-1	Control, tone, 1 megohm (assy consists of R30, R34 and SW1)
*SW1	V-10330-1	Switch, on-off (assy consists of R30, R34 and SW1)
SW2	V-9681-1	Switch, selector
T1	V-9688	Transformer, 1st FM IF
T2	V-9642	Transformer, 2nd FM IF
T3	V-9828	Transformer, ratio detector
T4	V-9665	Transformer, output
T5	V-9649-1	Transformer, 1st AM IF
T6	V-10350-1	Transformer, 2nd AM IF
Z2	V-9675	Coil and Capacitor Assy., FM osc.

MODELS H-334T7U, H-335T7U,
Ch. V-2136-5U; H-334T7UR,
Ch. V-2136-5R

SUPPLEMENTARY INFORMATION

MODELS H-334T7U AND H-335T7U — CHASSIS V-2136-5U

MODEL H-334T7UR—CHASSIS V-2136-5R

PRODUCTION CHANGES IN V-2136-5U CHASSIS

1. Later production chassis contain a 6 watt pilot lamp (type 6S6DC) rather than the 10 watt lamp indicated in the service notes. The purpose of the change is to eliminate pilot lamp noise and reduce heating inside the cabinet.

2. In some chassis, excessive HF oscillator voltage injection tends to reduce the sensitivity at the high frequency end of the AM band. This effect is eliminated by adding a 680 ohm ½ watt resistor (R35) between the tap on the AM oscillator coil (L1) and chassis ground. Some chassis do not require R35 for correct oscillator injection.

3. Excessive hum and a thumping effect as the receiver is tuned across an FM signal can be caused by abnormally low heater to cathode resistance in the 12AL5 tube. To eliminate this effect, some chassis contain a 470 ohm ½ watt resistor (R36) connected between pins #3 and #4 (heater) of the 12AL5.

4. Later production chassis contain a .005 mfd capacitor (C39) connected across the ratio detector electrolytic capacitor (C30). This serves as an RF bypass and eliminates an oscillation that may otherwise appear on the FM band.

5. In some chassis, the 455 kc. 2nd I-F transformer (T6) is part number V-6130-1 rather than the specified V-10350-1. The V-6130-1 transformer does not contain the two diode filter capacitors shown on the schematic diagram. Therefore, when the V-6130-1 transformer is used, an external 150 mmf capacitor (C40) is added between the bottom of R6 and ground to serve in place of the missing filter output capacitor. Since C19B, which is shown in parallel with the built-in filter input capacitor, provides sufficient capacitance without the built-in capacitor, an additional capacitor is not required at the filter input.

In accordance with the preceding information, the following parts should be added to the H-334T7U and H-335T7U parts list:

Ref. No.	*Part No.*	*Description*
	6S6DC	Lamp, pilot
C39	V-5596	Capacitor, .005 mfd
C40	RCM20A151M	Capacitor, 150 mmf (used when T6 is V-6130-1)
R35	RC20AE681M	Resistor, 680 ohms ½ w.
R36	RC20AE471M	Resistor, 470 ohms ½ w.

MODEL H-334T7UR – CHASSIS V-2136-5R

The V-2136-5R chassis used in Model H-334T7UR is similar to the V-2136-5U. However, there are enough differences to warrant the inclusion in this supplement of a schematic diagram covering the V-2136-5R chassis and a - - - - - - parts list for Model H-334T7UR. For alignment and other service information, refer to the original H-334T7U and H-335T7U service notes.

PARTS LIST FOR MODEL H-334T7UR

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS

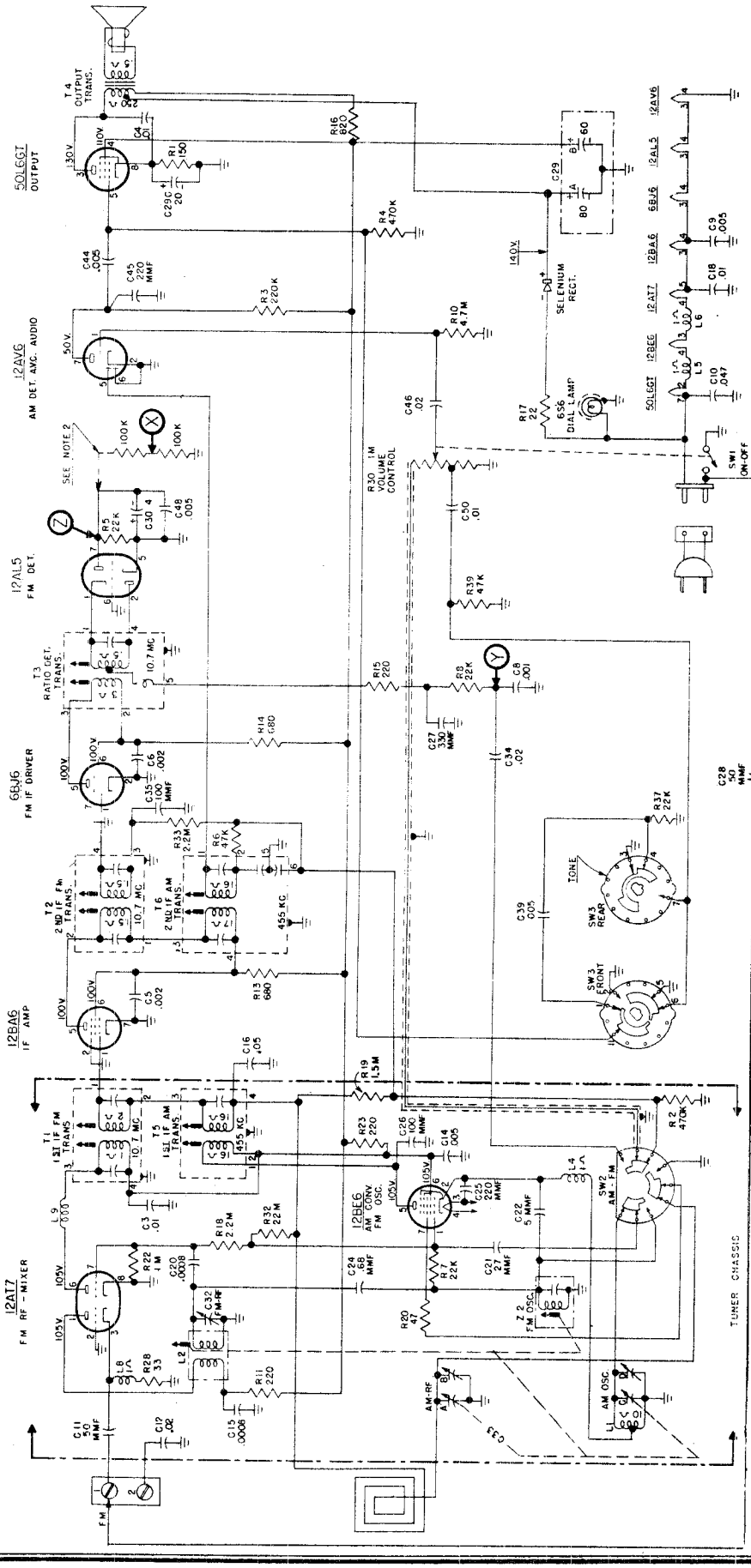
Part No.	*Description*
V-3246S	Socket, octal wafer (50L6) .....

Ref. No.	*Part No.*	*Description*
C12	RCP10W2203M	Capacitor, .02 mfd 200 v.
C14	V-5596	Capacitor, .005 mfd
C18	RCP10W4103M	Capacitor, .01 mfd 400 v.
C29	V-10415-1	Capacitor, electrolytic, 80 mfd 150 v., 60 mfd 150 v., 20 mfd 25 v.
C39	RCP10W4502M	Capacitor, .005 mfd 400 v.
C44	RCP10W4502M	Capacitor, .005 mfd 400 v.
C45	RCM20A221M	Capacitor, 220 mmf
C46	RCP10W2203M	Capacitor, .02 mfd 200 v.
C48	V-5596	Capacitor, .005 mfd
C50	RCP10W4103M	Capacitor, .01 mfd 400 v.
R3	RC20AE224M	Resistor, 220,000 ohms ½ w.
*R30	V-9824-1	Control, volume, 1 megohms (assy consists of R30, SW1 and SW3)
R37	RC20AE223M	Resistor, 22,000 ohms ½ w.
R39	RC20AE473M	Resistor, 47,000 ohms ½ w.
*SW1	V-9824-1	Switch, on-off (assy consists of R30, SW1 and SW3)
*SW3	V-9824-1	Switch, tone (assy consists of R30, SW1 and SW3)
T4	V-10660	Transformer, output

Sold only as a complete assembly.

Form RM3232
6-51

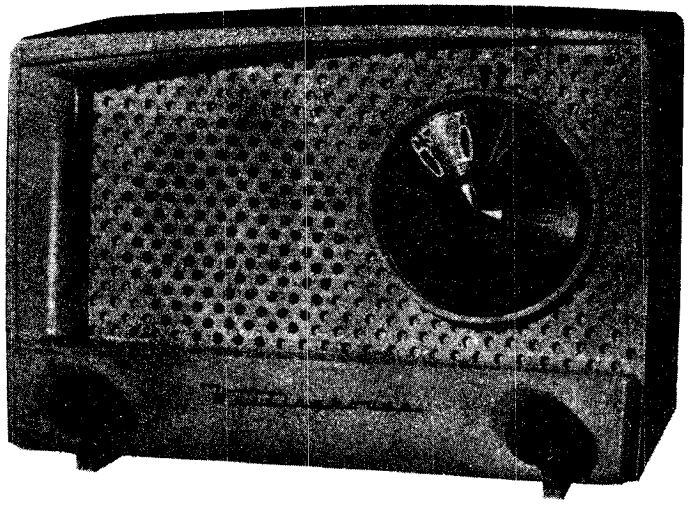
MODEL H-334T7UR,
Ch. V-2136-5R



SCHEMATIC DIAGRAM OF V-2136-5R CHASSIS

1. SELECTOR SWITCH SW2 IS SHOWN IN EXTREME CLOCKWISE POSITION OR AM BAND AS VIEWED FROM THE FRONT.
2. TO BE INSTALLED FOR ALIGNMENT ONLY.
3. SELECTOR SWITCH SW3 IS IN EXTREME COUNTER CLOCKWISE POSITION OR BASS POSITION AS VIEWED FROM THE FRONT.
4. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
5. ALL VOLTAGES MEASURED FROM CHASSIS (GROUND) USING A 20,000 OHM/VOLT METER. LINE VOLTAGE SET AT 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.

MODELS H-336T5U, H-337T5U, Ch. V-2157U



SPECIFICATIONS

FREQUENCY RANGE: ..... 540 to 1615 kc.

INTERMEDIATE FREQUENCY: ..... 455 kc.

TUBE COMPLEMENT:

1	12BE6	Converter
1	12BA6	I-F Amp.
* 1	12AV6	Det., AVC, and 1st A-F Amp.
1	50C5	Output Amp.
1	35W4	Rectifier

POWER OUTPUT:

Undistorted ..... 0.9 watt

Maximum ..... 1.5 watts

LOUDSPEAKER: ..... 4" P.M.

OPERATING VOLTAGE: ..... 105 to 120 volts, 50-60 cycles A-C or D-C

POWER CONSUMPTION: ..... 35 watts

* *See schematic diagram for substitute tubes.*

ALIGNMENT

It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial*	*Adjust for Maximum Output —*
1.	Stator of R-F tuning capacitor (A) through a 0.1 mfd capacitor.	455 kc.	Minimum Capacity	Top and bottom slugs in 2nd and 1st I-F trans. in order given. *
2.	Same as step 1	1615 kc.	Minimum Capacity	Osc. trimmer (D)
3.	Radiated Signal	1400 kc.	1400 kc.	Ant. trimmer (B)

**It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot.*

MODELS H-336T5U, H-337T5U, Ch. V-2157U

PARTS LIST

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS PARTS

Part No.	*Description*
V-10012-3	Background, dial
V-9746-1	Baffle and grille cloth assy. (H-337T5U)
V-1219-2	Cabinet (H-336T5U)
V-1219-4	Cabinet (H-337T5U)
V-3219S-1	Cord, dial drive (100' spool)
V-10008-3	Dial (H-337T5U)
V-10008-4	Dial (H-336T5U)
V-10009-7	Knob (H-337T5U)
V-10009-6	Knob (H-336T5U)
V-9996-2	Shaft, tuning
V-9727-1	Speaker, 4" PM (includes T3)
V-10076-1	Spring, dial drive
V-9888-2	Socket, wafer (12BE6, 50C5 and 35W4)
V-9888-3	Socket, wafer (12BA6 and 12AV6)

CHASSIS PARTS

Ref. No.	*Part No.*	*Description*
C1	V-10047	Capacitor, variable (consists of A, B, C, and D)
C2	RCP10W2503M	Capacitor, .05 mfd 200 v.
C3	V-9634-1	Capacitor, multiple ceramic (consists of A, B, C and D)
C4	V-9991	Capacitor, electrolytic 50-50 mfd 150 v. (consists of A and B)
C5	RCP10W4503M	Capacitor, .05 mfd 400 v.
C6	RCP10W4103M	Capacitor, .01 mfd 400 v.
C7	RCP10W4104M	Capacitor, .1 mfd 400 v.
L1	V-9994	Loop, antenna
L2	V-9992	Coil, osc.
R1	RC20AE223M	Resistor, 22,000 ohms ½ w.
R2	RC20AE335M	Resistor, 3.3 meg. ½ w.
R3	RC20AE680M	Resistor, 68 ohms ½ w.
*R4	V-9993-1	Control, volume 500,000 ohms (assy consists of R4 and SW1)
R5	RC20AE106M	Resistor, 10 megohms ½ w.
R6	RC20AE334M	Resistor, 330,000 ohms ½ w.
R7	RC20AE474M	Resistor, 470,000 ohms ½ w.
R8	RC20AE121M	Resistor, 120 ohms ½ w.
R9	RC30AE102M	Resistor, 1000 ohms 1 w.
*SW1	V-9993-1	Switch, on-off (assy consists of SW1 and R4)
T1	V-9735-1	Transformer, 1st I-F
T2	V-9735-1	Transformer, 2nd I-F
T3	V-9727-1	Transformer, audio (includes T3 and speaker)

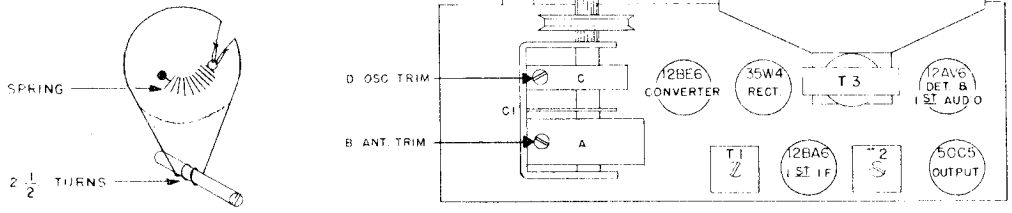
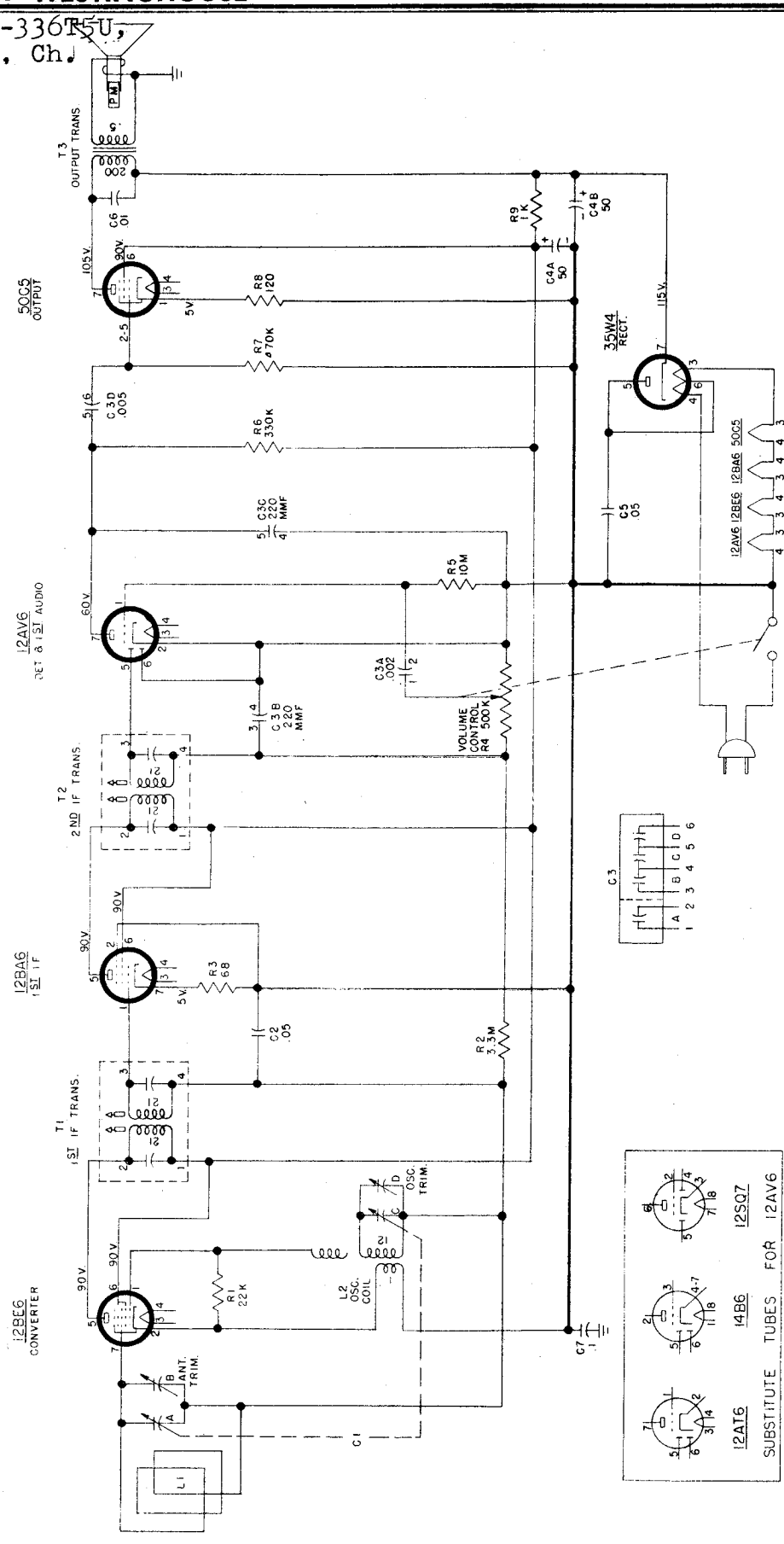


FIG. 1 — DIAL DRIVE AND CHASSIS LAYOUT

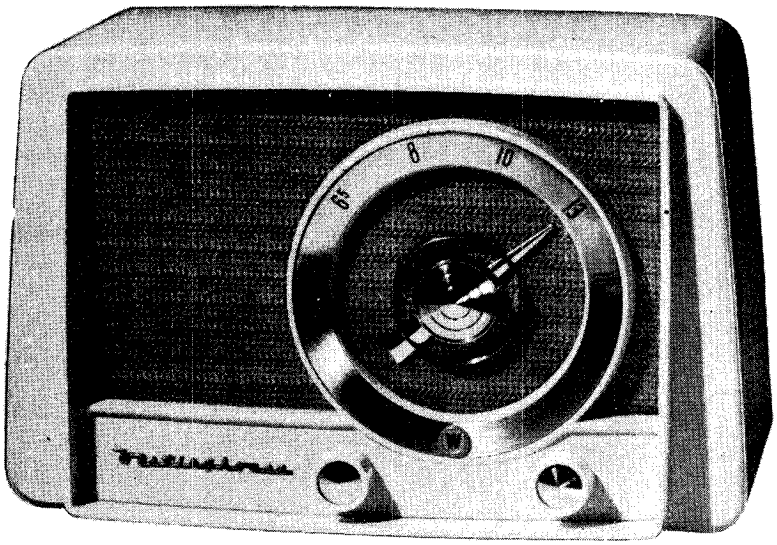
MODELS H-336T5U,
H-337T5U, Ch.
V-2157U



NOTE
1. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE USING A 20,000 OHM / VOLT METER. LINE VOLTAGE SET AT 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.
2. ALL CAPACITANCE VALUES IN MFD. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

FIG. 2 — SCHEMATIC DIAGRAM OF V-2157U CHASSIS

MODELS H-338T5U, H-341T5U, H-345T5, H-346T5, Ch. V-2157-4U



SPECIFICATIONS

FREQUENCY RANGE: ..... 540 to 1615 kc.

INTERMEDIATE FREQUENCY: ..... 455 kc.

TUBE COMPLEMENT:

1	12BE6	Converter
1	12BA6	I-F Amp.
1	12AV6	Det., AVC, and 1st A-F Amp.
1	50C5	Output Amp.
1	35W4	Rectifier

POWER OUTPUT:

Undistorted ..... 0.9 watt

Maximum ..... 1.5 watts

LOUDSPEAKER: ..... 4" P.M.

OPERATING VOLTAGE: ..... 105 to 120 volts, 50-60 cycles A-C or D-C

POWER CONSUMPTION: ..... 35 watts

ALIGNMENT

It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

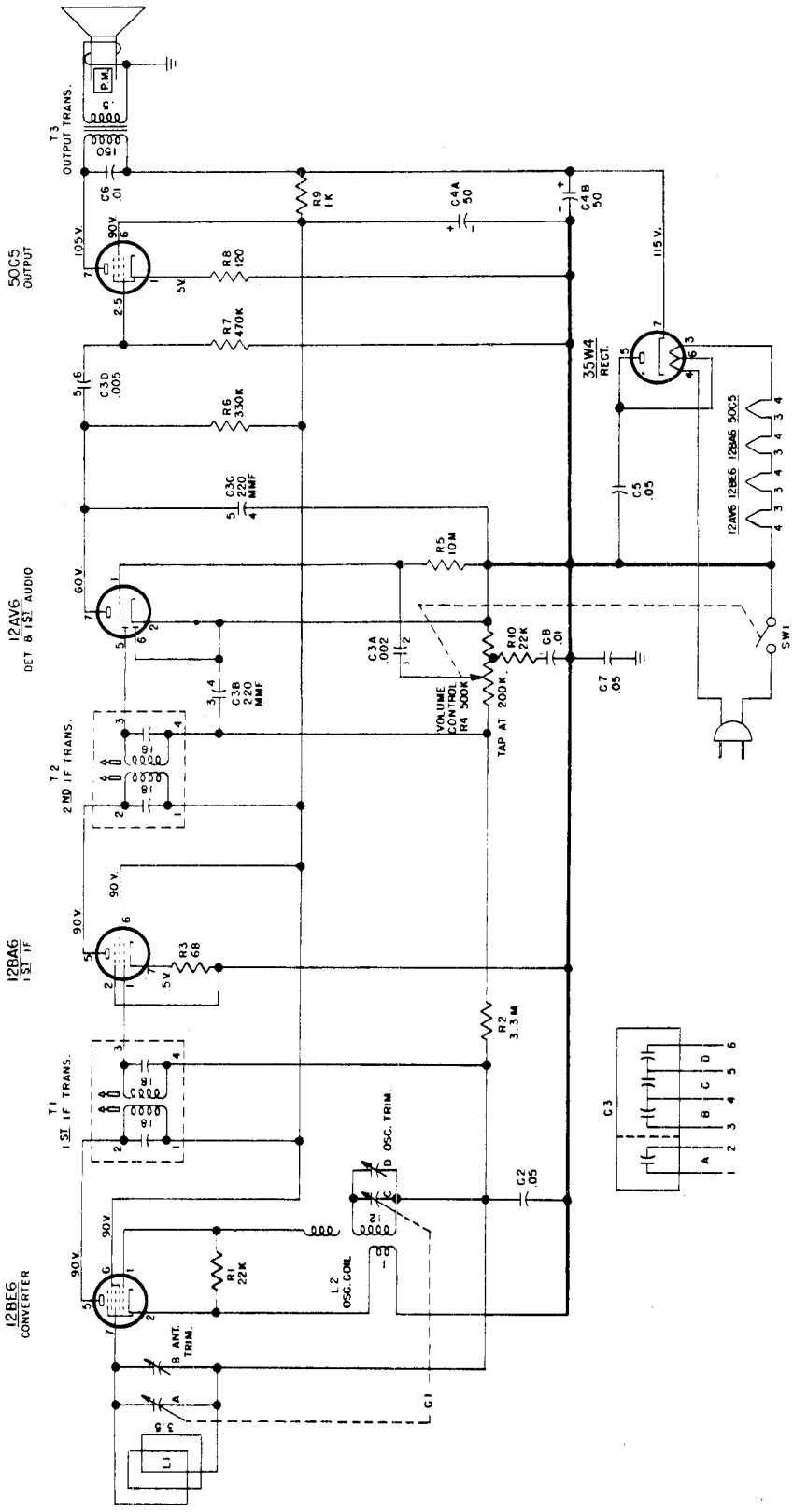
Make certain that the dial pointer is correctly positioned.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial*	*Adjust for Maximum Output —*
1.	Stator of ant. tuning capacitor (A) through a 200 mmf capacitor	455 kc.	Minimum capacity	Top and bottom slugs of T2 and T1 in order given*
2.	Same as step 1	1615 kc.	Minimum capacity	Oscillator trimmer (D)
3.	Radiated signal	1400 kc.	1400 kc.	Antenna trimmer (B)

** It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot.*

MODELS H-338T5U, H-341T5U, H-345T5, H-346T5, Ch. V-2157-4U



NOTES:
1. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE USING A 20,000 OHM / VOLT METER. LINE VOLTAGE SET AT 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.
2. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

FIG. 1 — SCHEMATIC DIAGRAM OF V-2157-4U CHASSIS

MODELS H-338T5U, H-341T5U, H-345T5, H-346T5, Ch. V-2157-4U

PARTS LIST FOR MODELS H-338T5U AND H-341T5U

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS PARTS

Part No.	*Description*
V-10333-1	Baffle and grille cloth assembly
V-1220-4	Cabinet, H-338T5U (less front grille and baffle and grille cloth)
V-1220-3	Cabinet, H-341T5U (less front grille and baffle and grille cloth)
V-5426	Clip, I-F mounting
V-3219S-1	Cord, dial drive (spool)
V-10335-1	Dial
V-10336-1	Grille, front (H-338T5U)
V-10336-2	Grille, front (H-341T5U)
V-10009-8	Knob (H-338T5U)
V-10009-9	Knob (H-341T5U)
V-10332-1	Pointer
V-3891	Nut, speed (front grille to cabinet)
V-3926	Nut, speed (baffle to front grille)
V-9996-2	Shaft, tuning
V-10052	Shield, bottom chassis
V-9727-2	Speaker, 4" PM (includes T3)
V-5786	Spring, pointer
V-10076-1	Spring, dial drive
V-9888-3	Socket (12AV6, 12BA6)
V-9888-2	Socket (12BE6, 50C5, 35W4)

V-2157-4U CHASSIS PARTS

Ref. No.	*Part No.*	*Description*
C1	V-10360-1	Capacitor, variable
C2	RCP10W2503M	Capacitor, .05 mfd. 200 v
C3	V-9634-1	Capacitor, multiple
C4	V-9991	Capacitor, electrolytic, 50-50 mfd. 150 v
C5	RCP10W4503M	Capacitor, .05 mfd. 400 v
C6	RCP10W4103M	Capacitor, .01 mfd. 400 v
C7	RCP10W4503M	Capacitor, .05 mfd. 400 v
C8	RCP10W4103M	Capacitor, .01 mfd. 400 v
L1	V-10450-1	Loop, antenna
L2	V-9992	Coil, oscillator
R1	RC20AE223M	Resistor 22,000 ohms ½ w
R2	RC20AE335M	Resistor 3.3 meg. ½ w
R3	RC20AE680M	Resistor 68 ohms ½ w
R4	V-9993-4	Control, volume 500,000 ohms
R5	RC20AE106M	Resistor 10 meg. ½ w
R6	RC20AE334M	Resistor 330,000 ohms ½ w
R7	RC20AE474M	Resistor 470,000 ohms ½ w
R8	RC20AE121M	Resistor 120 ohms ½ w
R9	RC30AE102M	Resistor 1000 ohms ½ w
R10	RC20AE223M	Resistor 22,000 ohms ½ w
T1	V-9735-1	Transformer, I-F
T2	V-9735-1	Transformer, I-F
T3	V-9727-2	Transformer, audio (includes speaker)

CABINET AND MISCELLANEOUS PARTS FOR MODELS H-345T5 AND H-346T5

Part No.	*Description*
V-10009-11	Knob (H-345T5)
V-10009-9	Knob (H-346T5)
V-3891	Nut, speed (front grille to cabinet)
V-3926	Nut, speed (baffle to front grille)
V-10332-1	Pointer
V-9996-2	Shaft, tuning
V-10052	Shield, bottom chassis
V-9727-2	Speaker, 4" PM (includes T3)
V-5786	Spring, pointer
V-10076-1	Spring, dial drive
V-9888-3	Socket (12AV6, 12BA6)
V-9888-2	Socket (12BE6, 50C5, 35W4)
V-10333-3	Baffle and grille cloth assembly (H-345T5)
V-10333-4	Baffle and grille cloth assembly (H-346T5)
V-1220-2	Cabinet, H-345T5 (less front grille & baffle & grille cloth assy.)
V-1220-3	Cabinet, H-346T5 (less front grille & baffle & grille cloth assy.)
V-5426	Clip, I-F mounting
V-3219S-1	Cord, dial drive (100' spool)
V-10335-1	Dial
V-10336-2	Grille, front

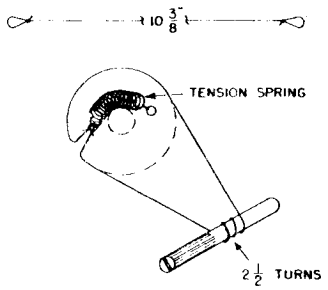


FIG. 2 — DIAL DRIVE

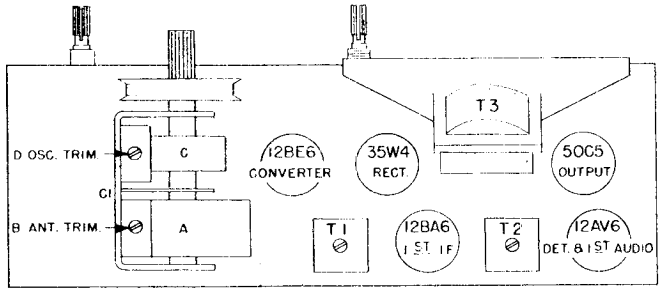
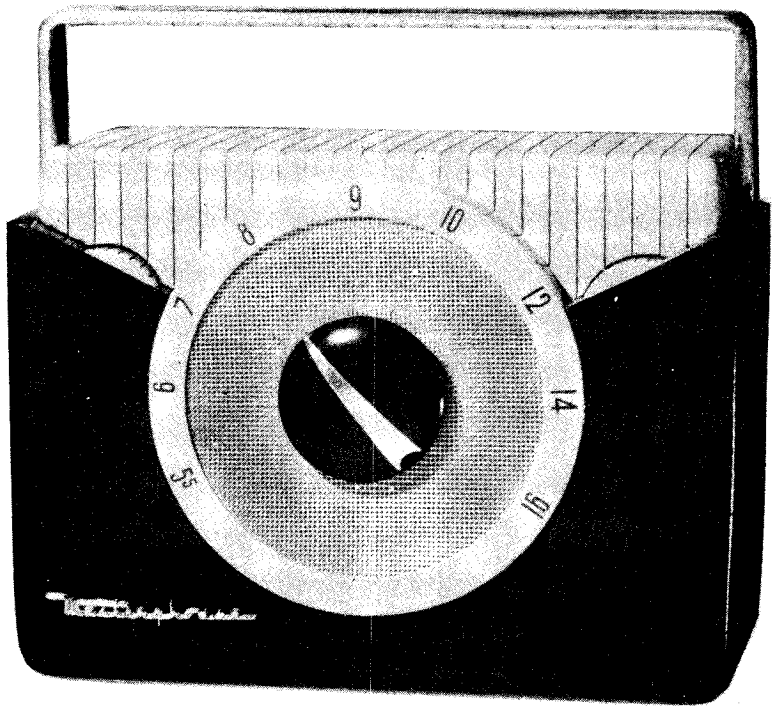


FIG. 3 — CHASSIS LAYOUT

MODELS H-342P5U, H-343P5U, H-348P5, H-349P5, Ch. V-2156-1U



SPECIFICATIONS

FREQUENCY RANGE ..... 540 to 1615 kc.

INTERMEDIATE FREQUENCY ..... 455 kc.

TUBE COMPLEMENT:

1	1U4	R-F Amplifier
1	1R5	Converter
1	1U4	I-F Amplifier
1	1U5	Det., AVC, and 1st A-F Amp.
1	3V4	Output Amplifier

POWER OUTPUT:

Maximum ..... 0.38 watt
Undistorted ..... 0.18 watt

LOUDSPEAKER ..... 5" PM

POWER SUPPLY:

Battery Operation— "AB" Battery Pack (9 v. "A" and 90 v. "B")— Eveready 756W, Burgess T6Z60, or Ray-O-Vac AB601

Line Operation .....105 to 120 volts, D-C or 50 to 60 cycles A-C

CURRENT CONSUMPTION (Battery Operation)

"A" section of "AB" battery ..... .05 amp.
"B" section of "AB" battery .... .016 amp.

POWER CONSUMPTION (Line Operation)

..... 15 watts

BATTERY INSTALLATION

One of the following "A-B" battery packs should be used with this radio: Eveready 756W, Burgess T6Z60, or Ray-O-Vac AB601.

Best performance is obtained by installing the battery with the plug toward the front of the cabinet as shown in Fig. 4. However, if the battery is oversize it may be necessary to install it with the plug toward the back of the radio to allow complete closing of the back cover.

MODELS H-342P5U, H-343P5U, H-348P5, H-349P5, Ch. V-2156-1U

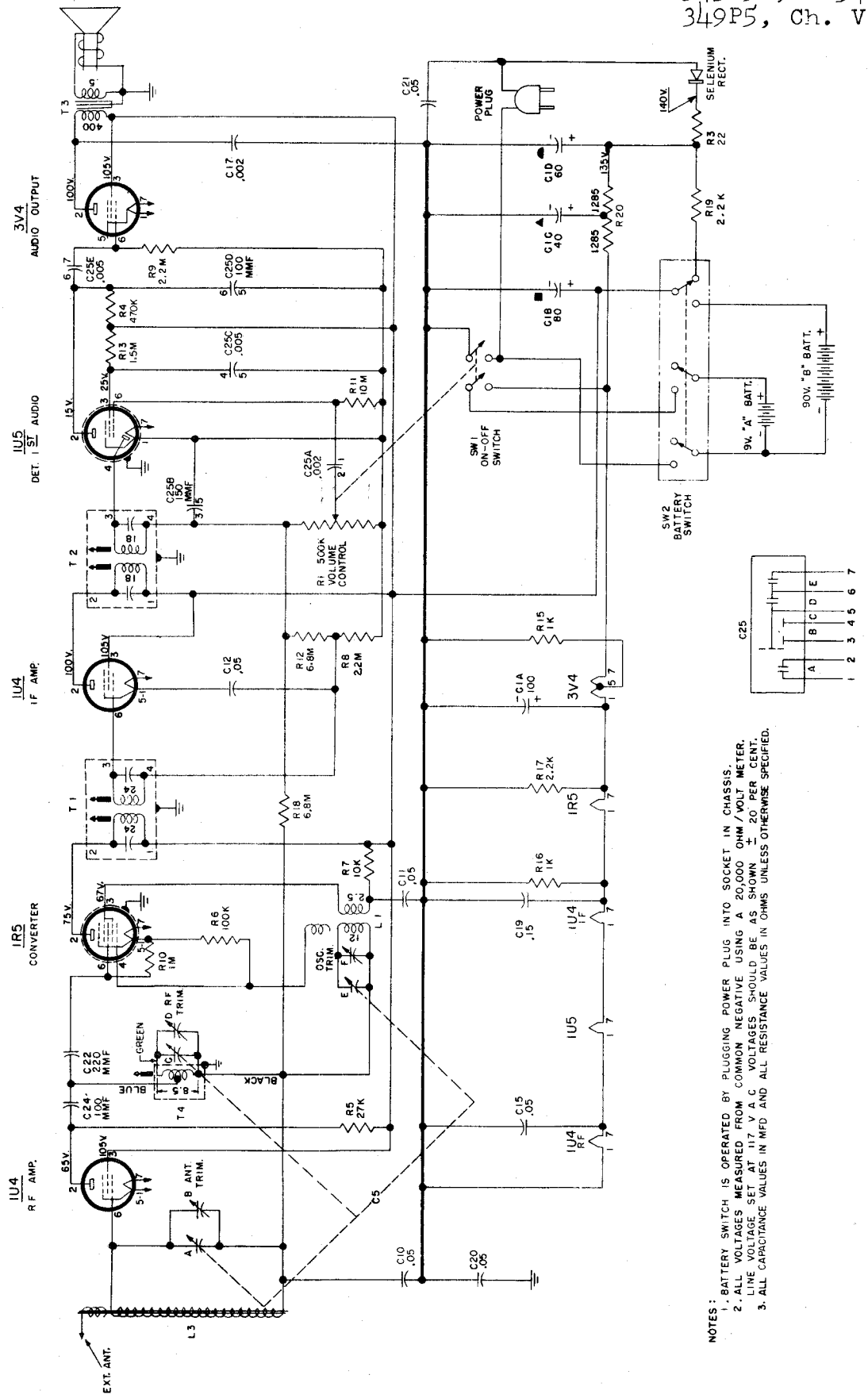


FIG. 1 — SCHEMATIC DIAGRAM OF V-2156-1U CHASSIS

NOTES:
1. BATTERY SWITCH IS OPERATED BY PLUGGING POWER PLUG INTO SOCKET IN CHASSIS.
2. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE USING A 20,000 OHM/VOLT METER. LINE VOLTAGE SET AT 117 V A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 PER CENT.
3. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

MODELS H-342P5U, H-343P5U, H-348P5, H-349P5, Ch. V-2156-1U

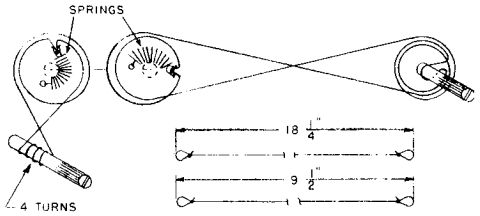


FIG. 2 — DRIVE MECHANISM

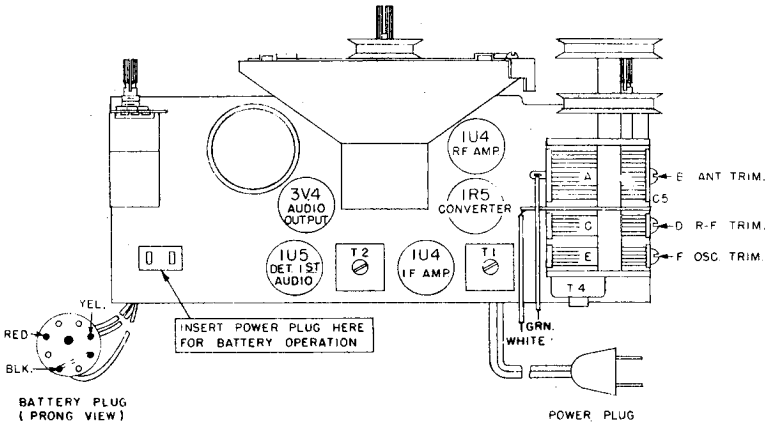


FIG. 3 — CHASSIS LAYOUT

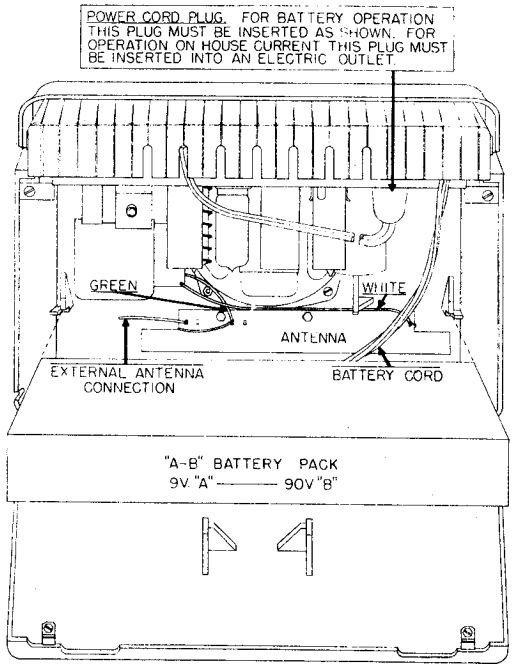


FIG. 4 — REAR VIEW

ALIGNMENT

It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	Connect Signal Generator to —	Signal Generator Frequency	Radio Dial Setting	Adjust for Maximum Output —
1	Pin No. 6 of the 1R5 converter through a 200 mmf capacitor	455 kc.	Minimum capacity	Top and bottom slugs of T2 and T1 in order given*
2	Stator of antenna tuning section of gang (E) through a 200 mmf capacitor	1615 kc.	Minimum capacity	Osc. trimmer (F)
3	Same as step 2	1400 kc.	1400 kc.	R-F trimmer (D)
4	Same as step 2	600 kc.	600 kc.	Slug of R-F trans. (T4)**
5	Recheck steps 3 and 4			
6	Radiated signal	1400 kc.	1400 kc.	Antenna trimmer (B)

* It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot.

** A 10/32" Allen wrench can be used to adjust the slug in T4.

MODELS H-342P5U, H-343P5U, H-348P5, H-349P5, Ch. V-2156-1U

PARTS LIST FOR

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS

Part No.	Description
V-10391-1	Antenna, iron core
V-4169-1	Base, miniature tube (1U5)
V-1235-1	Cabinet, H-342P5U (less handle)
V-1235-2	Cabinet, H-343P5U (less handle)
V-6554-2	Cable assembly, battery
V-5426	Clip, I-F mounting
V-10386-1	Clip, back cover catch
V-3219S-1	Cord, dial drive (100' spool)
V-10383-1	Handle
V-10388-1	Knob, H-342P5U
V-10388-2	Knob, H-343P5U
V-10363-2	Nameplate, Westinghouse
V-3873	Plug, battery
V-10389-1	Pointer, H-342P5U
V-10389-2	Pointer, H-343P5U
V-9704-4	Shaft, tuning
V-4169-2	Shield, miniature tube (1U5)
V-9706-1	Shield, spring, miniature tube (1R5)
V-4292S-3	Socket, miniature molded (3V4, 1U4, 1R5, and 1U5)
V-9705	Speaker, 5" PM
V-5687	Spring, back cover hinge
V-3448	Spring, dial cord

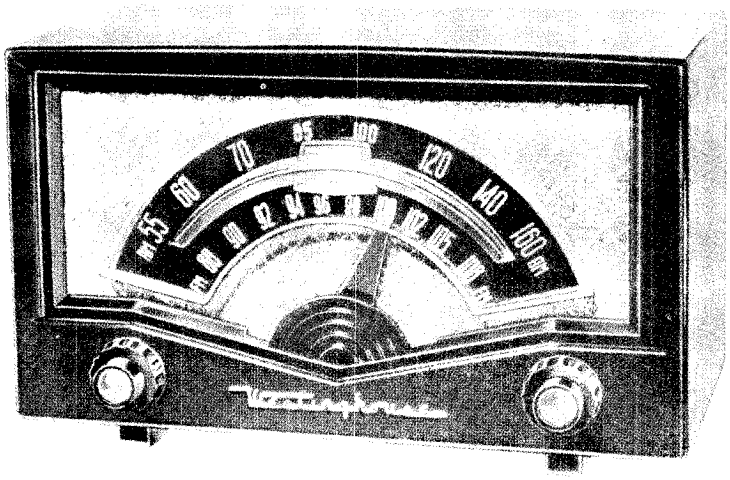
MODELS H-348P5 AND H-349P5

Part No.	Description
V-10391-1	Antenna, iron core
V-4169-1	Base, miniature tube
V-1235-3	Cabinet, H-348P5 (less handle)
V-1235-4	Cabinet, H-349P5 (less handle)
V-6554-2	Cable assembly, battery
V-5426	Clip, I-F mounting
V-10386-1	Clip, back cover catch
V-3219S-1	Cord, dial drive (100' spool)
V-10383-1	Handle
V-10388-3	Knob, H-348P5
V-10388-2	Knob, H-349P5
V-10363-2	Nameplate, Westinghouse
V-3873	Plug, battery
V-10389-3	Pointer, H-348P5
V-10389-4	Pointer, H-349P5
V-9704-4	Shaft, tuning
V-4169-2	Shield, miniature tube (1U5)
V-9706-1	Shield, spring, miniature tube (1R5)
V-4292S-3	Socket, miniature molded (3V4, 1U4, 1R5 and 1U5)
V-9705	Speaker, 5" PM
V-5687	Spring, back cover hinge
V-3448	Spring, dial cord

V-2156-1U CHASSIS

Ref. No.	Part No.	Description
C1	V-6552-2	Capacitor, electrolytic (consists of A, B, C and D - 100 mfd 25 v. and 80, 60, 40 mfd at 150 v.)
C5	V-10372-1	Capacitor, variable tuning (consists of A, B, C, D, E and F)
C10	RCP10W2503M	Capacitor, .05 mfd 200 v.
C11	RCP10W2503M	Capacitor, .05 mfd 200 v.
C12	RCP10W2503M	Capacitor, .05 mfd 200 v.
C14	RCP10W2503M	Capacitor, .05 mfd 200 v.
C15	RCP10W2503M	Capacitor, .05 mfd 200 v.
C17	RCP10W6202M	Capacitor, .002 mfd 600 v.
C19	RCP10W2154M	Capacitor, .15 mfd 200 v.
C20	RCP10W2503M	Capacitor, .05 mfd 200 v.
C21	RCP10W4503M	Capacitor, .05 mfd 400 v.
C22	RCM20A221M	Capacitor, 220 mmf
C24	RCM20A101M	Capacitor, 100 mmf
C25	V-9703-1	Capacitor, multiple (consists of A, B, C and D)
L1	V-5661	Coil, oscillator
L3	V-10391-1	Antenna, iron core
*R1	V-10373-1	Control, volume, 500,000 ohms (assy consists of R1 and SW1)
	V-9446-2	Rectifier, selenium
R3	RC30AE220M	Resistor, 22 ohms 1 w.
R4	RC20AE474M	Resistor, 470,000 ohms ½ w.
R5	RC20AE273M	Resistor, 270,000 ohms ½ w.
R6	RC20AE104M	Resistor, 100,000 ohms ½ w.
R7	RC20AE103M	Resistor, 10,000 ohms ½ w.
R8	RC20AE225M	Resistor, 2.2 megohms ½ w.
R9	RC20AE225M	Resistor, 2.2 megohms ½ w.
R10	RC20AE105M	Resistor, 1 megohm ½ w.
R11	RC20AE106M	Resistor, 10 megohms ½ w.
R12	RC20AE685M	Resistor, 6.8 megohms ½ w.
R13	RC20AE155M	Resistor, 1.5 megohms ½ w.
R15	RC20AE102K	Resistor, 1000 ohms ½ w.
R16	RC20AE102K	Resistor, 1000 ohms ½ w.
R17	RC20AE222K	Resistor, 2200 ohms ½ w.
R18	RC20AE685M	Resistor, 6.8 megohms ½ w.
R19	RC30AE222K	Resistor, 2200 ohms 1 w.
R20	V-5659-4	Resistor, ballast, 2570 ohms
*SW1	V-10373-1	Switch, on-off (assy consists of R1 and SW1)
SW2	V-6565	Switch, line-battery
T1	V-6972-5	Transformer, 1st I-F
T2	V-6972-6	Transformer, 2nd I-F
T3	V-6567-2	Transformer, audio
T4	V-6561-2	Transformer, RF

MODELS H-350T7,
H-351T7, Ch. V-2180-1



MODELS H-350T7 AND H-351T7

(BROWN) (IVORY)

CHASSIS V-2180-1

SERVICE NOTES

SPECIFICATIONS

FREQUENCY RANGES:

Amplitude Modulation ..... 540 to 1615 kc.
Frequency Modulation ..... 88 to 108 mc.

INTERMEDIATE FREQUENCIES:

Amplitude Modulation ..... 455 kc.
Frequency Modulation ..... 10.7 mc.

TUBE COMPLEMENT:

1 6BJ6 ..... RF Amplifier (FM)
1 12AT7 ..... Mixer-osc.
2 12BA6 ..... I-F Amp.
1 12AL5 ..... Ratio Det. (FM)
1 12AV6 .. Det. and AVC (AM) and A-F Amp.
1 50C5 ..... Output Amp.

POWER OUTPUT:

Undistorted ..... 1.0 watts
Maximum ..... 1.9 watts

LOUDSPEAKER: ..... 5¼" PM

OPERATING VOLTAGE:

..... 105 to 120 volts, DC or 60 cycles AC

POWER CONSUMPTION: ..... 35 watts

WARNING

The chassis is connected directly to one side of the power line. When making repairs or adjustments, it is recommended that the chassis be isolated from the line by means of an isolation transformer. Otherwise, *serious shock may result* if the radio chassis and ground are contacted at the same time.

Form RM3239
6-51

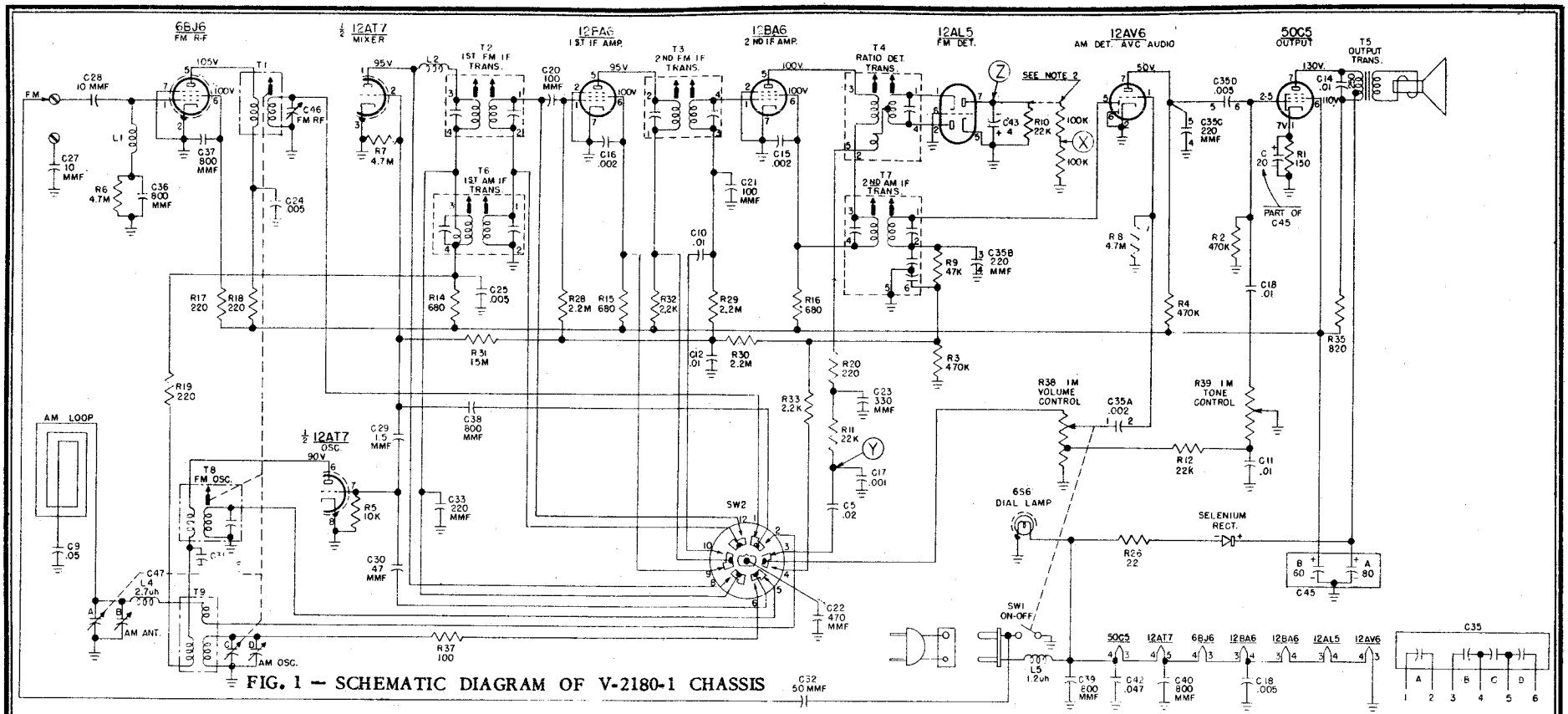


FIG. 1 — SCHEMATIC DIAGRAM OF V-2180-1 CHASSIS

CHASSIS NO. V-2180-1

NOTES:
1. SELECTOR SWITCH SW2 IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION OR FM BAND. EXTREME CLOCKWISE POSITION IS AM BAND. SWITCH SHOWN AS VIEWED FROM FRONT OF SET.
2. TO BE INSTALLED FOR ALIGNMENT ONLY.
3. ALL CAPACITANCE VALUES IN MFD. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
4. ALL VOLTAGES MEASURED FROM CHASSIS (GND.) USING A 20,000 OHM/VOLT METER. LINE VOLTAGE 117 V.A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 PER CENT.

ANTENNA INFORMATION

An external AM antenna can be coupled to the set by taping the lead-in wire to the outside of the rear cover as shown in Fig. 2. The wire should be dressed in the position shown and can be held in place with adhesive tape or other similar material.

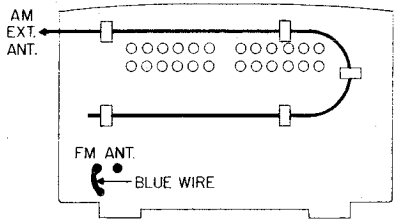


FIG. 2 — ANTENNA COUPLING

The blue wire emerging from the hole in rear cover is a "line" antenna for FM reception. It should be connected to the left antenna terminal as shown in Fig. 2. If an external FM antenna is to be used, disconnect the blue wire and connect the transmission line to the two terminals.

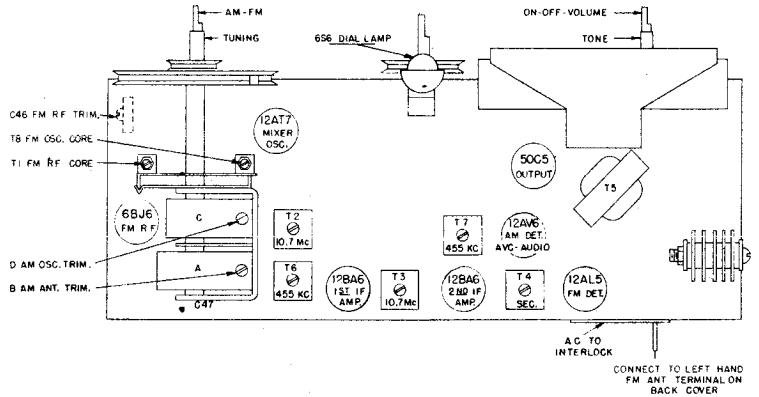


FIG. 3 — TOP VIEW OF CHASSIS

MODELS H-350T7, H-351T7, Ch. V-2180-1

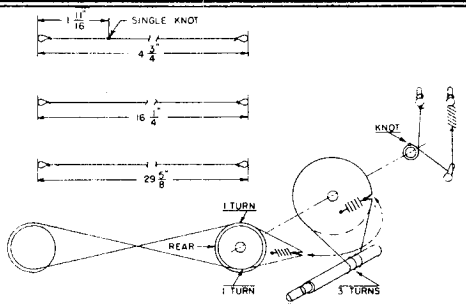


FIG. 4 — DRIVE MECHANISM

ALIGNMENT

BROADCAST BAND

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Check the dial pointer position by meshing the tuning capacitor plates completely and seeing that the dial pointer is set on the end mark of the dial scale.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to AM			
2	Stator of tuning capacitor (A) through a 0.1 mfd capacitor	455 kc.	minimum capacity	Pri. and sec. of T7 and T6 for max. output in order given
NOTE: If the I-F transformers are badly mis-aligned, it may be impossible to obtain sufficient output using the above system. In this event, it will be necessary to align each transformer separately. Start with the last I-F transformer and work forward, connecting the signal generator to the control grid of the tube preceding the transformer under alignment.				
3	Radiated signal (no actual connection)	1615 kc.	minimum capacity	AM osc. trimmer (D) for max. output
4	Radiated signal (no actual connection)	1400 kc.	tune to signal	AM ant. trimmer (B) for max. output (rock-in) adjustment)

FM BAND

Do not align the FM circuits until all AM adjustments have been completed.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to FM			
2	Connect two 100,000 ohm resistors (the resistances must be equal within 5 per cent) between pin No. 7 of the 12AL5 tube and ground as shown on the schematic diagram.			
3	Connect a V.T.V.M. between points "X" and "Y" (see schematic diagram).			
4	Pin No. 2 of 12AT7 through a 0.1 mfd mica capacitor	10.7 mc.	minimum capacity	Sec. of T4 for *zero* (use medium strength signal)
5	Connect the V.T.V.M. between point "Z" and ground.			
6	Same as step 4	10.7 mc.	minimum capacity	Pri. of T4 and pri. and sec. of T3 and T2 for maximum voltage
7	Reconnect the V.T.V.M. between points "X" and "Y" and increase the signal strength 10 times.			
8	Same as step 4	10.7 mc.	minimum capacity	Recheck sec. of T4 for *zero* voltage
9	Reconnect the V.T.V.M. between point "Z" and ground.			
10	Same as step 4	10.7 mc.	min. cap.	Pri. of T4 for maximum voltage
11	Remove the two 100,000 ohm resistors that were inserted in step 2.			
12	FM ant. terminal through a 300 ohm non-inductive resistor	98 mc.	98 mc.	FM osc. core for maximum voltage
13	Same as step 12	98 mc.	98 mc.	FM R-F trimmer (C46) for maximum voltage
14	Same as step 12	105 mc.	tune to signal	FM R-F core for maximum voltage
15	Same as step 12	90 mc.	tune to signal	FM R-F trimmer (C46) for maximum voltage (rock-in)
16	Recheck steps 14 and 15 for tracking.			

MODELS H-350T7, H-351T7, Ch. V-2180-1

PARTS LIST FOR MODELS H-350T7 AND H-351T7

When ordering parts, specify model number of set in addition to part number and description of part.

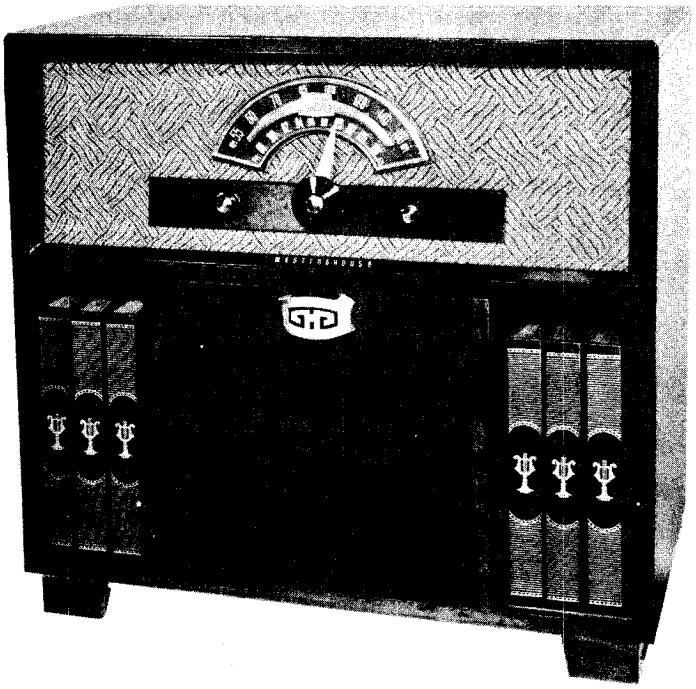
CABINET AND MISCELLANEOUS

Part No.	*Description*
V-10364-3	Baffle and grille cloth assembly (H-350T7)
V-10364-4	Baffle and grille cloth assembly (H-351T7)
V-1233-3	Cabinet (brown)
V-1233-4	Cabinet (ivory)
V-5426	Clip, I-F mounting
V-3219S-1	Cord, dial drive (100' spool)
V-9636-4	Cover assembly, back
V-10308-1	Dial
V-10604-1	Escutcheon
V-9104-9	Knob, tuning, rear (brown)
V-9104-10	Knob, tone, rear (brown)
V-9104-11	Knob, tuning, rear (ivory)
V-9104-12	Knob, tone, rear (ivory)
V-10408-1	Knob, band (brown)
V-10408-2	Knob, off-on-volume (brown)
V-10408-3	Knob, band (ivory)
V-10408-4	Knob, off-on-volume (ivory)
6S6DC	Lamp, pilot
V-9653	Loop, AM antenna
V-10318-2	Nameplate, Westinghouse
V-9661	Plug, AC power (male)
V-10310-1	Pointer
V-10357-1	Pulley assembly, gang
V-10647-1	Pulley and shaft assembly, pointer
V-9655	Shell, interlock
V-10472-1	Shield, lamp
V-10038-1	Shield, miniature tube (6BJ6)
V-10649-1	Shield, miniature tube (12AT7)
V-9654	Socket, interlock
V-6878-2	Socket, miniature wafer (50C5)
V-9888-3	Socket, miniature wafer (6BJ6, 12BA6, 12AL5, 12AV6)
V-10133-2	Socket, miniature wafer (12AT7)
V-10650-1	Socket, pilot lamp
V-9641-2	Speaker, 5¼" PM
V-6795-3	Spring, FM tuner and gang drive

V-2180-1 CHASSIS

Ref. No.	*Part No.*	*Description*
C5	RCP10W2203M	Capacitor, .02 mfd 200 v.
C9	RCP10W2503M	Capacitor, .05 mfd 200 v.
C10	RCP10W4103M	Capacitor, .01 mfd 400 v.
C11	RCP10W4103M	Capacitor, .01 mfd 400 v.
C12	RCP10W4103M	Capacitor, .01 mfd 400 v.
C13	RCP10W4103M	Capacitor, .01 mfd 400 v.
C14	RCP10W4103M	Capacitor, .01 mfd 400 v.
C15	RCP10W6202M	Capacitor, .002 mfd 600 v.
C16	RCP10W6202M	Capacitor, .002 mfd 600 v.
C17	RCP10W6102M	Capacitor, .001 mfd 600 v.
C18	V-5596	Capacitor, .005 mfd
C20	R4CC21YY101M	Capacitor, 100 mmf
C21	R4CC21YY101M	Capacitor, 100 mmf
C22	R5CC21ZY471M	Capacitor, 470 mmf
C23	RCM20A331M	Capacitor, 330 mmf
C24	V-5596	Capacitor, .005 mfd
C25	V-5596	Capacitor, .005 mfd
C27	V-5658-7	Capacitor, 10 mmf
C28	V-5658-7	Capacitor, 10 mmf
C29	V-5658-9	Capacitor, 1.5 mmf
C30	V-10710-1	Capacitor, 47 mmf
C31	V-10710-1	Capacitor, 47 mmf
C32	V-5658-10	Capacitor, 50 mmf
C33	V-10710-2	Capacitor, 220 mmf
C35	V-9634-1	Capacitor, multiple ceramic (.002 mfd, 220 mmf, 220 mmf, .005 mfd)
C36	V-9863-1	Capacitor, 800 mmf
C37	V-9863-1	Capacitor, 800 mmf
C38	V-9863-1	Capacitor, 800 mmf
C39	V-9863-1	Capacitor, 800 mmf
C40	V-9863-1	Capacitor, 800 mmf
C42	V-10157-4473M	Capacitor, .047 mfd 400 v.
C43	V-4637	Capacitor, 4 mfd 50 v.
C45	V-10415-2	Capacitor, electrolytic (80-60 mfd 250 v. and 20 mfd 20 v.)
C46	V-10640-1	Capacitor, FM RF trimmer
C47	V-10662-2	Capacitor, variable (consists of A, B, C and D)
	V-9676-1	Core, FM tuning
L1	V-10644-1	Reactor, RF
L2	V-4886-13	Reactor, RF
L4	V-9099-5	Reactor, 2.7 microhenries
L5	V-9099-1	Reactor, 1.2 microhenries
	V-9640	Rectifier, selenium
R1	RC30AE151K	Resistor, 150 ohms 1 w.
R2	RC20AE474M	Resistor, 470,000 ohms ½ w.
R3	RC20AE474M	Resistor, 470,000 ohms ½ w.
R4	RC20AE474M	Resistor, 470,000 ohms ½ w.
R5	RC20AE103M	Resistor, 10,000 ohms ½ w.
R6	RC20AE475M	Resistor, 4.7 megohms ½ w.
R7	RC20AE475M	Resistor, 4.7 megohms ½ w.
R8	RC20AE475M	Resistor, 4.7 megohms ½ w.
R9	RC20AE473M	Resistor, 47,000 ohms ½ w.
R10	RC20AE223K	Resistor, 22,000 ohms ½ w.
R11	RC20AE223M	Resistor, 22,000 ohms ½ w.
R12	RC20AE223M	Resistor, 22,000 ohms ½ w.
R14	RC20AE681M	Resistor, 680 ohms ½ w.
R15	RC20AE681M	Resistor, 680 ohms ½ w.
R16	RC20AE681M	Resistor, 680 ohms ½ w.
R17	RC20AE221M	Resistor, 220 ohms ½ w.
R18	RC20AE221M	Resistor, 220 ohms ½ w.
R19	RC20AE221M	Resistor, 220 ohms ½ w.
R20	RC20AE221M	Resistor, 220 ohms ½ w.
R26	RC30AE220K	Resistor, 22 ohms 1 w.
R28	RC20AE225M	Resistor, 2.2 megohms ½ w.
R29	RC20AE225M	Resistor, 2.2 megohms ½ w.
R30	RC20AE225M	Resistor, 2.2 megohms ½ w.
R31	RC20AE156M	Resistor, 15 megohms ½ w.
R32	RC20AE222M	Resistor, 2200 ohms ½ w.
R33	RC20AE222M	Resistor, 2200 ohms ½ w.
R35	V-6984-10	Resistor, 820 ohms 5 w.
R37	RC20AE101M	Resistor, 100 ohms ½ w.
*R38	V-10330-2	Control, volume, 1 megohm (assy consists of R38, R39 & SW1)
*R39	V-10330-2	Control, tone, 1 megohm (assy consists of R38, R39 & SW1)
*SW1	V-10330-2	Switch, on-off (assy consists of R38, R39 and SW1)
SW2	V-10651-1	Switch, AM-FM selector
T1	V-10642-1	Transformer, FM RF
T2	V-9688	Transformer, 1st FM IF
T3	V-9642	Transformer, 2nd FM IF
T4	V-9828	Transformer, ratio detector
T5	V-10660	Transformer, audio
T6	V-10619	Transformer, 1st AM IF
T7	V-10350-1	Transformer, 2nd AM IF
T8	V-10643-1	Transformer, FM oscillator
T9	V-10641-1	Transformer, AM oscillator

MODEL H-354C7,
Ch. V-2180-2



MODEL H-354C7

CHASSIS V-2180-2

SERVICE NOTES

For Record Changer Information, Refer to the V-9481 Automatic Record Changer Service Notes

SPECIFICATIONS

FREQUENCY RANGES:

Amplitude Modulation ..... 540 to 1615 kc.
Frequency Modulation ..... 88 to 108 mc.

INTERMEDIATE FREQUENCIES:

Amplitude Modulation ..... 455 kc.
Frequency Modulation ..... 10.7 mc.

TUBE COMPLEMENT:

1 6BJ6 ..... RF Amplifier (FM)
1 12AT7 ..... Mixer-osc.
2 12BA6 ..... I-F Amp.
1 12AL5 ..... Ratio Det. (FM)
1 12AV6 .. Det. and AVC (AM) and A-F Amp.
1 50L6GT ..... Output Amp.

POWER OUTPUT:

Undistorted ..... 2.5 watts
Maximum ..... 3.0 watts

LOUDSPEAKER: ..... 8" PM

OPERATING VOLTAGE:

..... 105 to 120 volts, 60 cycles AC

POWER CONSUMPTION: ..... 70 watts

WARNING: The chassis of this receiver is connected directly to one side of the power line. When making repairs or adjustments, it is recommended that the chassis be isolated from the line by means of an isolation transformer. Otherwise, serious shock may result if the radio chassis and ground are contacted at the same time.

It should be noted that the interlock plug, which must be released from

Form RM3240
6-51

MODEL H-354C7,
Ch. V-2180-2

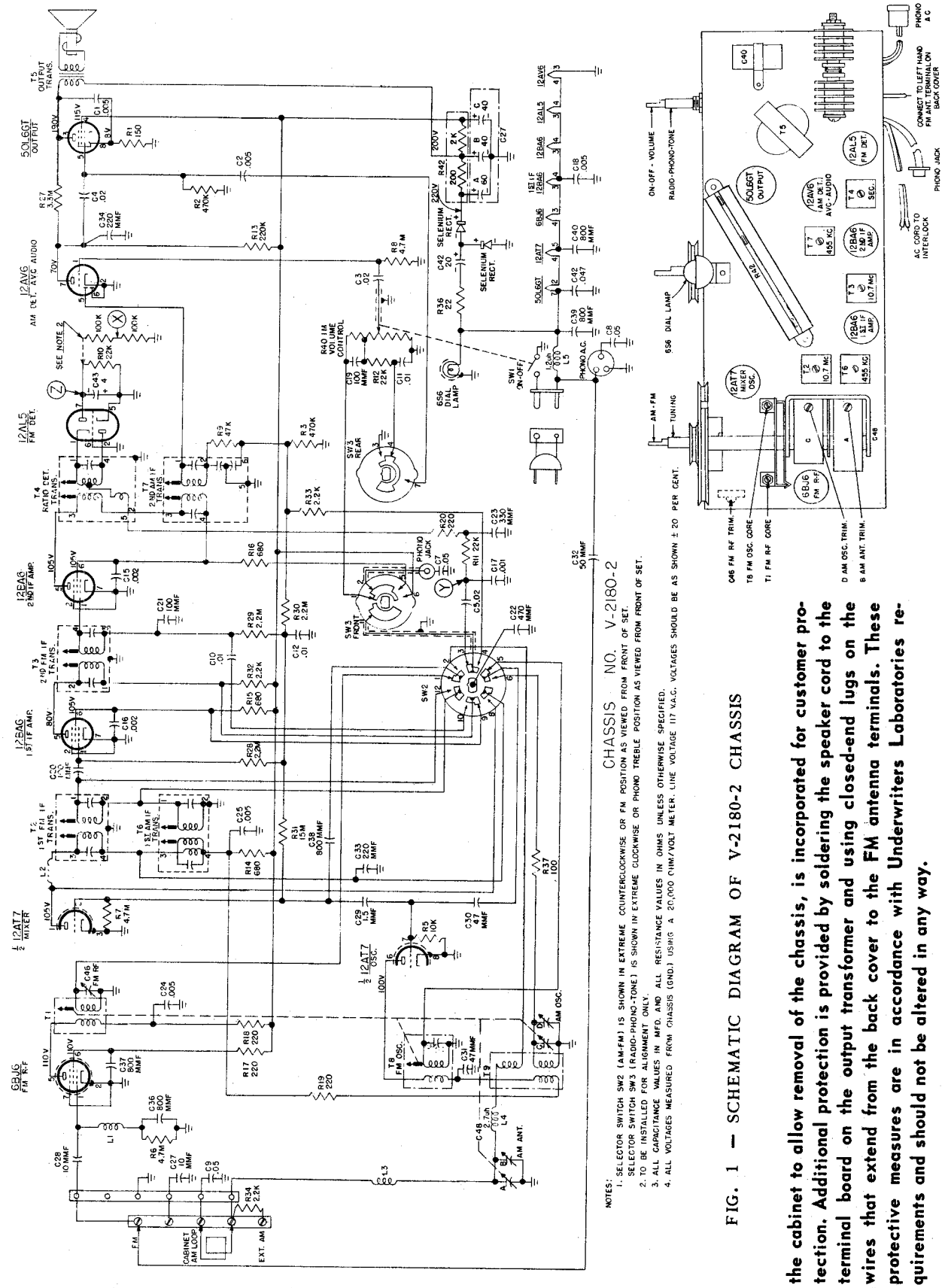


FIG. 1 — SCHEMATIC DIAGRAM OF V-2180-2 CHASSIS

FIG. 2 — TOP VIEW OF CHASSIS

the cabinet to allow removal of the chassis, is incorporated for customer protection. Additional protection is provided by soldering the speaker cord to the terminal board on the output transformer and using closed-end lugs on the wires that extend from the back cover to the FM antenna terminals. These protective measures are in accordance with Underwriters Laboratories requirements and should not be altered in any way.

MODEL H-354C7,
Ch. V-2180-2

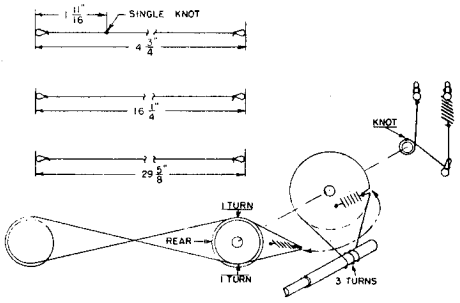


FIG. 3 — DIAL DRIVE

ALIGNMENT

BROADCAST BAND

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to AM and the radio-phono-tone control to RADIO			
2	Stator of tuning capacitor (A) through 0.1 mfd capacitor	455 kc.	minimum capacity	Pri. and sec. of T7 and T6 for max. output in order given
NOTE: If the I-F transformers are badly mis-aligned, it may be impossible to obtain sufficient output using the above system. In this event, it will be necessary to align each transformer separately. Start with the last I-F transformer and work forward, connecting the signal generator to the control grid of the tube preceding the transformer under alignment.				
3	Radiated signal (no actual connection)	1615 kc.	minimum capacity	AM osc. trimmer (D) for max. output
4	Radiated signal (no actual connection)	1400 kc.	tune to signal	AM ant. trimmer (B) for max. output (rock-in adjustment)

FM BAND

Do not align the FM circuits until all AM adjustments have been completed.

Step	*Connect Signal Generator to —*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust*
1	Set the band switch to FM			
2	Connect two 100,000 ohm resistors (the resistances must be equal within 5 per cent) between pin No. 7 of the 12AL5 tube and ground as shown on the schematic diagram.			
3	Connect a V.T.V.M. between points "X" and "Y" (see schematic diagram).			
4	Pin No. 2 of 12AT7 through a 0.1 mfd mica capacitor	10.7 mc.	minimum capacity	Sec. of T4 for *zero* (use medium strength signal)
5	Connect the V.T.V.M. between point "Z" and ground			
6	Same as step 4	10.7 mc.	minimum capacity	Pri. of T4 and pri. and sec. of T3 and T2 for max.
7	Reconnect the V.T.V.M. between points "X" and "Y" and increase the signal strength 10 times.			
8	Same as step 4	10.7 mc.	minimum capacity	Recheck sec. of T4 for *zero* voltage
9	Reconnect the V.T.V.M. between point "Z" and ground			
10	Same as step 4	10.7 mc.	minimum capacity	Pri. of T4 for maximum voltage
11	Remove the two 100,000 ohm resistors that were inserted in step 2			
12	FM ant. terminal through a 300 ohm non-inductive resistor	98 mc.	98 mc.	FM osc. core for maximum voltage
13	Same as step 12	98 mc.	98 mc.	FM R-F trimmer (C46) for maximum voltage
14	Same as step 12	105 mc.	tune to signal	FM R-F core for maximum voltage
15	Same as step 12	90 mc.	tune to signal	FM R-F trimmer (C46) for maximum voltage (rock-in)
16	Recheck steps 14 and 15 for tracking			

MODEL H-354C7,
Ch. V-2180-2

PARTS LIST FOR MODEL H-354C7

When ordering parts, specify model number of set in addition to part number and description of part.

CABINET AND MISCELLANEOUS

Part No.	Description
V-1245-1	Cabinet
V-6415-5	Cable, phono pickup
V-9822-1	Cable assembly, phono AC power (female)
V-9833-1	Cable assembly, phono AC power (male)
V-5426	Clip, I-F mounting
V-3254S	Connector, phono
V-10444-2	Connector assembly, phono
V-3219S-1	Cord, dial drive (100' spool)
V-9845-1	Cover, back (record changer)
V-10682-1	Cover assembly, back (radio)
V-10308-1	Dial
V-8585	Drawer, record changer (complete less hardware)
V-10604-1	Escutcheon, dial
V-10261-4	Grille cloth
V-10338-1	Hub, pointer
V-9104-9	Knob, tuning (rear)
V-9861-2	Knob, radio-phono-tone (rear)
V-10408-1	Knob, band
V-10408-2	Knob, on-off-volume
6S6DC	Lamp, pilot
V-8586	Panel, background for knobs
V-9661	Plug, AC
V-10310-1	Pointer, dial
V-10591-3	Pull, record changer drawer
V-10357-1	Pulley assembly, gang
V-10647-2	Pulley and shaft assembly, pointer
V-9655	Shell, interlock
V-10472-1	Shield, lamp
V-10038-1	Shield, miniature tube (6BJ6)
V-10649-1	Shield, miniature tube (12AT7)
V-9654	Socket, interlock
V-9888-3	Socket, miniature wafer (6BJ6, 12BA6, 12AL5, 12AV6)
V-10133-2	Socket, miniature wafer (12AT7)
V-3246S	Socket, octal wafer (50L6GT)
V-10650-1	Socket, pilot lamp
V-10675-1	Speaker, 8" PM
V-6795-3	Spring, dial drive
V-10673-1	Terminal strip, antenna

V-2180-2 CHASSIS

Ref. No.	Part No.	Description
C1	RCP10W4502M	Capacitor, .005 mfd 400 v.
C2	RCP10W4502M	Capacitor, .005 mfd 400 v.
C3	RCP10W2203M	Capacitor, .02 mfd 200 v.
C4	RCP10W2203M	Capacitor, .02 mfd 200 v.
C5	RCP10W2203M	Capacitor, .02 mfd 200 v.
C7	RCP10W2503M	Capacitor, .05 mfd 200 v.
C8	RCP10W2503M	Capacitor, .05 mfd 200 v.
C9	RCP10W2503M	Capacitor, .05 mfd 200 v.
C10	RCP10W4103M	Capacitor, .01 mfd 400 v.
C11	RCP10W4103M	Capacitor, .01 mfd 400 v.
C12	RCP10W4103M	Capacitor, .01 mfd 400 v.
C15	RCP10W6202M	Capacitor, .002 mfd 600 v.
C16	RCP10W6202M	Capacitor, .002 mfd 600 v.
C17	RCP10W6102M	Capacitor, .001 mfd 600 v.
C18	V-5596	Capacitor, .005 mfd
C19	R4CC21YY101M	Capacitor, 100 mmf
C20	R4CC21YY101M	Capacitor, 100 mmf
C21	R4CC21YY101M	Capacitor, 100 mmf
C22	R5CC21ZY471M	Capacitor, 470 mmf
C23	RCM20A331M	Capacitor, 330 mmf
C24	V-5596	Capacitor, .005 mfd
C25	V-5596	Capacitor, .005 mfd
C27	V-5658-7	Capacitor, 10 mmf
C28	V-5658-7	Capacitor, 10 mmf
C29	V-5658-9	Capacitor, 1.5 mmf
C30	V-10710-1	Capacitor, 47 mmf
C31	V-10710-1	Capacitor, 47 mmf
C32	V-5658-10	Capacitor, 50 mmf
C33	V-10710-2	Capacitor, 220 mmf
C34	V-10710-2	Capacitor, 220 mmf
C36	V-9863-1	Capacitor, 800 mmf
C37	V-9863-1	Capacitor, 800 mmf
C38	V-9863-1	Capacitor, 800 mmf
C39	V-9863-1	Capacitor, 800 mmf
C40	V-9863-1	Capacitor, 800 mmf
C42	V-10157-4473M	Capacitor, .047 400 v.
C43	V-4637	Cap., electrolytic, 4 mfd 50 v.
C44	V-9919-2	Capacitor, electrolytic, 60-40-40 mfd 250 v.
C46	V-10640-1	Capacitor, FM RF trimmer
C48	V-10662-1	Capacitor, variable (consists of A, B, C and D)
C49	V-9823-2	Capacitor, electrolytic, 20 mfd 200 v.
L1	V-10644-1	Reactor, RF
L2	V-4886-13	Reactor, RF
L3	V-6157-1	Coil, antenna loading
L4	V-9099-5	Reactor, 2.7 microhenries
L5	V-9099-1	Reactor, 1.2 microhenries
	V-9640	Rectifier, selenium
R1	RC30AE151K	Resistor, 150 ohms 1 w.
R2	RC20AE474M	Resistor, 470,000 ohms ½ w.
R3	RC20AE474M	Resistor, 470,000 ohms ½ w.
R5	RC20AE103M	Resistor, 10,000 ohms ½ w.
R6	RC20AE475M	Resistor, 4.7 megohms ½ w.
R7	RC20AE475M	Resistor, 4.7 megohms ½ w.
R8	RC20AE475M	Resistor, 4.7 megohms ½ w.
R9	RC20AE473M	Resistor, 47,000 ohms ½ w.
R10	RC20AE222K	Resistor, 2200 ohms ½ w.
R11	RC20AE223M	Resistor, 22,000 ohms ½ w.
R12	RC20AE223M	Resistor, 22,000 ohms ½ w.
R13	RC20AE224M	Resistor, 220,000 ohms ½ w.
R14	RC20AE681M	Resistor, 680 ohms ½ w.
R15	RC20AE681M	Resistor, 680 ohms ½ w.
R16	RC20AE681M	Resistor, 680 ohms ½ w.
R17	RC20AE221M	Resistor, 220 ohms ½ w.
R18	RC20AE221M	Resistor, 220 ohms ½ w.
R19	RC20AE221M	Resistor, 220 ohms ½ w.
R20	RC20AE221M	Resistor, 220 ohms ½ w.
R27	RC20AE335M	Resistor, 3.3 megohms ½ w.
R28	RC20AE225M	Resistor, 2.2 megohms ½ w.
R29	RC20AE225M	Resistor, 2.2 megohms ½ w.
R30	RC20AE225M	Resistor, 2.2 megohms ½ w.
R31	RC20AE156M	Resistor, 15 megohms ½ w.
R32	RC20AE222M	Resistor, 2200 ohms ½ w.
R33	RC20AE222M	Resistor, 2200 ohms ½ w.
R34	RC20AE222M	Resistor, 2200 ohms ½ w.
R36	V-6067-7	Resistor, 22 ohms 3 w.
R37	RC20AE101M	Resistor, 100 ohms ½ w.
*R40	V-10359-2	Control, volume, 1 megohm (assy. consists of R40, SW1 & SW3)
R42	V-10054-1	Resistor, ballast, 2000 ohms 6 w. and 200 ohms 3 w.
*SW1	V-10359-2	Switch, on-off (assy. consists of R40, SW1 and SW3)
SW2	V-10651-1	Sw., selector (AM-FM-PHONO)
*SW3	V-10359-2	Switch, tone (assy. consists of R40, SW1 and SW3)
T1	V-10642-1	Transformer, FM RF
T2	V-9688	Transformer, 1st FM I-F
T3	V-9642	Transformer, 2nd FM I-F
T4	V-9828	Transformer, ratio detector
T5	V-9827	Transformer, audio
T6	V-10619	Transformer, 1st AM I-F
T7	V-10350-1	Transformer, 2nd AM I-F
T8	V-10643-1	Transformer, FM oscillator
T9	V-10641-1	Transformer, AM oscillator

TUBES: The Tubes used, and their functions, are as follows:

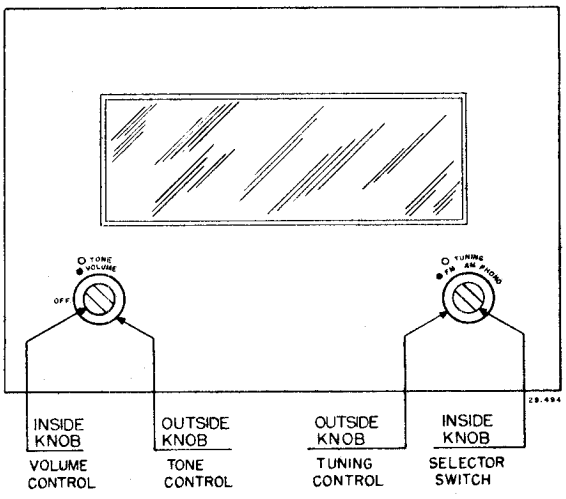
12AT7	R-F Amplifier and Mixer (F-M)
6BE6	A-M Converter and F-M Oscillator
6BA6	1st I-F Amplifier (A-M & F-M)
6BA6	2nd I-F Amplifier (F-M)
6AL5	F-M Detector
6AV6	A-M Detector, A.V.C. and Audio Amp.
6V6GT	Beam Power Amplifier
5Y3GT	Rectifier

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts; 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION INCLUDING RECORD CHANGER: 115 Watts.

TUNING RANGE:

Broadcast Band:	540 to 1650 Kilocycles (182 to 555 Meters)
F-M Band:	87.5 to 108.5 Megacycles (2.7 to 3.4 Meters)



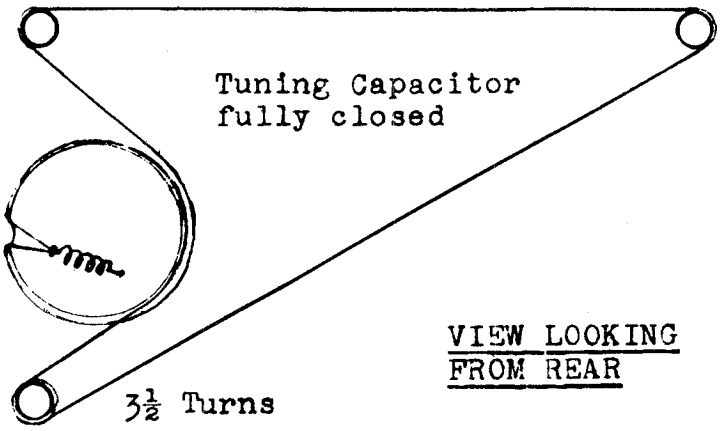


FIG. 1—FRONT PANEL CONTROLS

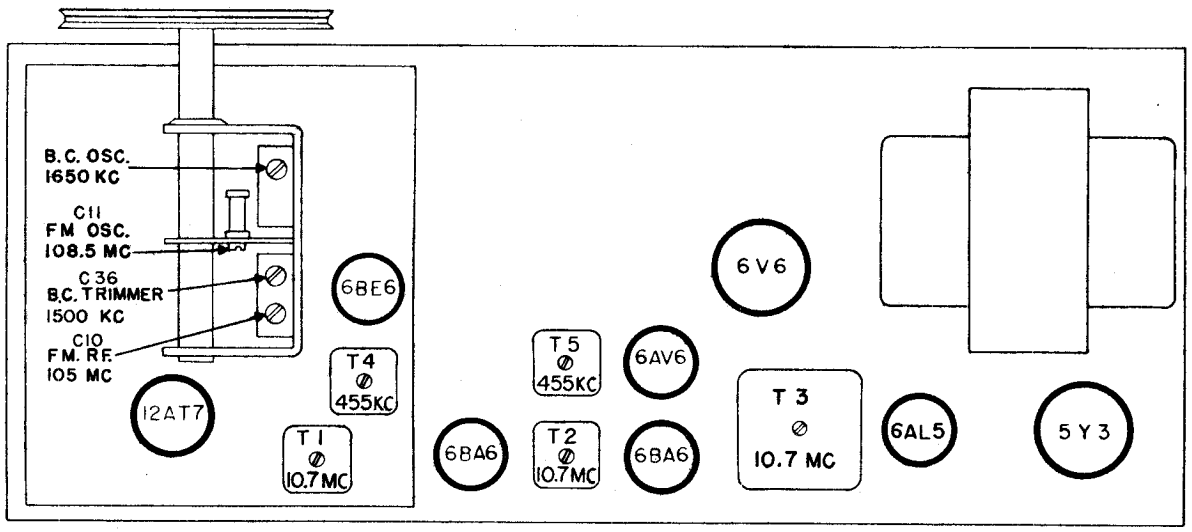


FIG. 2—TUBE AND ADJUSTMENT LOCATION DIAGRAM

ALIGNMENT CHART

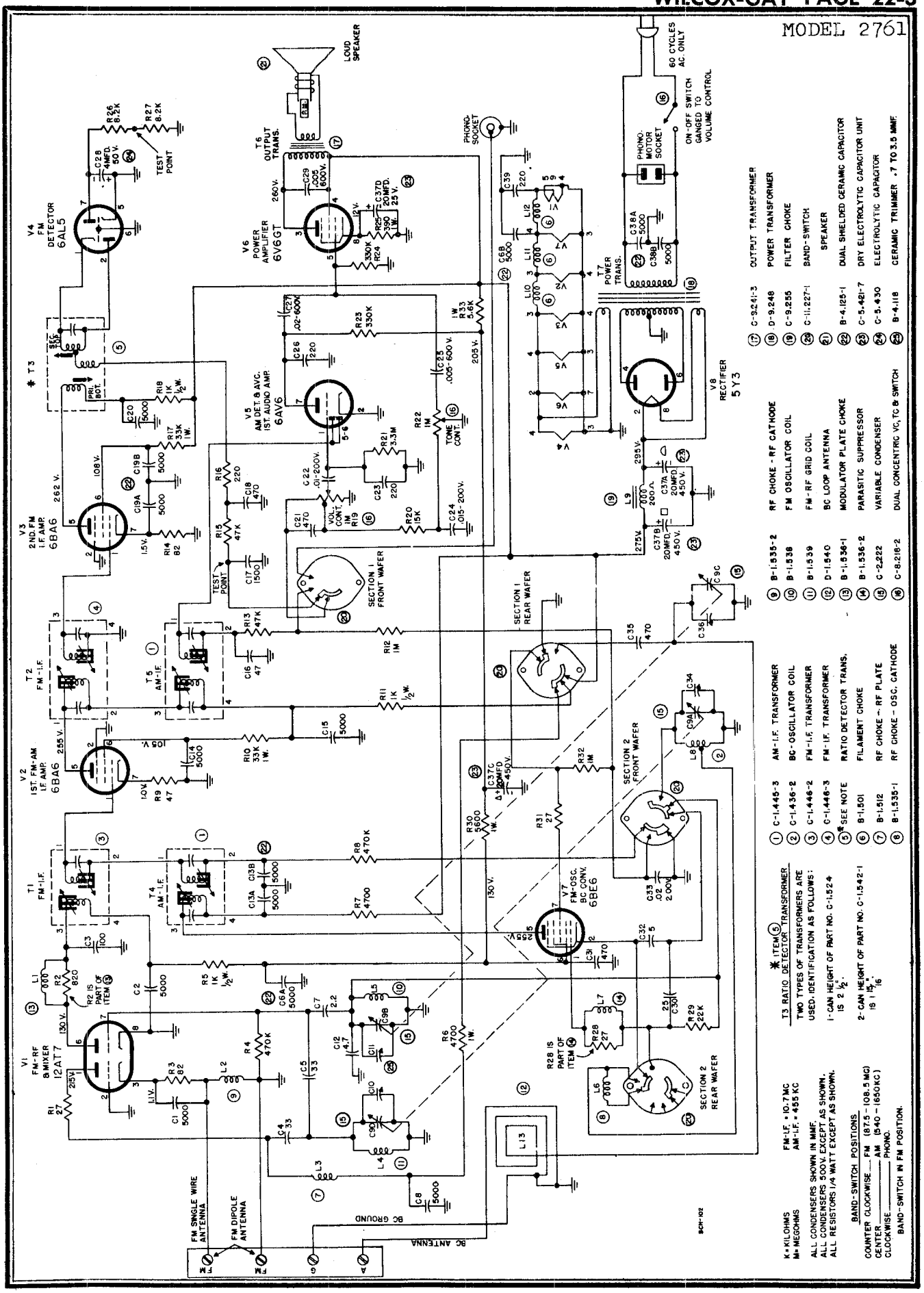
STEP	CIRCUIT ALIGNED	RECEIVER DIAL AT	SIGNAL GENERATOR			METER		ADJUST	METER INDICATION
			TYPE	FREQ.	CONNECTIONS	TYPE	CONNECTIONS		
1	B.C. I.F.	B.C. BAND MAX. FREQ.	A.M.	455 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T4 & T5	MAX. OUTPUT
PREFERRED METHOD 2	F.M. I.F.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.	HIGH SIDE THROUGH .005 MF. (APPROX.) CAP TO PIN 7 OF 12AT7	OUTPUT	ACROSS VOICE COIL	TOP & BOT. OF T1 & T2; BOT. OF T3	MAX. OUTPUT
ALTERNATE METHOD 2			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 3	F.M. DET.	F.M. BAND MAX. FREQ.	F.M.	10.7 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TOP OF T3	MAX. OUTPUT
ALTERNATE METHOD 3			R.F. OR A.M.	10.7 MC. UNMOD.		D.C. V.T.V.M.	NEG. TO JUNCTION OF 8.2K'S AT 6AL5; POS. TO JUNCTION OF R15 & C17.		ZERO BETWEEN TWO OPPOSITE POLARITY PEAKS
PREFERRED METHOD 4	F.M. OSC.	F.M. BAND MAX. FREQ.	F.M.	108.5 MC. 30% MOD.	EACH SIDE OF GEN. OUTPUT THROUGH 150 OHM RESISTOR TO F.M. ANT. TERMINALS	OUTPUT	ACROSS VOICE COIL	TRIMMER ON TOP CENTER OF VAR. COND. (C11)	MAX. OUTPUT
ALTERNATE METHOD 4			R.F. OR A.M.	108.5 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
PREFERRED METHOD 5	F.M. R.F.	F.M. BAND 105 MC	F.M.	105 MC. 30% MOD.		OUTPUT	ACROSS VOICE COIL	TRIMMER AT REAR OF VAR. COND. (C10)	MAX. OUTPUT
ALTERNATE METHOD 5			R.F. OR A.M.	105 MC. UNMOD.		D.C. V.T.V.M.	NEGATIVE TO PIN 7 OF 6AL5; POSITIVE TO GROUND		MAX. DEFLECTION
6	B.C OSC.	B.C. BAND MAX. FREQ.	A.M.	1650 KC 30% MOD.	REAR B.C. SECTION OF VARIABLE CONDENSER	OUTPUT	ACROSS VOICE COIL	TRIMMER AT FRONT OF VAR. COND. (C34).	MAX. OUTPUT
7	B.C. R.F.	B.C. BAND 1500 KC	A.M.	1500 KC 30% MOD.	EACH SIDE OF GEN. OUTPUT TO 2 OR 3-TURN LOOP (1 FOOT DIA.) SEVERAL FEET FROM ANT.	OUTPUT	ACROSS VOICE COIL	B.C. TRIM. AT REAR OF VAR. COND. (C36).	

29.498

NOTES:

1- TURN VOLUME CONTROL FULLY CLOCKWISE.
2- MAINTAIN SIGNAL INPUT LOW ENOUGH TO HAVE LESS THAN 2 VOLTS ACROSS METERS.
3- UNLESS OTHERWISE NOTED, CONNECT LOW SIDE OF SIGNAL GENERATOR TO CHASSIS.
4- UNLESS OTHERWISE NOTED, SET VARIABLE CONDENSER TO MINIMUM CAPACITY (MAX. FREQ.)
5- USE PROPER TOOL FOR SMALL I.F. TRANS. ADJUSTMENTS— I.E., .150 DIA. BAKELITE WITH BLADE .075 THICK.
6- MAINTAIN 60 CYCLE LINE VOLTAGE AT APPROX. 117 VOLTS.

MODEL 2761



K = KILOHMS
M = MEGOHMS

ALL CONDENSERS SHOWN IN MMF.
ALL CONDENSERS 500V. EXCEPT AS SHOWN.
ALL RESISTORS 1/4 WATT EXCEPT AS SHOWN.

BAND-SWITCH POSITIONS
COUNTER CLOCKWISE ___ FM (87.5 - 108.5 MC)
CENTER _____ AM (540 - 1650 KC)
CLOCKWISE _____ PHONO.
BAND-SWITCH IN FM POSITION.

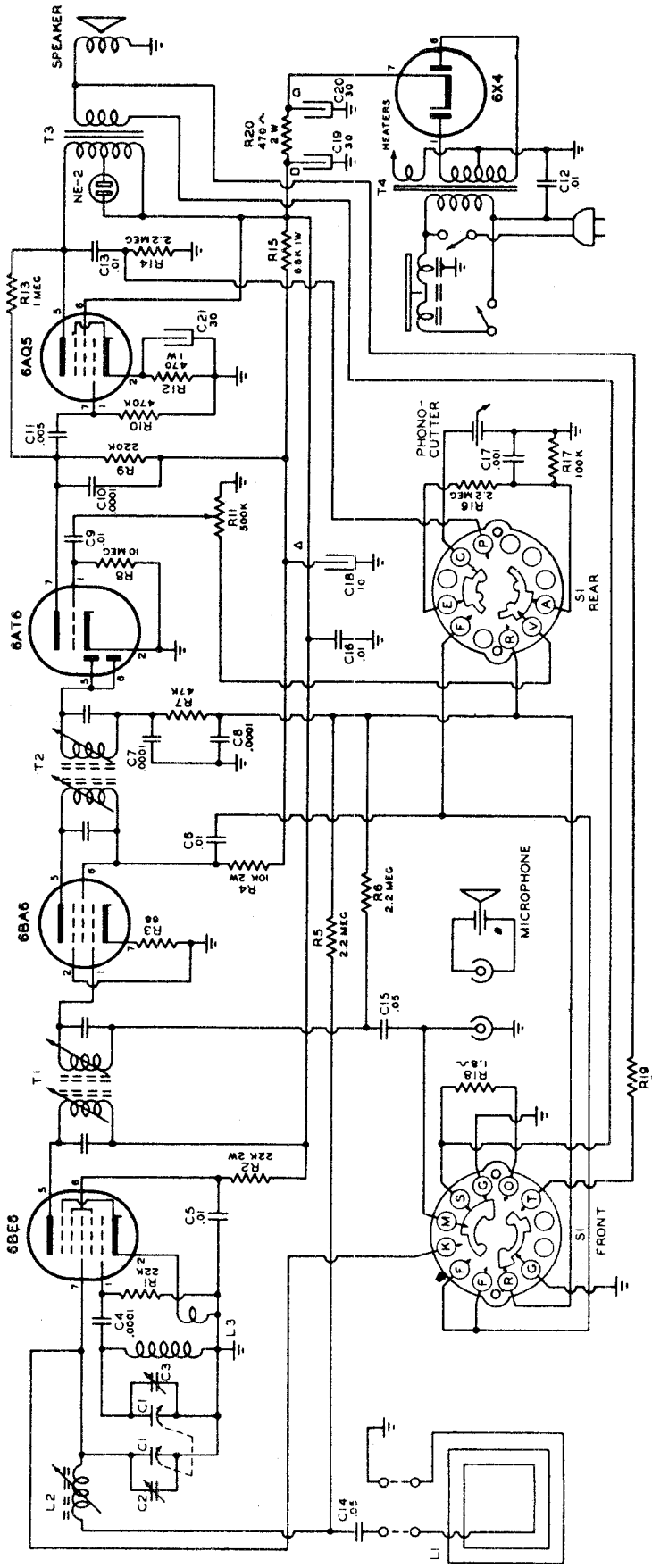
FM-I.F. = 10.7 MC
AM-I.F. = 455 KC

T3 RATIO DETECTOR TRANSFORMER
TWO TYPES OF TRANSFORMERS ARE USED. IDENTIFICATION AS FOLLOWS:
1-CAN HEIGHT OF PART NO. C-1.524 IS 2 1/2".
2-CAN HEIGHT OF PART NO. C-1.542-1 IS 1 15/16".

ITEM		
①	C-1.445-3	AM-I.F. TRANSFORMER
②	C-1.436-2	BC-OSCILLATOR COIL
③	C-1.446-2	FM-I.F. TRANSFORMER
④	C-1.446-3	FM-I.F. TRANSFORMER
⑤*	SEE NOTE	RATIO DETECTOR TRANS.
⑥	B-1.501	FILAMENT CHOKE
⑦	B-1.512	RF CHOKE - RF PLATE
⑧	B-1.535-1	RF CHOKE - OSC. CATHODE
⑨	B-1.535-2	RF CHOKE - RF CATHODE
⑩	B-1.538	FM OSCILLATOR COIL
⑪	B-1.539	FM-RF GRID COIL
⑫	D-1.540	BC LOOP ANTENNA
⑬	B-1.536-1	MODULATOR PLATE CHOKE
⑭	B-1.536-2	PARASITIC SUPPRESSOR
⑮	C-2.222	VARIABLE CONDENSER
⑯	C-8.218-2	DUAL CONCENTRIC VC, TC & SWITCH
⑰	C-9.241-3	OUTPUT TRANSFORMER
⑱	D-9.246	POWER TRANSFORMER
⑲	C-9.255	FILTER CHOKE
⑳	C-11.227-1	BAND-SWITCH
㉑		SPEAKER
㉒	B-4.125-1	DUAL SHIELDED CERAMIC CAPACITOR
㉓	C-5.421-7	DRY ELECTROLYTIC CAPACITOR UNIT
㉔	C-5.430	ELECTROLYTIC CAPACITOR
㉕	B-4.118	CERAMIC TRIMMER .7 TO 3.5 MMF

MODEL 1J-10

Schematic Diagram



TYPICAL VOLTAGE CHART

TUBE	VOLTAGE FROM PIN NO. BELOW TO GND.						
	1	2	3	4	5	6	7
6BE6	-6.7V		GND	6.3V*	250V	95V	
6BA6			GND	6.3V*	78V	78V	7
6AT6	-.3		GND	6.3V*	-.3V	-.3	70V
6AQ5		14.5	GND	6.3V*	235V	250V	
6X4	290V*		GND	6.3V*		290V*	270V

MEASURED WITH 20,000Ω PER VOLT METER
SCALES USED 10-50-250-1000 *A.C. VOLTAGE

FUNCTION	SWITCH CONTACTS CLOSED		
PHONOGRAPH	R-G	M-S-G	E-C	A-V
RADIO	G-F	M-S-G-O		V-R
RECORD RADIO	G-F	M-G-O-T	C-P	V-R
RECORD MICROPHONE	G-R-K	O-T	C-P	V-F

SWITCH IN PHONO POSITION-(COUNTERCLOCKWISE)-VIEWED FROM SHAFT END.

March 1, 1950 82 - 2451

Dial Assembly

46-915	Tuning & Vol. Control Knob (2 used)
46-929	Tuning & Vol. Control Knob (2 used on G Model only)
59-228	Dial Pointer
59-259	Dial Pointer (G Model only)
54-263	Speed Nut
80-209	Dial Cord Tension Spring
93-1085	Felt Washer (2 used on Knobs)
188-132	Retaining Ring (Used on S-17845)
S-17844	Pointer Shaft & Pulley Assembly
S-17845	Tuning Shaft & Pulley Assembly
S-17846	Pulley Mtg. Strip & Bushing Assembly
S-17847	Dial Cord & Eyelet Assembly

Coils & Chokes

95-1132	T1	1st. I. F. Transformer
95-1133	T2	2nd. I. F. Transformer
S-17933	L2	Osc. Coil Assembly

Condensers

22-3	C9,18	.01 Mfd. Ceramic (Disc) (4 used)	500V
22-4	C7	.004 Mfd. Ceramic (Disc)	500V
22-5	C19	110 Mmfd. (or 22-1669)	500V
22-182	C5	220 Mmfd. Mica (Molded)	500V
22-326	C11	.003 Mfd.	400V
22-827	C6	.05 Mfd.	200V
22-829	C17	.05 Mfd.	200V
22-1386	C10	.02 Mfd.	200V
22-1741	C13,14,15,16	Four Section Elect.	
22-2287	C1	Two Section Gang	

Resistors

63-1719	R15	27	ohm	1/2W	10%	Ins.	Res.
63-1761	R3	270	ohm	1/2W	10%	Ins.	Res.
63-1771	R4	470	ohm	1/2W	10%	Ins.	Res.
63-1778	R7	680	ohm	1/2W	10%	Ins.	Res.
63-1841	R6	22K	ohm	1/2W	10%	Ins.	Res.
63-1870	R1	100K	ohm	1/2W	20%	Ins.	Res.
63-1912	R12	1	megohm	1/2W	20%	Ins.	Res.
63-1933	R14	3.3	megohm	1/2W	20%	Ins.	Res.
63-1940	R13	4.7	megohm	1/2W	20%	Ins.	Res.
63-1954	R2	10	megohm	1/2W	20%	Ins.	Res.
63-1961	R11	15	megohm	1/2W	20%	Ins.	Res.
63-1999	R8	140	ohm Zipohm	3W	10%	Ins.	Res.
63-2010	R9,10	Two Section Candohm					
63-2328	R5	Vol. Control & Switch					

Miscellaneous

11-104	Line Cord & Plug
14-1310	Plastic Cabinet for H401 - Portable Model
14-1316	Plastic Cabinet for H401G - Portable Model
15-51	Cable Socket Cap & Insulator (used on S-17887)
16-690	Packing Carton
19-210	Connector Clip (used on S-17843)

Miscellaneous (Cont'd.)

19-223		Cabinet Hinge Clip (2 used on Rear Cover & Latch)
24-568		Cabinet Rear Cover
24-571		Cabinet Rear Cover (G Model only)
43-199		Handle Housing (2 used)
43-205		Handle Housing (G Model only) (2 used)
49-706	SP1	4" P. M. Speaker *ZC409C Cone & Voice Coil
49-710	SP1	4" P. M. Speaker
54-30		8-32 x 5/16 x 7/64" Hex Nut (2 used on Handle Strap)
54-34		#6-32 x 1/4" x 3/32 Hex Nut Steel (used on 212-10)
54-139		3/8-32 x 9/16" Palnut (used on 63-2328)
54-267		#6-32 x 5/16" Palnut (1 ea. used on 95-1132 & 95-1133)
54-282		Spring Nut (8 used on Cabinet Front)
57-1613		Emblem Plate
57-1739		Chassis Bottom Plate
57-1751		Emblem Plate (G Model only)
78-274		Elect. Cond. Socket
78-782		Miniature Tube Socket
78-806		Miniature Tube Socket
78-807		Miniature Tube Socket (2 used)
80-611		Latch Spring
82-29		Handle Strap
82-30		Handle Strap (G Model only)
83-1888		Ant. Mtg. Strip (2 used on S-17843)
85-511	S1	Power Change over Switch (or 85-450)
93-125		#6 Int. Shakeproof Lockwasher (used on 212-10)
93-126		#8 Int. Shakeproof Lockwasher (2 used on Handle Strap)
94-295		Gang Cond. Mtg. Bushing (3 used)
94-680		Handle Mtg. Bushing (2 used)
112-164		#8-32 x 3/4" Binding Hd. M.S. (2 used on Handle Strap)
114-157		6-32 x 1/2" Lg. x 1/4" A.F. Hex Hd. S.T. (2 used on Dial Mtg.)
114-248		6-20 x 5/16" Lg. x 1/4" A.F. Hex Hd. S. T. (2 used on S-17843)
114-297		6-32 x 1/4" Lg. x 1/4" A.F. Hex Hd. S. T. (2 used on Chassis Mtg.)
114-311		6-32 x 1" Lg. x 1/4" A.F. Hex Hd. (used on 212-10)
125-81		Strain Relief Grommet - Male
125-82		Strain Relief Grommet - Female
138-47		Cabinet Grille
138-48		Cabinet Grille (G Model only)
149-109		Iron Core (used with S-17843)
166-44		Rubber Bumper
196-175		Speaker Gasket
199-153		Antenna Balancing Sleeve
202-879		Instruction Book
212-10	SE1	Selenium Rectifier
S-17843	L1	Iron Core Loop Antenna Assembly
S-17858		Latch Plate & Brkt. Assembly
S-17887	W1	Battery Cable & Socket Assembly
S-17960		Latch Plate & Brkt. Assembly (G Model only)
S-17971		Twisted Wire & Eyelet Assembly

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	BAND	SET DIAL TO	TRIMMERS	PURPOSE
1	Converter Grid	.1 Mfd	455 Kc.	BC	600 Kc.	L3, 4, 5 & 6	I.F. Alignment
2	Two turns loosely coupled to Wavemagnet		1600 Kc.	BC	1600 Kc.	Osc. Trim. C3	Set Oscillator to scale
3	Two turns loosely coupled to Wavemagnet		1400 Kc.	BC	1400 Kc.	Ant. Trim. C2	Align Wavemagnet

The 4H40 chassis is an AC, DC or battery operated superheterodyne. The chassis is isolated from the DC circuit, and all measurements must be made from a common negative point. The most convenient place to reach this negative point is the negative side or container of the electrolytic. When the change-over Switch S1 is in AC position, the DC resistance from chassis to any circuit must be almost infinite. If any circuit becomes grounded a hum will result. Microphonic tubes will cause audio howl. Check the 1R5 and 1S5.

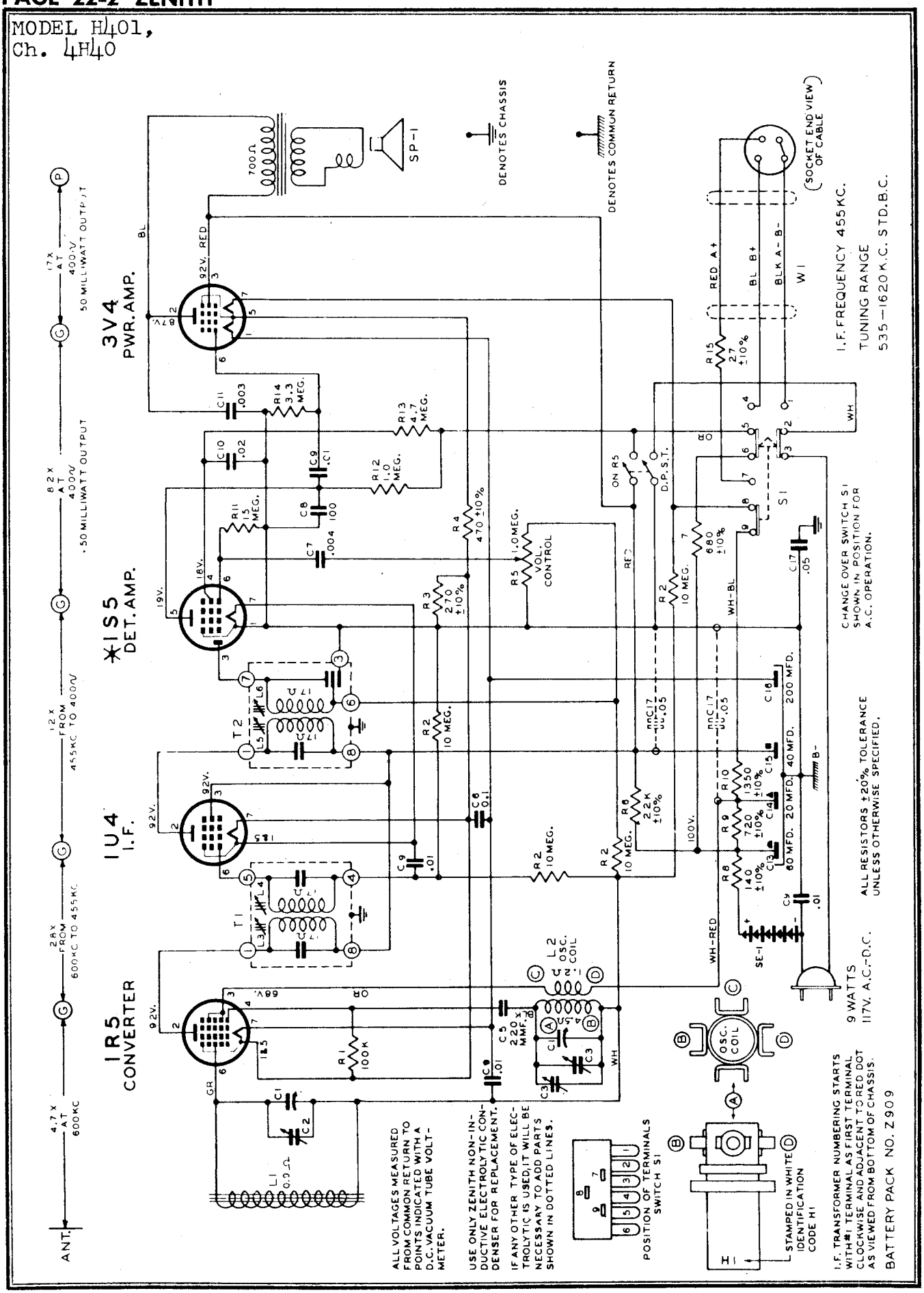
If the R.F. becomes weak or dead, check the DC resistance of the wavemagnet. This DC resistance should be approximately .9 ohm. If it is open check the wavemagnet.

IF Alignment: Remove the chassis from the cabinet and arrange the units so that the wavemagnet can be connected. All the connections and adjustments can be made from the top of the chassis. Connect a signal generator, through a .1 mfd. dummy antenna, to the converter grid and B-(common return). Connect an output meter across the voice coil of the speaker (two lugs provided). Set the signal generator to 455 Kc. and adjust L3, L4, L5 and L6 for the maximum indication on the output meter. Always keep the signal output from the generator just high enough to get an indication, otherwise excessive loading may result.

RF Alignment: Connect a two turn loop across the leads of the signal generator, loosely couple this loop to the wavemagnet. Set the signal generator and the dial pointer of the receiver to 1600 Kc. and adjust C3 oscillator trimmer to resonance. Set the signal generator and dial pointer to 1400 and adjust C2 antenna trimmer to resonance. These trimmers are on the top of gang condenser. Check operation and reinstall set in cabinet. Tune in a weak station near 1400 Kc. or use background noise and readjust antenna trimmer for maximum sensitivity.

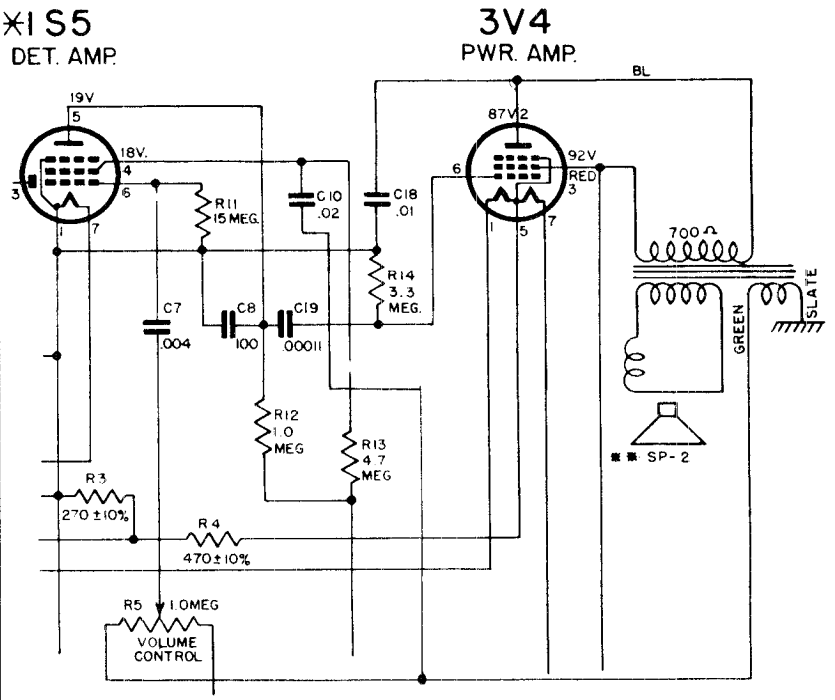
The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I.F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I.F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

MODEL H401,
Ch. 4H40



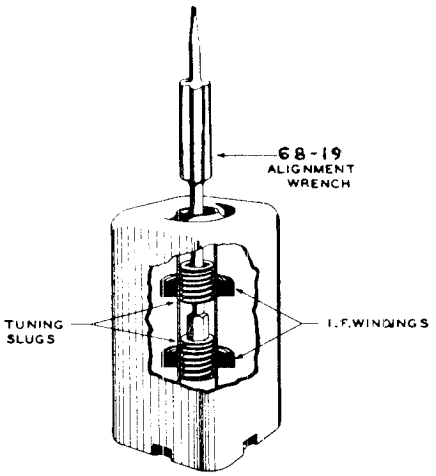
MODEL H401,
Ch. 4H40

ALTERNATE AUDIO CIRCUIT
USED ON LATER RELEASES.

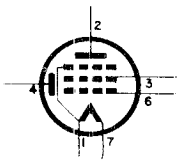


** WHEN SP-2 IS USED, C-18 AND C-19 MUST ALSO BE USED.

DETAILED VIEW OF I. F. TRANSFORMERS.

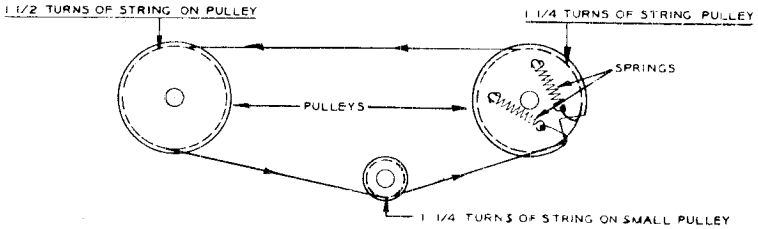


* 1U5

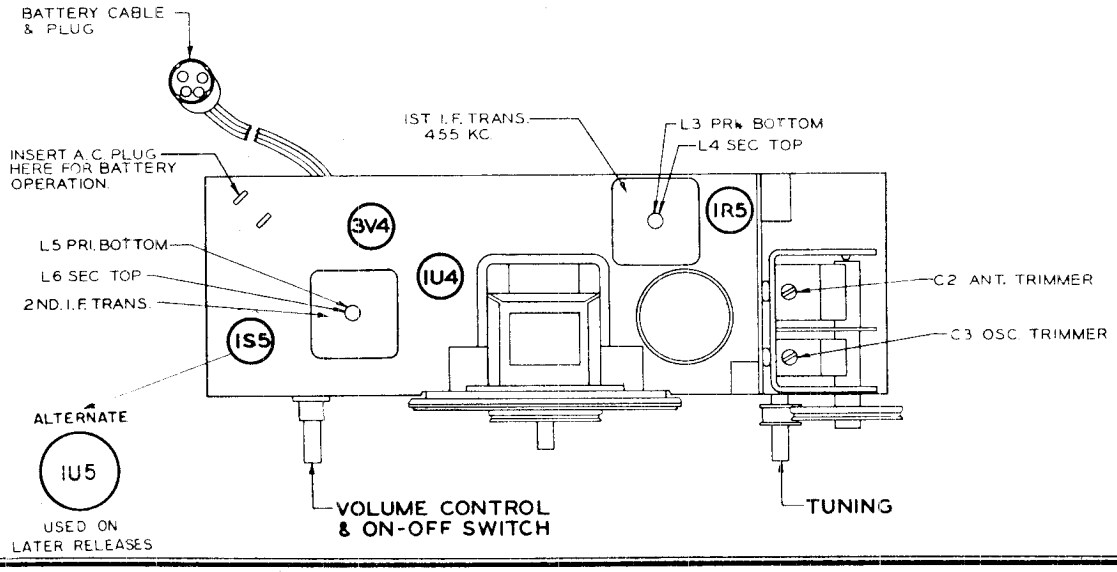


USED ON
LATER RELEASES

DIAL CABLE DRAWING



TUBE AND TRIMMER LOCATION



MODEL H500,
Ch. 5H40

ALIGNMENT PROCEDURE

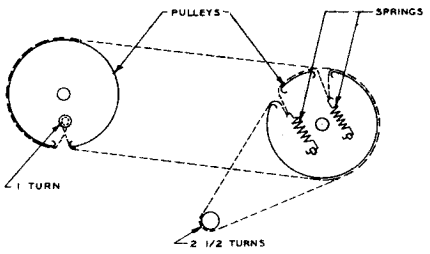
OPER.	CONNECT OSCILLATOR TO DUMMY ANTENNA	INPUT SIGNAL FREQ.	BAND	SET DIAL AT	TRIMMERS	PURPOSE
1	Positive lead of signal generator to converter grid through a .1 Mfd. condenser & negative lead to negative filament of 1L6 tube.	455 Kc	BC	600 Kc	L5, 6, 7, 8	Align I. F.
2	One turn loop coupled loosely to broadcast wavemagnet	1600 Kc	BC	1600 Kc	C4	Set oscillator to scale
3		1400 Kc	BC	1400 Kc	C3	Alignment of detector
4		1400 Kc	BC	1400 Kc	C2	Alignment of BC antenna
5*		600 Kc	BC	Rock at 600 Kc	C32	Alignment of BC at 600 Kc

*Note: Rock Tuning Condenser When Making Alignment Under Operations 5, 7, 10, 12, 13, 14 & 15.

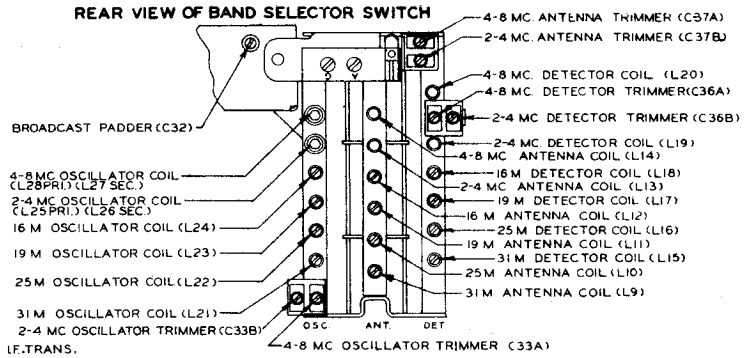
NOTE: If Trimmers C2, C3, C4 are adjusted after procedures #2 through #15 are completed, it will be necessary to repeat alignment procedures #2 through #15.

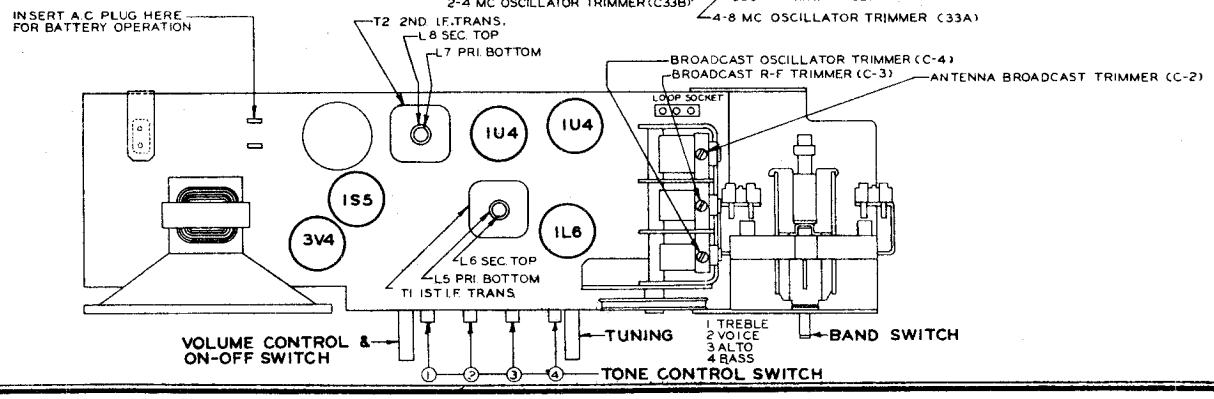
OPERATION	CONNECT OSCILLATOR TO DUMMY ANTENNA	INPUT SIGNAL FREQ.	BAND	SET DIAL AT	TRIMMERS	PURPOSE
6	3 feet of wire approximately 1 foot from extended wave rod.	7.8 Mc	4-8 Mc	7.8 Mc	C33A, C36A, C37A	Alignment of S. W. Oscillator Detector and Antenna
7*		4.2 Mc	4-8 Mc	Rock at 4.2 Mc	4-8 Mc Osc. slug	
8		Repeat Operations 6 & 7				
9		3.9 Mc	2-4 Mc	3.9 Mc	C33B, C36B, C37B	
10 *		2.1 Mc	2-4 Mc	Rock at 2.1 Mc	2-4 Mc Osc. slug	
11		Repeat Operation 9 & 10				
12 *		17.8 Mc	16 Meters	17.8 Mc	L24, L18, L12	
13 *		15.2 Mc	19 Meters	15.2 Mc	L23, L17, L11	
14 *		11.8 Mc	25 Meters	11.8 Mc	L22, L16, L10	
15 *		9.6 Mc	31 Meters	9.6 Mc	L21, L15 L9	

TUBE, TRIMMER LOCATION AND DIAL CABLE DRAWING



DIAL CORD DRIVE





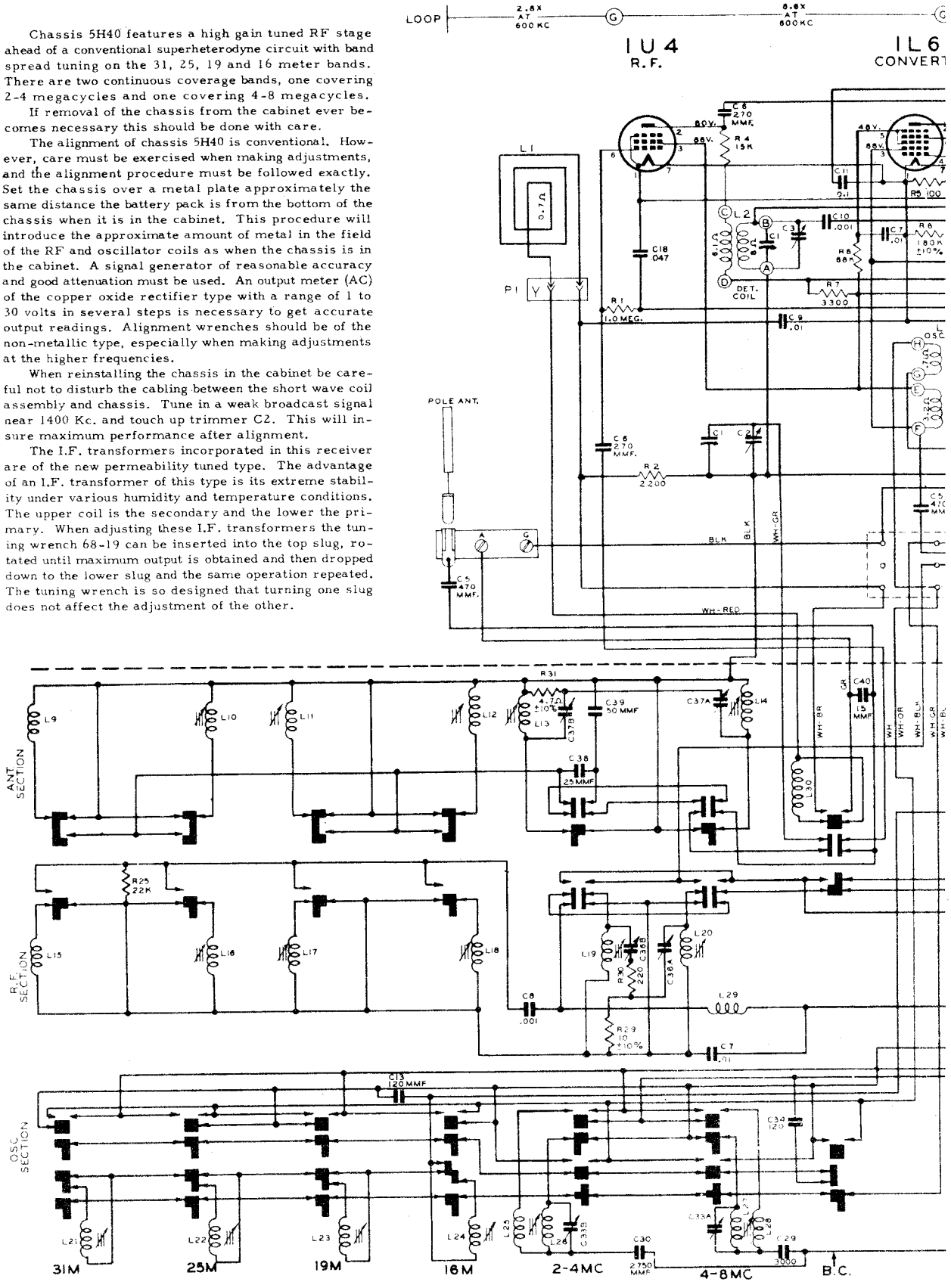
Chassis 5H40 features a high gain tuned RF stage ahead of a conventional superheterodyne circuit with band spread tuning on the 31, 25, 19 and 16 meter bands. There are two continuous coverage bands, one covering 2-4 megacycles and one covering 4-8 megacycles.

If removal of the chassis from the cabinet ever becomes necessary this should be done with care.

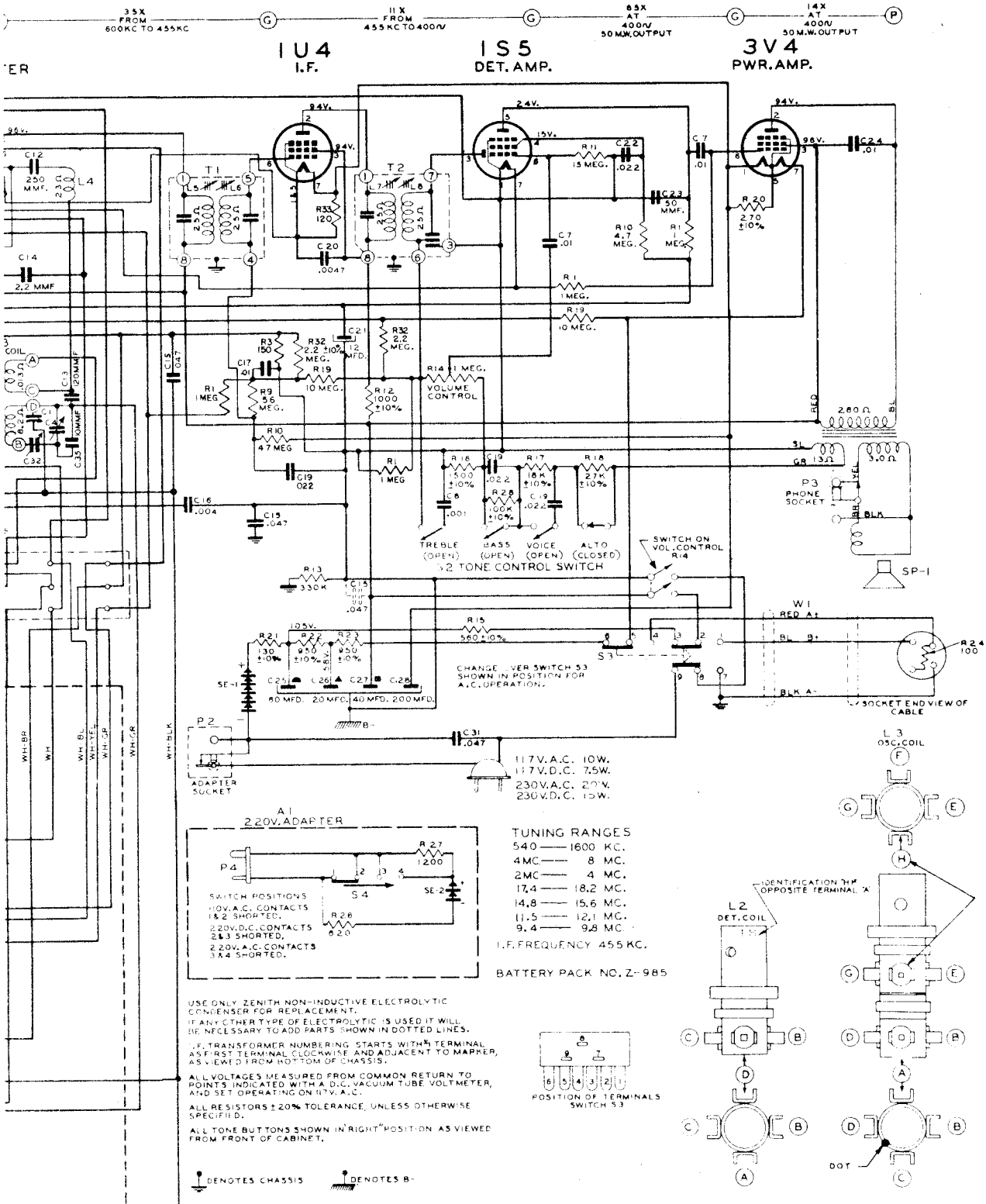
The alignment of chassis 5H40 is conventional. However, care must be exercised when making adjustments, and the alignment procedure must be followed exactly. Set the chassis over a metal plate approximately the same distance the battery pack is from the bottom of the chassis when it is in the cabinet. This procedure will introduce the approximate amount of metal in the field of the RF and oscillator coils as when the chassis is in the cabinet. A signal generator of reasonable accuracy and good attenuation must be used. An output meter (AC) of the copper oxide rectifier type with a range of 1 to 30 volts in several steps is necessary to get accurate output readings. Alignment wrenches should be of the non-metallic type, especially when making adjustments at the higher frequencies.

When reinstalling the chassis in the cabinet be careful not to disturb the cabling between the short wave coil assembly and chassis. Tune in a weak broadcast signal near 1400 Kc. and touch up trimmer C2. This will insure maximum performance after alignment.

The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I.F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I.F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.



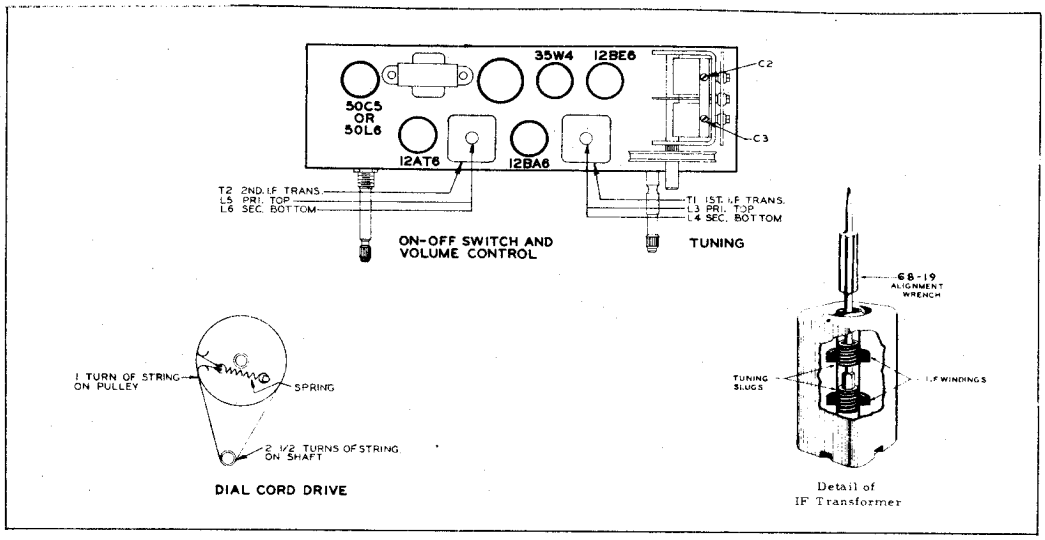
MODEL H500,
Ch. 5H40



MODEL H500, Ch. 5H40

PART NO.	DIAG. NO.	DESCRIPTION
		DIAL ASSEMBLY
12-1826		Pointer Shaft Bracket
26-457		Dial Scale
59-257		Dial Pointer
76-621		Tuning Control Shaft
80-69		Dial Cord Tension Spring (2 used)
83-1885		Dial Scale Support Strip
93-209		.031 x .140 x 7/16 Steel washer-Cad (2 used on 26-457)
114-157		6-32 x 1/2" lg. x 1/4" Hex Hd. S.T. (2 used on 26-457)
114-248		6-20 x 5/16 lg. x 1/4" Hex Hd. S. T. (used on 26-457)
188-128		Retaining Ring (1 ea. used on 76-621 & S-17798)
S-15781		Pointer Pulley Cord & Eyelet Assem. Short
S-15782		Pointer Pulley Cord & Eyelet Assem. Long
S-17798		Pointer Pulley & Shaft Assembly
		COILS & CHOKES
95-1148	T1	1st. I. F. Transformer
95-1149	T2	2nd. I. F. Transformer
S-11952	L29	R. F. Shunt Coil Assembly
S-14403	L4	R. F. Choke Coil Assembly
S-17709	L3	Oscillator Coil Assembly (B.C.)
S-17710	L2	Detector Coil Assembly (B. C.)
		CONDENSERS
22-3	C7	.01 Mfd. Ceramic (3 used) 500V
22-4	C16	.004 Mfd. Ceramic 500V
22-1390	C5	470 Mmfd. Mica 500V
22-1674	C23	50 Mmfd. Ceramic 500V
22-1741	C25,26, 27 & 28	Elect. Cond. 60 Mfd.-150V x 40 Mfd. 150V. 20 Mfd.-150V x 200 Mfd. 10V
22-1763	C14	2.2 Mmfd. Molded 500V
22-1775	C15	.047 Mfd. (2 used) 400V
22-1777	C11	.1 Mfd. 200V
22-1778		.047 Mfd. (Molded) 200V
22-1779	C24	.01 Mfd. 600V
22-1783	C20	.0047 Mfd. 400V
22-1784	C9	.01 Mfd. 400V
22-1844	C31	.047 Mfd. 600V
22-1846	C17	.01 Mfd. 400V
22-1886	C10	.001 Mfd. Ceramic 500V
22-1953	C35	10 Mmfd. Ceramic 500V
22-2056	C21	Elect. Cond. 12 Mfd. 150V
22-2058	C6	270 Mmfd. Mica (2 used) 500V
22-2071	C19	.022 Mfd. (3 used) 200V
22-2072	C22	.022 Mfd. 400V
22-2126	C12	250 Mmfd. Ceramic 500V
22-2127	C8	.001 Mfd. Ceramic 600V
22-2279	C13	120 Mmfd. Ceramic 500V
22-2282	C32	Single Section Trimmer
22-2286	C1	Three Section Variable
		RESISTORS
63-1362	R22-R23	Two Section Candohm
63-1743		100 Ohm 1/2W 10% Ins. Res.
63-1744	R24	100 Ohm 1/2W 20% Ins. Res.
63-1747		120 Ohm 1/2W 10% Ins. Res.
63-1750		150 Ohm 1/2W 10% Ins. Res.
63-1761	R20	270 Ohm 1/2W 10% Ins. Res.
63-1785	R12	1000 Ohm 1/2W 10% Ins. Res.
63-1792	R16	1500 Ohm 1/2W 10% Ins. Res.
63-1800	R2	2200 Ohm 1/2W 20% Ins. Res.
63-1807	R7	3300 Ohm 1/2W 20% Ins. Res.
63-1835	R4	15K Ohm 1/2W 20% Ins. Res.
63-1838	R17	18K Ohm 1/2W 10% Ins. Res.
63-1842	R25	22K Ohm 1/2W 20% Ins. Res.
63-1845	R18	27K Ohm 1/2W 10% Ins. Res.
63-1863	R6	68K Ohm 1/2W 20% Ins. Res.
63-1869	R28	100K Ohm 1/2W 10% Ins. Res.
63-1880	R8	180K Ohm 1/2W 10% Ins. Res.
63-1891	R13	330K Ohm 1/2W 20% Ins. Res.
63-1912	R1	1 Megohm 1/2W(5 used)20% Ins. Res.
63-1926		2.2 Megohm 1/2W 20% Ins. Res.
63-1940	R10	4.7 " 1/2W(2 used)20% Ins. Res.
63-1943	R9	5.6 " 1/2W 10% Ins. Res.
63-1954	R19	10 " 1/2W(2 used)20% Ins. Res.
63-1961	R11	15 " 1/2W 20% Ins. Res.
63-2018	R21	130 Ohm 3W Zipohm 10%
63-2276	R14	Volume Control & Switch
		MISCELLANEOUS
11-104		Line Cord & Plug
15-57		Cap & Insulator (used on S-15785)
44-17	P3	Headphone Jack
49-668	SP-1	5 1/4" PM Speaker ZC5091 Cone
78-274		Elect. Cond. Socket
78-543		Four Contact Socket
78-802	P1	Wavemagnet Socket
78-806		Miniature Tube Socket
78-817		Miniature Tube Socket
78-844	P2	Adapter Socket (220V)
78-845		Miniature Tube Socket (3 used)
85-450	S3	Power Changeover Switch
85-503	S2	Band Switch
94-295		Gang Cond. & Spkr. Mtg. Bushing (6 used)
114-308		6-32 x 1 1/8" lg. x 1/4" Fl. M.S. Steel (used on 212-10)
125-81		Strain Relief Grommet - Male
125-82		Strain Relief Grommet - Female
139-96		Speaker Baffle
149-86		Iron Core (16 used)
196-174		Speaker Gasket
212-5	SE-2	Selenium Rectifier
S-15785	W1	Battery Cable & Socket Assembly
S-15715	A1	Voltage Adapter Assembly
		CABINET PARTS
12-1082		Telescoping Ant. Mtg. Brkt.
14-1303		Cabinet for H500 Portable Model
16-676		Packing Carton - Complete
17-67		Telescoping Ant. Ret. Clamp
19-134		Wavemagnet Cable Ret. Clip
19-188		Cable Retaining Clip
36-46		Cabinet Handle
40-73		Cabinet Back Cover Hinge (2 used)
46-912		Band Switch Knob (7 used)
46-913		Tuning & Vol. Control Knobs (2 used)
54-295		Wavemagnet Ret. Nut (#6-32) (used on S-17747)
54-296		Wavemagnet Ret. Nut (#10-32) (used on S-17747)
57-1724		Front Panel Escutcheon
57-1725		Emblem Plate
58-179		Three Prong Plug (1 ea. used on S-15799 & S-15805)
70-122		#6 x 5/16 R.P.W.S. Steel (2 used on 19-188)
70-168		#4 x 1/2" Phill. R.H. Wood Screw Brass-Blk. Ox. (3 used on 57-1724)
70-169		#4 x 3/4" Phill. R.H. Wood Screw Brass-Blk. Ox. (4 used on 57-1724)
83-1876		Push Button Felt Strip
97-367		Handle Mtg. Stud (2 used)
114-197		Hexagon Washer Hd. S. T. Screw (2 used on Chassis Mtg.)
156-42		Door Latch (upper half)
156-43		Door Latch (Lower half)
157-7		Strike Fastener (2 used)
157-8		Strike Fastener (2 used)
159-48		Snap Button (2 used on S-15805 & 2 used on S-17782)
159-49		Snap Button (4 used on S17747 & 2 used on 19-134 & S-17782)
199-119		Antenna, Insulating Sleeve
202-869		Instruction Book & Station Log
202-870		Service Notes
202-872		Weather Bureau Bulletin
202-880		Short Wave Station List
S-15635		Wavemagnet Suction Cup Assem. (2 used)
S-15722		Antenna Knob & Latch Spring Assembly
S-15799		Wavemagnet Cable Assembly
S-15802		Telescoping Antenna Assembly
S-15805		Wavemagnet Ext. Cable Assembly
S-15806		Eyelet & Wire Assembly
S-17743		Front Cover Hinge & Terminal Assem.(R.H.)
S-17744		Front Cover Hinge & Terminal Assem.(L.H.)
S-17747	L1	Wavemagnet Assembly
S-17782		Tube Holder Assembly
		FREQUENCY BAND SWITCH ASSEMBLY
12-1825		Band Switch Mtg. Brkt.
22-3	C7	.01 Mfd. Ceramic 500V
22-1390	C5	470 Mmfd. Mica 500V
22-1392	C3	25 Mmfd. Ceramic 500V
22-1433	C30	2750 Mmfd. Mica 500V
22-1761	C39	50 Mmfd. Ceramic 500V
22-1953	C35	10 Mmfd. Ceramic 500V
22-2127	C8	.001 Mfd. 600V
22-2279	C13	120 Mmfd. Ceramic 500V
22-2280	C34	120 Mmfd. Ceramic 500V
22-2281	C29	3000 Mmfd. Mica 500V
22-2283	C33A,33B	Two Section Trimmer
22-2284	C36A,36B	Two Section Trimmer
22-2285	C37A,37B	Two Section Trimmer
63-1581	R31	4.7 Ohm W.W. 1/2W 10% Ins. Res.
63-1701	R29	10 Ohm. 1/2W 10% Ins. Res.
63-1758	R30	220 Ohm 1/2W 10% Ins. Res.
85-502	S1	Band Switch
149-96		Iron Core (1 used on S-17730 & S-17731
S-16047	L30	Antenna Loading Coil Assembly
S-17688		Band Switch, Brkt. & Coil Assembly
S-17714	L18	R.F. Coil Assembly (16M)
S-17715	L17	R.F. Coil Assembly (19M)
S-17716	L16	R.F. Coil Assembly (25M)
S-17717	L15	R.F. Coil Assembly (31M)
S-17718	L12	Ant. Coil Assembly (16M)
S-17719	L11	Ant. Coil Assembly (19M)
S-17720	L10	Ant. Coil Assembly (25M)
S-17721	L9	Ant. Coil Assembly (31M)
S-17722	L19	R.F. Coil Assembly (2-4 MC)
S-17723	L20	R.F. Coil Assembly (4-8 MC)
S-17724	L13	Ant. Coil Assembly (2-4 MC)
S-17725	L14	Ant. Coil Assembly (4-8 MC)
S-17726	L24	Osc. Coil Assembly (16M)
S-17727	L23	Osc. Coil Assembly (19M)
S-17728	L22	Osc. Coil Assembly (25M)
S-17729	L21	Osc. Coil Assembly (31M)
S-17730	L27,28	Osc. Coil Assembly (4-8 MC)
S-17731	L25,26	Osc. Coil Assembly (2-4 MC)
		VOLTAGE ADAPTER
57-1564		Voltage Indicator Plate
58-182		Two Prong Plug
63-2155		Dual Resistor 620 Ohm 15W & 1200 Ohm - 7W
85-473		Three Position Switch
112-784		Thumb Screw
212-9		Selenium Rectifier
S-15715		Voltage Adapter Assem. (Complete)

MODELS H511, H511Y, H511W, Ch. 5H01



TUBE, TRIMMER LOCATION, DIAL CABLE DRAWING AND DETAILED VIEW OF I.F. TRANSFORMERS.

The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I.F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I.F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

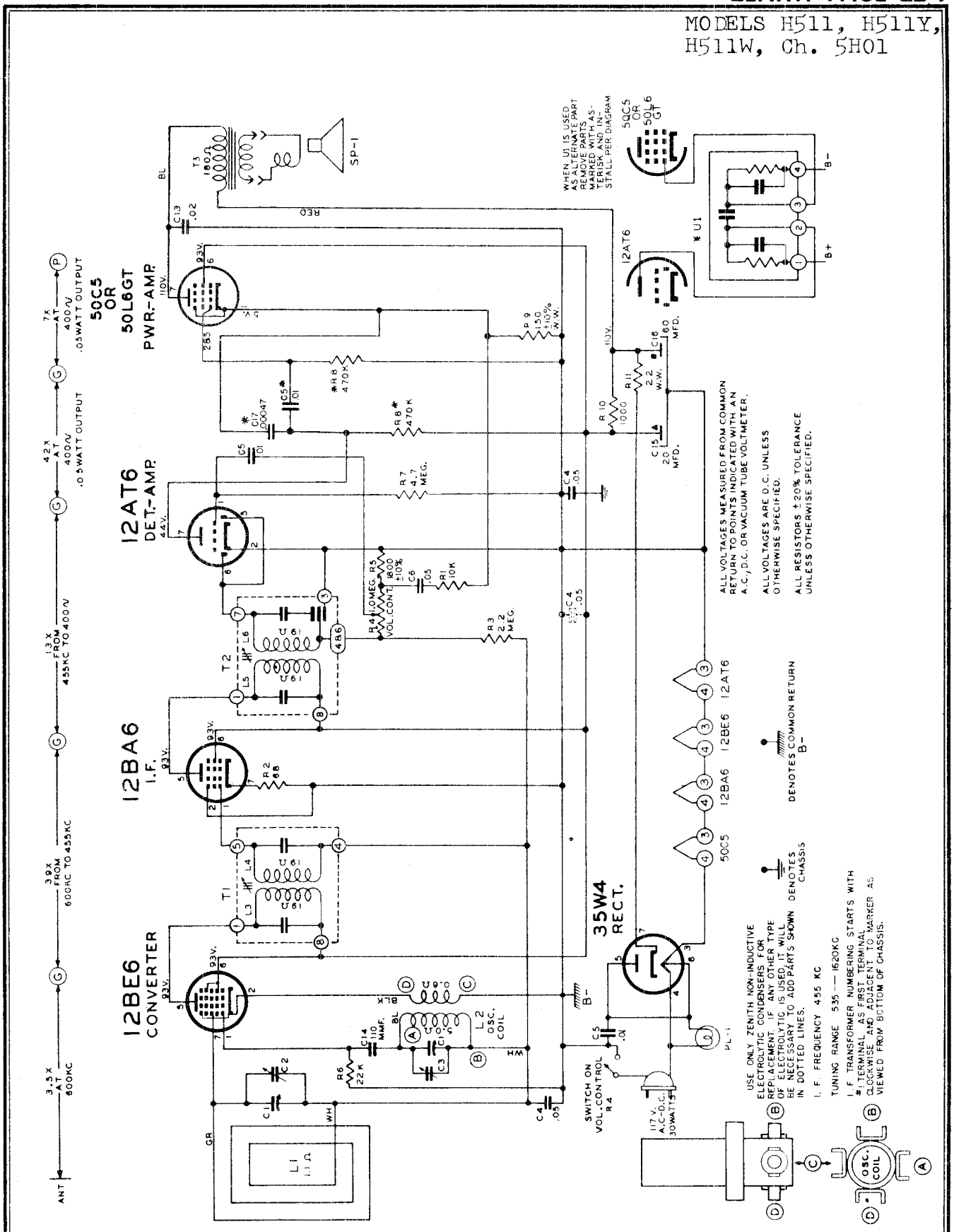
ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 Mfd.	455 Kc.	600 Kc.	L3,L4,L5, L6	Align I.F. for maximum output
2	One Turn Loop Coupled Loosely to Wave Magnet	---	1600 Kc.	1600 Kc.	C3	Set Oscillator to Dial Scale.
3		---	1400 Kc.	1400 Kc.	C2	Align Antenna Stage

PARTS LIST

PART NO.	DESCRIPTION
	DIAL ASSEMBLY
57-1719	Escutcheon Plate
59-256	Dial Pointer
76-620	Tuning Shaft
78-913	Pilot Light Socket & Wire Assembly
80-209	Dial Cord Tension Spring
83-1875	Indicator Strip
100-67	Pilot Light Bulb
188-32	Retaining Ring (used on 76-620)
S-17691	Dial Cord & Eyelet Assembly
	COILS & CHOKES
95-1101	1st. I.F. Transformer
95-1102	2nd. I.F. Transformer
S-14842	Osc. Coil Assembly
	CONDENSERS
22-3	.01 Mfd. Ceramic (2 used) 500V
22-5	110 Mmfd. Ceramic (or 22-162 or 22-1669) 500V
22-829	.05 Mfd. (2 used) 200V
22-1158	.05 Mfd. 200V
22-1379	.02 Mfd. 400V
22-1804	Elect. Cond. 60-20 Mfd. 150V
22-2277	Two Section Gang Cond.
105-28	Couplate Unit (or 1 ea. 22-3 & 22-6 & 2 ea. 63-1898)
	RESISTORS
63-686	150 Ohm W.W. 1/2W 10% Ins. Res.
63-1219	22 Ohm W.W. 1/2W 20% Ins. Res.
63-1574	1000Ohm 1W 20% Ins. Res.
63-1737	68 Ohm 1/2W 20% Ins. Res.
63-1796	1900Ohm 1/2W 10% Ins. Res.
63-1828	10K Ohm 1/2W 20% Ins. Res. (2 used)
63-1926	2.2 Megohm 1/2W 20% Ins. Res.
63-1940	4.7 Megohm 1/2W 20% Ins. Res.
63-2271	Volume Control & Switch
	MISCELLANEOUS
11-85	Line Cord & Plug
14-1295	Plastic Cabinet for H511 Table Model
14-1305	Plastic Cabinet for H511Y Table Model
14-1311	Plastic Cabinet for H511W Table Model
16-675	Packing Carton
46-745	Tuning & Vol. Control Knob (2 used)
46-745Y	Tuning & Vol. Control Knob (2 used) (W & Y Models only)
49-698	4" P.M. Speaker *ZC409H Cone & Voice Coil
54-139	#3/8-32 x 9/16" Walnut Cad. (used on 63-2271)
54-267	#6-32 x 5/16" Walnut Cad. (1 ea. used on 95-1101 & 95-1102)
57-1720	Trim Plate (2 used)
57-1721	Emblem Plate
78-275	Elect. Cond. Socket
78-755	Octal Tube Socket (used only when 50L6GT is used)
78-806	Miniature Tube Socket
78-807	Miniature Tube Socket (3 used)
78-918	Miniature Tube Socket - Special (used only when 50C5 is used)
83-1877	Handle Strip
83-1881	Handle Strip (Y & W Models only)
94-334	Gang Cond. Mtg. Bushing (3 used)
95-1269	Output Transformer
114-192	6-20 x 7/16 lg. x 1/4 Hex Hd. (2 used Chassis Mtg.)
114-253	6-20 x 3/8 lg. x 1/4 Hex Hd. (4 used on Spkr. & Handle Strip Mtg.)
125-17	Rubber Grommet (3 used on Gang)
125-81	Strain Relief Grommet - Male
125-82	Strain Relief Grommet - Female
159-69	Trimount Stud (4 used on Wavemagnet Mtg.)
202-868	Instruction book
S-17697	Wavemagnet Assembly
S-17792	Wavemagnet Assembly (Y Model only)
S-17868	Wavemagnet Assembly (W Model only)

MODELS H511, H511Y,
H511W, Ch. 5H01

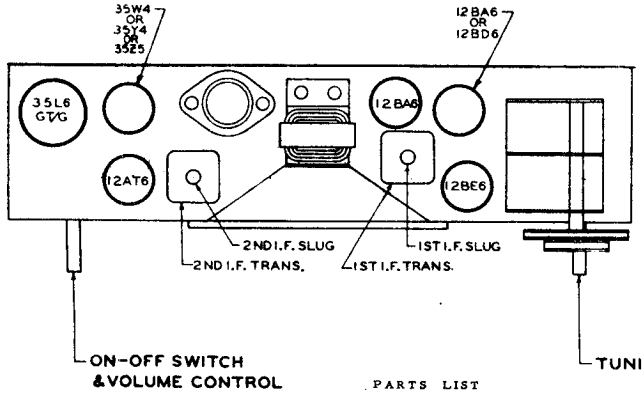


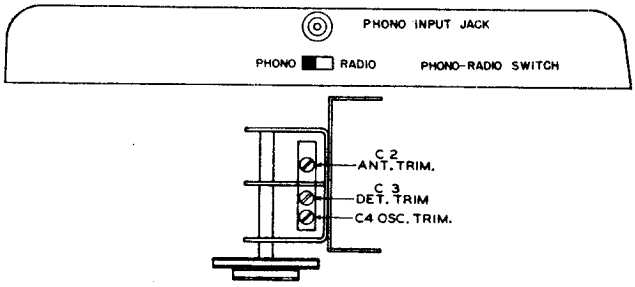
MODEL H615Z,
Ch. 6G05

The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I. F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I. F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Convertor Grid	.5 Mfd	455 Kc.	600 Kc.	Adjust Primary & Secondary Slugs	For I.F. Alignment
2	Single Turn Loosely Coupled to Wave Magnet	--	1600 Kc.	1600 Kc.	C-4	Set Oscillator to Dial Scale.
3		--	1400 Kc.	1400 Kc.	C-3	Detector Alignment
4		--	1400 Kc.	1400 Kc.	C-2	Antenna Alignment

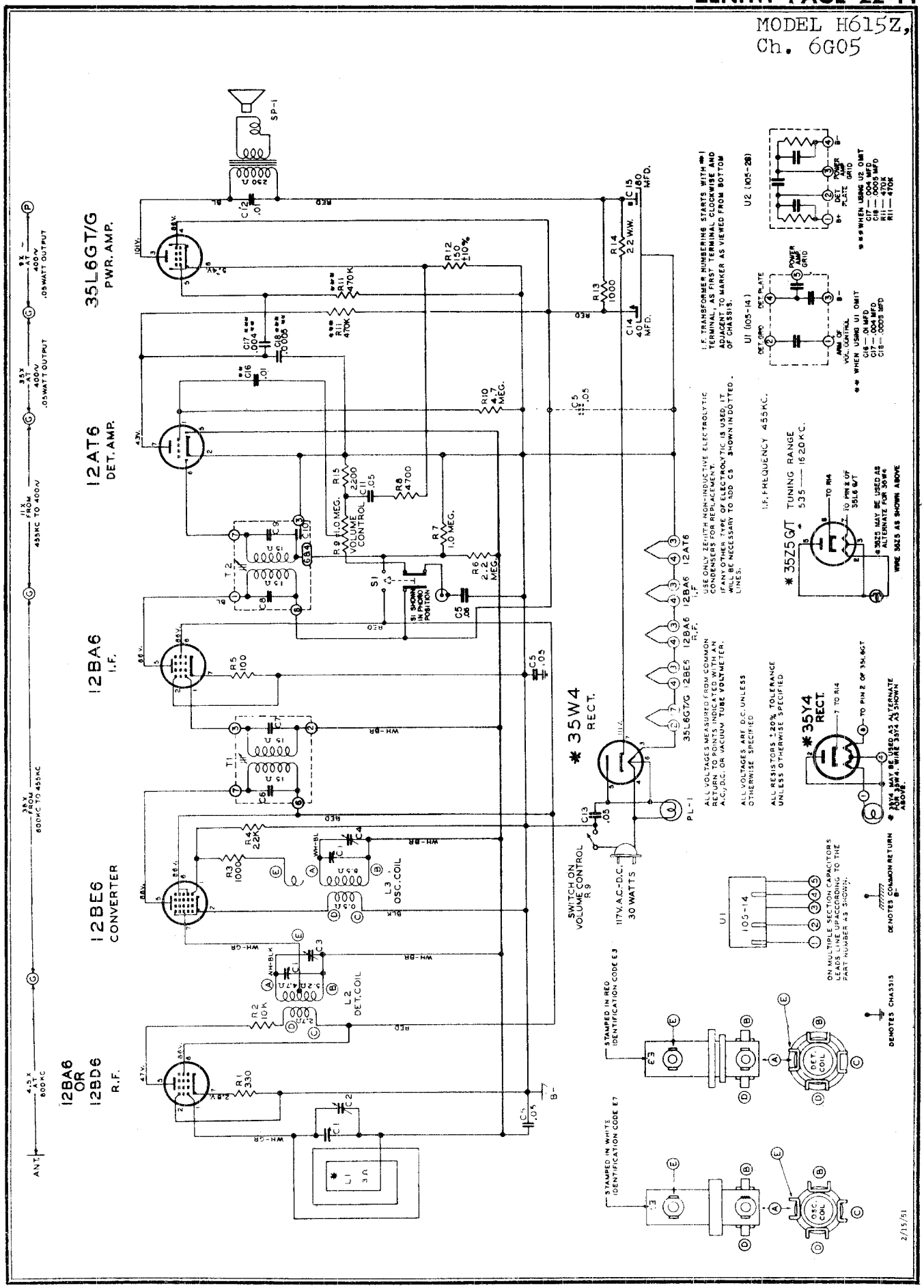




PARTS LIST

PART NO.	DIAG. NO.	DESCRIPTION
		DIAL ASSEMBLY
26-452		Dial Scale
59-252		Dial Pointer
59-253		Dial Pointer (Used on W & Y models only)
76-519		Tuning Shaft
78-882		Dial Light Socket & Wire
80-69		Dial Cord Tension Spring
80-209		Dial Cord Tension Spring
100-67	PL1	Dial Light Bulb
171-12		Pilot Light Lens
188-32		Retaining Ring (Used on 76-519)
188-54		Clamping Ring (Used on Dial Pointer)
188-60		Retaining Ring (Used on S-14867)
S-14834		Dial Cord & Eyelet Assem. (Short)
S-14867		Pointer Pulley & Bushing Assem.
S-14868		Brkt. & Stud Assem.
S-16593		Dial Cord & Eyelet Assm. (Long)
		Coils & Chokes
95-1101	T1	1st. I.F. Transformer
95-1102	T2	2nd I.F. Transformer
S-14832	L2	Detector Coil Assem.
S-14833	L3	Oscillator Coil Assem.
		Condensers
22-3	C16	.01 Mfd. 500V
22-178	C11	.05 Mfd. 200V
22-448	C17	.004 Mfd. 600V
22-829	C5	.05 Mfd. 200V
22-854	C18	.0005 Mfd. 600V
22-1017	C13	.05 Mfd. 400V
22-1182	C12	.01 Mfd. 400V
22-1808	C14,C15	Elec. Cond. 80-40 Mfd. 150V
22-2158	C1	Three Section Gang Cond.
105-14	U1	Multiple Capacitor Unit (or 105-28)
		Resistors
63-1219	R14	22 Ohm W.W. 1/2W 20% Ins. Res.
63-1574	R13	1000 Ohm 1 W 20% " "
63-1664	R9	Volume Control & Switch
63-1744	R5	100 Ohm 1/2W 20% Ins. Res.
63-1765	R1	330 Ohm 1/2W 20% " "
63-1786	R3	1000 Ohm 1/2W 20% " "
63-1800	R15	2200 Ohm 1/2W 20% " "
63-1814	R8	4700 Ohm 1/2W 20% " "
63-1828	R2	10K Ohm 1/2W 20% " "
63-1842	R4	22K Ohm 1/2W 20% " "
63-1898	R11	470K Ohm 1/2W 20% " " (2 used)
63-1912	R7	1 Megohm 1/2W 20% " "
63-1926	R6	2.2 Megohm 1/2W 20% " "
63-1940	R10	4.7 Megohm 1/2W 20% " "
63-1977	R12	150 Ohm 1 W 10% " "
		Miscellaneous
11-85		Line Cord & Plug
14-1320		Plastic Cabinet for H615Z
14-1321		Plastic Cabinet for H615WZ
14-1322		Plastic Cabinet for H615YZ
16-660		Packing Carton
44-25		Phono Jack
46-745		Tuning & Vol. Control Knob (2 used)
46-745Y		Tuning & Vol. Control Knob (2 used) (W & Y Model only)
49-643	SP1	5-1/4" PM Speaker TS-2035 Output Transformer ZC-5091 Cone & Voice Coil
54-129		Speed Nut (10 used on mtg. dial scale & gasket)
54-139		#3/8-32 x 9/16" Palnut Type N Cad. (used on 63-1664)
54-267		#6-32 x 5/16" Palnut (1 ea. used on 95-1101 & 95-1102)
57-1688		Cabinet Front Plate
78-275		Elect. Cond. Socket
78-596		Loktal Tube Socket (used only when 35Y4 is used)
78-611		Octal Tube Socket
78-801		Octal Tube Socket (used only when 35Z5GT is used)
78-807		Miniature Tube Socket (4 used)
78-810		Miniature Tube Socket (used only when 35W4 is used)
83-1833		Rubber Strip (used with Dial Scale)
85-495	S1	Phono-Radio Switch
94-334		Gang Cond. Mtg. Bushing (3 used)
110-155		Grill Cloth
110-156		Grill Cloth (used on W&Y Model only)
114-192		#6 x 7/16" Hex. Hd. S.T.(2 used on Chassis Mtg.)
139-92		Baffle Board
139-95		Speaker Baffle (Rubber)
159-69		Trimount Stud-St.Br.(4 used on Wavemagnet)
166-41		Rubber Bumper(or 166-44) (used on Gang Cond)
188-136		Trim Ring
196-154		Grill Cloth Support Gasket
202-886		Instruction Book
S-18134		Wavemagnet Assem.

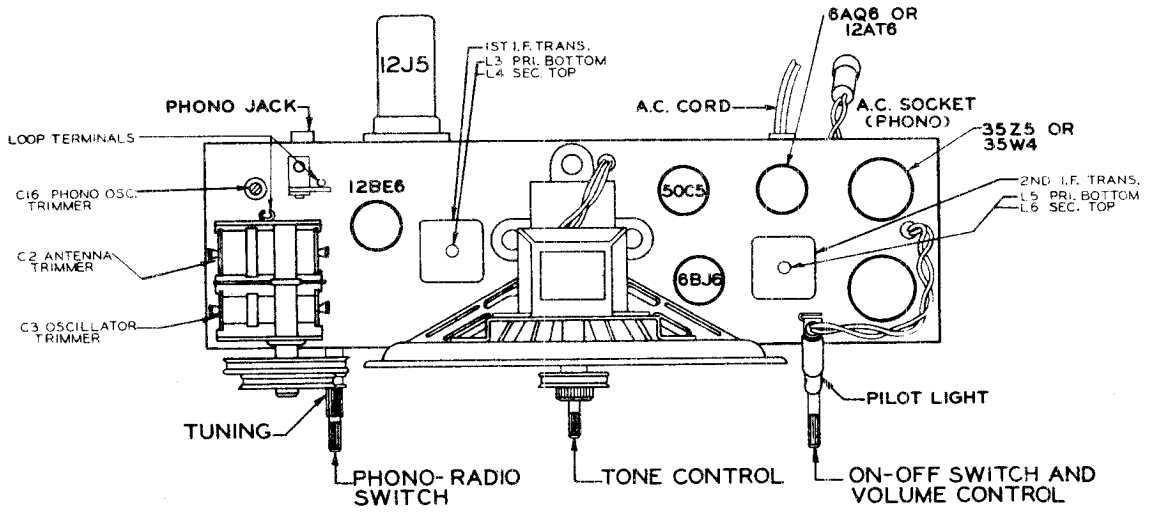
MODEL H615Z,
Ch. 6G05



MODEL H664,
Ch. 6H02

The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I.F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I.F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other. In the event the receiver oscillates during phono operation, adjust C16 4-80 mmf. capacitor to a point at which the oscillation ceases.

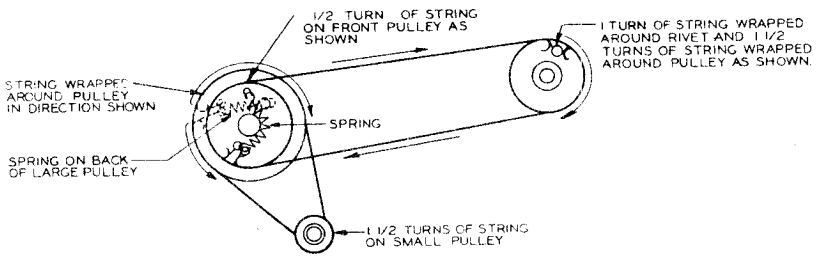
This position of no oscillation will sometimes vary with different cartridges, and in this case readjustment of C16 must be made.



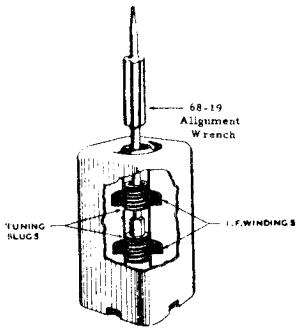
TUBE AND TRIMMER LOCATION

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 Mfd.	455 Kc.	600 Kc.	L3, 4, 5, 6	For I. F. Alignment
2	One Turn Loop Coupled Loosely to Wave Magnet	--	1600 Kc.	1600 Kc.	C-3	Set Oscillator to Dial Scale.
3		--	1400 Kc.	1400 Kc.	C-2	Align Antenna Stage

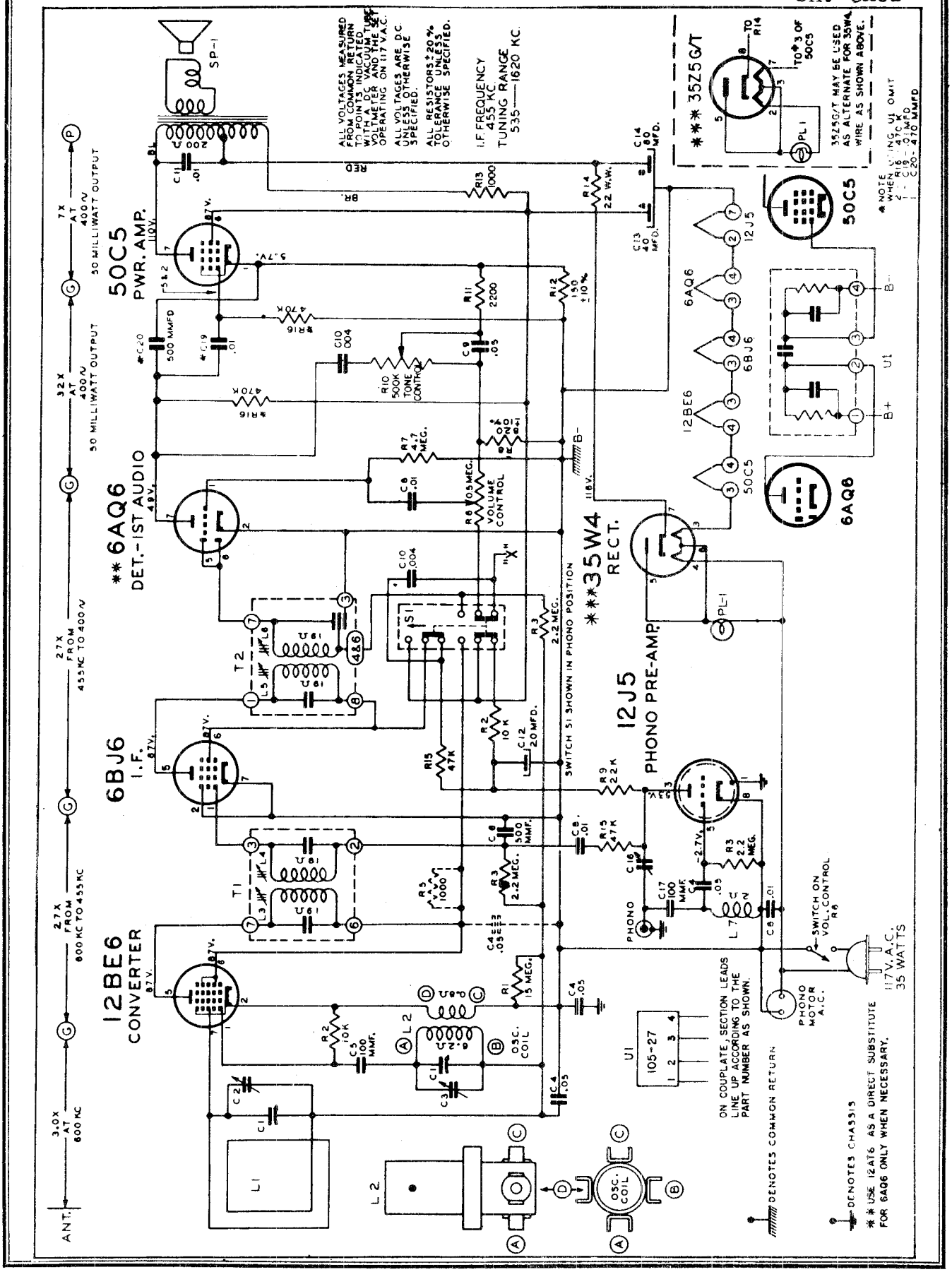


DIAL CABLE DRAWING AND DETAIL OF I. F. TRANSFORMER



Detail of IF Transformer

MODEL H664,
Ch. 6H02



MODEL H664,
Ch. 6H02

USE ONLY ZENITH NON-INDUCTIVE ELECTROLYTIC CONDENSER FOR REPLACEMENT.
IF ANY OTHER TYPE OF ELECTROLYTIC IS USED IT WILL BE NECESSARY TO ADD PARTS SHOWN IN DOTTED LINES.

I.F. TRANSFORMER NUMBERING STARTS WITH #1 TERMINAL AS FIRST TERMINAL CLOCKWISE AND ADJACENT TO MARKER AS VIEWED FROM BOTTOM OF CHASSIS.
"X" TEST POINT

PARTS LIST
MODEL H664 CHASSIS 6H02

PART NO.	DIAG. NO.	DESCRIPTION
		Dial Assembly
26-456		Dial Scale & Escutcheon
46-718		Phono Radio Knob
46-855		Tone Control Knob
46-924		Tuning Control Knob
59-255		Dial Pointer
78-911		Pilot Light Socket & Wire
80-69		Dial Cord Tension Spring
80-209		Dial Cord Tension Spring
83-1868		Pilot Light Indicator Strip
100-67	PL1	Dial Light Bulb
188-60		Retaining Ring (used on S-17857)
188-102		Knob Retaining Ring (46-924)
S-17638		Dial Cord Assembly (Short)
S-17639		Dial Cord Assembly (Long)
S-17640		Pulley & Bushing Assembly
S-17857		Tuning Shaft & Pulley Assembly
S-17923		Volume Control Knob Assembly
		Coils & Chokes
95-1101	T1	1st. I.F. Transformer
95-1102	T2	2nd. I.F. Transformer
S-12603	L7	Phono Oscillator Coil Assembly
S-13799	L2	Oscillator Coil Assembly
		Condensers
22-3	C8	.01 Mfd. Ceramic (Disc) (3 used) 500V
22-4	C10	.004 Mfd. Ceramic (Disc) (2 used) 500V
22-5	C5	110 Mmfd. Ceramic (Disc)(or 22-162)500V
22-178	C9	.05 Mfd. 200V
22-829	C4	.05 Mfd. (3 used) 200V
22-854	C6	.0005 Mfd. 600V
22-1182	C11	.01 Mfd. 400V
22-2242	C16	Trimmer Cond.
22-2272	C12,13,14	Elect. Cond. 20 Mfd.-150V x 40 Mfd. - 150V x 80 Mfd. - 150V
22-2273	C1	Two Gang Variable Cond.
22-2311	C17	100 Mmfd. Ceramic 500V
105-27	U1	Couplate Unit (or 1 ea. 22-3 & 22-854 & 2 ea. 63-1898)
		Resistors
63-1219	R14	22 ohm W.W. 1/2W 20% Ins. Res.
63-1574	R13	1000 ohm 1W 20% Ins. Res.
63-1782	R8	820 ohm 1/2W 10% Ins. Res.
63-1786	R5	1000 ohm 1/2W Ins. Res.
63-1800	R11	2200 ohm 1/2W 20% Ins. Res.
63-1828	R2	10K ohm(2 used) 1/2W 20% Ins. Res.
63-1842	R9	22K ohm 1/2W 20% Ins. Res.
63-1856	R15	47K ohm(2 used) 1/2W 20% Ins. Res.
63-1926	R3	2.2 Megohm(3 used) 1/2W 20% Ins. Res.
63-1940	R7	4.7 Megohm 1/2W 20% Ins. Res.
63-1961	R1	15 Megohm 1/2W 20% Ins. Res.
63-1977	R12	150 ohm 1W 10% Ins. Res.
63-2269	R10	Tone Control
63-2270	R6	Volume Control & Switch

PART NO.	DIAG. NO.	DESCRIPTION
		Miscellaneous
11-85		Line Cord & Plug - 6 ft. long
12-1812		Pilot Light Socket Mtg. Brkt.
14-1293		Plastic Cabinet for H664 (Top Section)
12-1294		Plastic Cabinet for H664 (Bottom Section)
16-786		Packing Carton
17-116		Wavemagnet Retaining Clamp
19-169		Record Changer Mtg. Clip (3 used)
24-566		Chassis Cover
40-93		Cabinet Cover Hinge (2 used)
40-94		Cover Support Hinge
44-25		Phono Jack
49-697	SP1	7½" PM Speaker ZC7512B Cone & Voice Coil
52-588		Two Prong Receptacle & Cable
54-129		Speed Nut (7 used on Dial Scale Mtg. & 2 used Wavemagnet Mtg.)
54-139		3/8-32x9/16" Palnut Cad. (1 ea. used on 85-499 & 63-2270)
54-140		3/8-32x9/16"x3/32 Hex Nut-Steel N.P.(used on 63-2269)
54-271		6-32x1/4" Palnut Cad. (1 ea. used on 95-1101 & 95-1102)
57-1713		Record Changer Trim Plate
78-709		Octal Tube Socket
78-801		Octal Tube Socket (used only when 35Z5GT is used)
78-806		Miniature Tube Socket (2 used)
78-807		Miniature Tube Socket (2 used)
78-810		Miniature Tube Socket
78-910		Elect. Cond. Socket
80-830		Record Changer Mtg. Spring (4 used)
83-1908		Felt Strip
85-499	S1	Phono-Radio Switch (or 85-512)
94-295		Gang & Spkr. Mtg. Bushing (4 used)
94-753		Bushing (4 used on 57-1713)
112-773		#6x3/8 Phill. B.H.S.T. St. Br. (2 ea. used on S-17651 & 24-566 & 4 used on 40-94)
112-820		#8x½" Phill. Flt. Hd. S.T. (4 used on each 40-93)
112-827		6-32x3/8 Phill. Flt. Hd. S.T. Br. (3 used on Dial Scale Mtg.)
112-828		6-20x7/8 Phill. Flt. Hd. S.T. (4 used on 57-1713)
114-39		#8x1/4" Hex Hd. S.T. (used on 12-1812)
114-42		#10-32x1-1/4" Hex Washer Hd. Cad. (4 used chassis Mtg.)
125-81		Strain Relief Grommet
125-82		Strain Relief Grommet
126-674		Dial Light Shield
138-45		Cabinet Grill
188-34		Retaining Ring (used on 63-2269)
196-172		Speaker Gasket
202-858		Instruction Book (Radio-Phono)
S-14041		Cobra-Matic Record Changer
S-15780		Cobra Cartridge Assembly
S-16419		Record Adapter Plug & Envelope Assembly
S-17651	L1	Wavemagnet Assembly

The 7H04Z chassis incorporates a superheterodyne circuit with two stages of IF, on the FM Band, and two stages on the AM Band, There is one stage of RF amplification on the FM Band.

When adjustments are made on the 7H04Z or any AC-DC chassis, a line isolation transformer (110-V input to 110-V output) is recommended in order to avoid a "hot" chassis. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

The IF transformers and the discriminator transformer are the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF and discriminator transformers, tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the others.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined in this service note.

FM Discriminator Alignment; When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

Alignment of this chassis will, in most cases, be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

Note: If a 12AT7 is replaced with a 12AU7 or vice versa, the RF portion of this reciever must be realigned.

Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

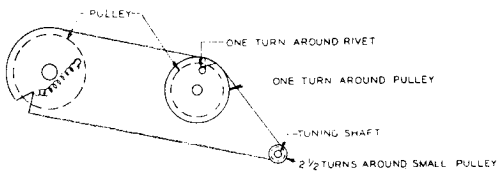
The signal generator output should be kept just high enough to get an indication on the meter.

(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (half discriminator load).

(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (full discriminator load).

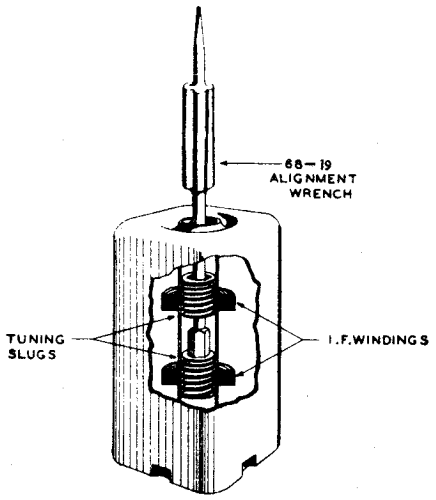
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.

(d) Loosen Slugs by applying a hot iron to the cement.

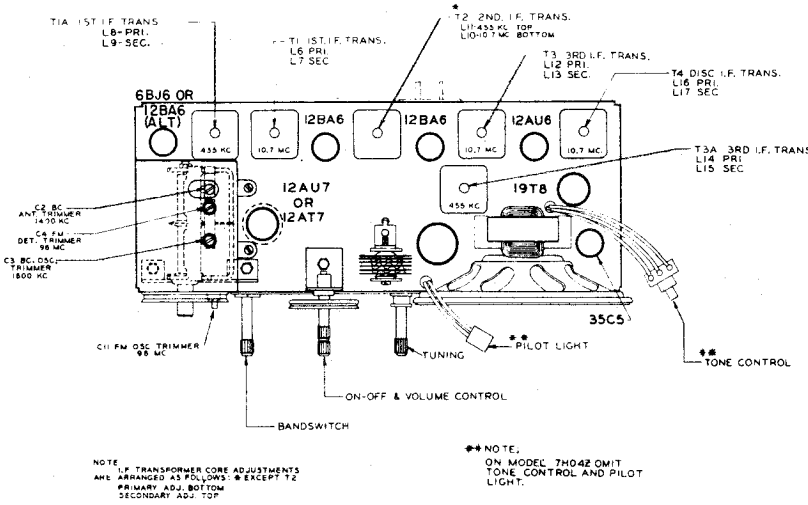


DIAL CORD DRIVE

TUBE AND TRIMMER LOCATION



Detail of
IF Transformer



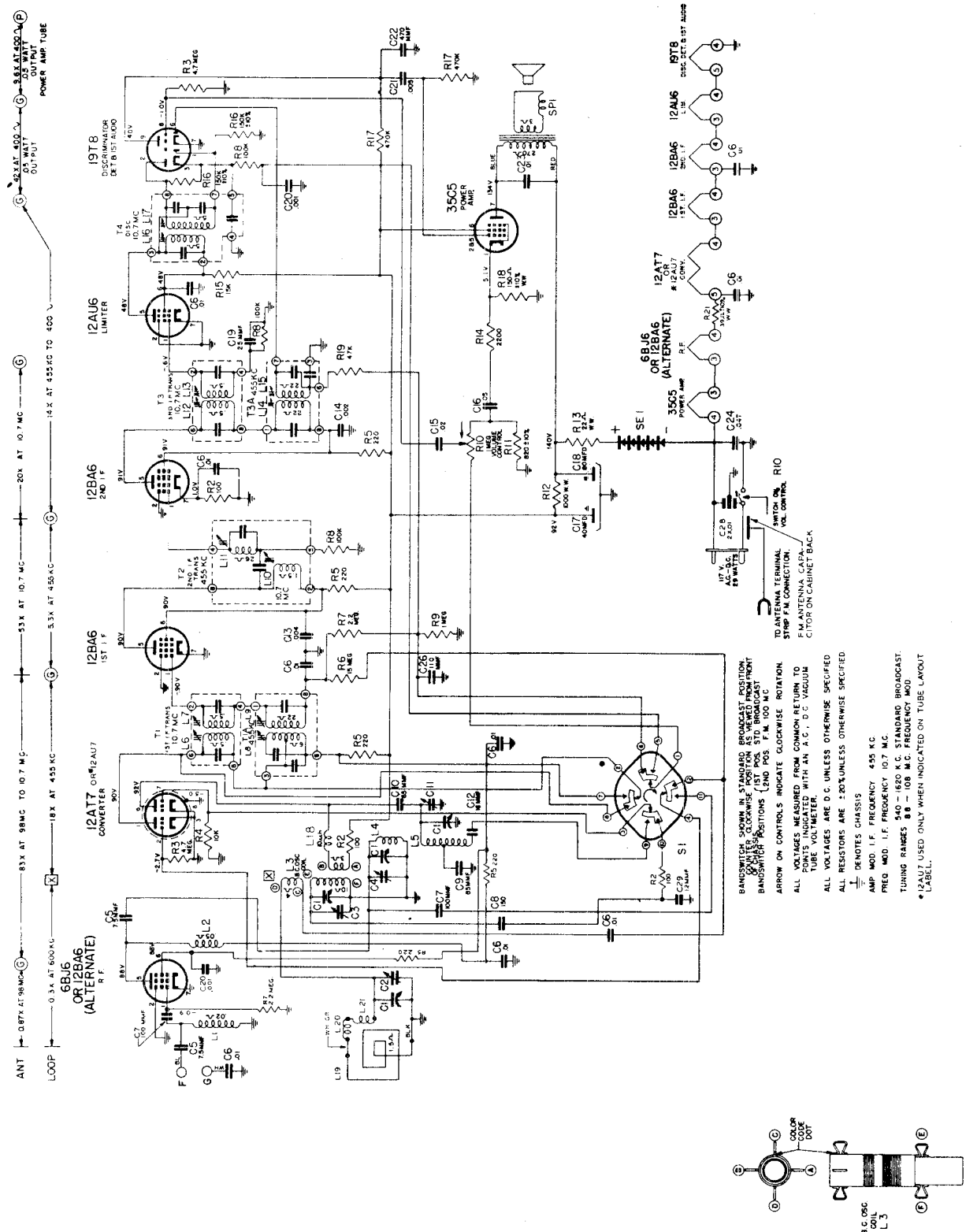
NOTE,
I.F. TRANSFORMER CORE ADJUSTMENTS ARE ARRANGED AS FOLLOWS: * EXCEPT T2
PRIMARY ADJ. BOTTOM
SECONDARY ADJ. TOP

** NOTE,
ON MODEL 7H042 OMIT TONE CONTROL AND PILOT LIGHT.

ALIGNMENT PROCEDURE

Operation	Connect Oscillator to	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 2-12AT7, or 12AU7 Converter	.05 Mfd.	455 KC. Modulated	BC	600 Kc.	L8, 9, 11, 14; 15	Align I. F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc. Modulated	BC	1600 Kc.	C3	Set oscillator to dial scale.
3	2 turns loosely cpld. to wavemagnet		1400 Kc. Modulated	BC	1400 Kc.	C2	Align antenna stage.
4 (a)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L16 coil slug Primary discr.	Align primary of discriminator for maximum reading.
5 (b)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L17 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading.
6 (c)	Pin 1 (grid) on 12BA6 2nd IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L12 and 13 Prim. and Sec. of 3rd IF trans.	Align 3rd IF transformer for maximum reading.
7 (c)	Pin 1 (grid) on 12BA6 1st IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L10 Prim. of 2nd IF transformer.	Align 2nd IF transformer for maximum reading.
8 (c)	Pin 2 (grid) on 12AT7 or 12AU7 converter tube socket.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L6 and L7 Prim. and Sec. of 1st IF transformer.	Align 1st IF transformer for maximum reading.
9 (c)	Antenna Post FM (Remove line ant.)	270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	C11 Osc. Coil.	Set Oscillator to dial scale.
10 (c) (d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	C4 Det. Coil.	Align det. stage to maximum reading.

MODEL H723Z,
Ch. 7H04Z



PARTS LIST

PART NO.	DIAG. NO.	DESCRIPTION
		DIAL ASSEMBLY
46-859		Band Switch Knob
46-860		Tuning Control Knob
46-900		Volume Control Knob
59-251		Dial Pointer
80-69		Dial Cord Tension Spring
188-129		Retaining Ring
S-17334		Tuning Shaft & Pulley Assem.
S-17336		Tuning Shaft Brkt. & Ins. Strip Assem.
S-17350		Dial Cord & Eyelet Assem.
S-17467		Brkt. & Pulley Assem.
		COILS & CHOKES
20-328	L5	F.M. Osc. Coil
20-331	L4	F.M. Mixer "
20-333	L18	R.F. Choke "
20-335	L2	R.F. Plate Load Coil
20-336	L1	F.M. Antenna Coil
95-1102	T3A	3rd. I.F. Trans. 455KC
95-1150	T3	1st. & 3rd. I.F. Trans. 10.7 MC (2 Used)
95-1153	T4	Disc. Trans. 10.7 MC
95-1250	T1A	1st. I.F. Trans. 455KC
95-1251	T2	2nd. I.F. Trans. 10.7 MC & 455 KC
S-17340	L3	B.C. Osc. Coil Assem.
		CONDENSERS
22-3	C6	.01 Mfd. Ceramic Disc. (9 Used) 500V
22-5	C26	110 Mmfd. " " (or 22-1669) 500V
22-6	C22	470 Mmfd. Ceramic 500V
22-229	C21	.005 Mfd. 600V
22-448	C13	.004 " 600V
22-830	C15	.02 " 600V
22-1126	C23	.01 " 400V
22-1158	C16	.05 " 200V
22-1220	C14	.002 " 600V
22-1507	C19	25 Mmfd. Ceramic 500V
22-1669	C7	100 " " (2 Used) 500V
22-1675	C8	150 " " 500V
22-1676	C20	.001 Mfd. " (2 Used) 500V
22-1757	C18,C17	Elect. Cond. 40 Mfd. - 150V - 80 Mfd. 150V

PART NO.	DIAG. NO.	DESCRIPTION
		CONDENSERS Cont'd.
22-1775	C24	.047 Mfd. 400V
22-1852	C5	7.5 Mmfd. Ceramic (2 Used) 500V
22-2253	C11	Trimmer Cond. (Slug Tuned)
22-2255	C1	Variable Gang Two Sect. B.C. Two Section F.M.
22-2256	C10	65 Mmfd. Ceramic 500V
22-2257	C12	16 Mmfd. Ceramic 500V
22-2258	C9	85 Mmfd. Ceramic 500V
22-2276	C28	Dual Ceramic - .01 Mfd. 500V
22-2278	C29	12 Mmfd. Ceramic 500V
		RESISTORS
63-686	R18	150 Ohm W.W. 1/2W 10% Ins. Res.
63-1450	R13	22 Ohm W.W. 1W 20% Ins. Res.
63-1527	R12	1000 Ohm W.W. 3W 20% Ins. Res.
63-1744	R2	100 Ohm 1/2W 20% Ins. Res. (3 Used)
63-1758	R5	220 Ohm 1/2W 20% Ins. Res. (5 Used)
63-1782	R11	820 Ohm 1/2W 10% Ins. Res.
63-1800	R14	2200 Ohm 1/2W 20% Ins. Res.
63-1828	R4	10K Ohm 1/2W 20% Ins. Res.
63-1835	R15	15K Ohm 1/2W 20% Ins. Res.
63-1856	R19	47K Ohm 1/2W 20% Ins. Res.
63-1870	R8	100K Ohm 1/2W 20% Ins. Res. (3 Used)
63-1876	R16	150K Ohm 1/2W 10% Ins Res. (2 Used)
63-1898	R17	470K Ohm 1/2W 20% Ins. Res. (2 Used)
63-1912	R9	1 Megohm 1/2W 20% Ins. Res.
63-1926	R7	2.2 Megohm 1/2W 20% Ins. Res. (2 Used)
63-1940	R3	4.7 Megohm 1/2W 20% Ins. Res. (2 Used)
63-1961	R6	15 Megohm 1/2W 20% Ins. Res.
63-2143	R10	Volume Control & Switch
63-2424	R21	39 Ohm W.W. 1W 10% Ins. Res.
		MISCELLANEOUS
11-85		Line Cord & Plug (6 ft.)
12-1070		Wavemagnet Mtg. Brkt.
14-1272		Plastic Table Cabinet for H723UZ

PART NO.	DIAG. NO.	DESCRIPTION
		MISCELLANEOUS Cont'd.
16-656		Packing Carton
19-175		Coil Mtg. Clip (Used on S-17340)
24-535		Line Cord Plug Cover
49-689	SP1	5-1/4" PM Speaker ZC5091 Cone & Voice Coil
54-129		Speed Nut (9 used to mt. Grille & Baffle)
54-271		6-32 X 1/4" Palnut Steel (1 used on ea. I.F.)
57-1686		Emblem Plate
57-1690		Emblem Mtg. Plate
57-1717		Chassis Bottom Plate
58-188		Two Prong Plug
78-787		Two Contact Socket (Cabt. Back)
78-806		Miniature Tube Socket
78-869		Miniature Tube Socket
78-870		Miniature Tube Socket (3 Used)
78-871		Miniature Tube Socket
78-903		Miniature Tube Socket
83-1056		Wavemagnet Mtg. Strip
83-1829		Insulator Strip
85-501		Band Switch
97-293		Chassis Mtg. Stud (2 Used)
110-152		Grill Cloth
112-281		#10 X 3/4" Truss Hd. S.T. Stat. Br. Screw (2 Used Chassis Mtg.)
114-297		#6 X 1/4" Hex Hd. S.T. (4 Used on S-17679 & 6 Used 57-1717)
114-356		#6-32 X 1-1/4" Hex Hd. S.T. Screw (Used on 212-7)
126-618		Tube Shield
138-42		Cabinet Grill
139-91		Speaker Baffle
149-89		Iron Core
159-69		Plug Button
196-153		Speaker Gasket
202-697		F.M. Instruction Book
202-860		Instruction Book
212-7	SE1	Selenium Rectifier
S-17366		Cabt. Back Assem.
S-17679		Gang Cond. Shield & Terminal Strip Assem.
S-17696	L19	Wavemagnet Assem.
S-17855	L21	Choke Coil Assem.
S-17856	L20	Loop Loading Coil Assem.

The 7H02Z chassis incorporates a superheterodyne circuit with two stages of IF, on the FM Band, and two stages on the AM Band. There is one stage of RF amplification on the FM Band.

When adjustments are made on the 7H02Z or any AC-DC chassis, a line isolation transformer (110-V input to 110-V output) is recommended in order to avoid a "hot" chassis. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

The I.F. transformers and the discriminator transformer are the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF and discriminator transformers, tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined in this service note.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not abbolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

Alignment of this chassis will, in most cases, be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

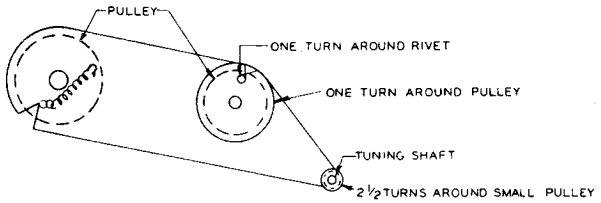
The signal generator output should be kept just high enough to get an indication on the meter.

(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (half discriminator load).

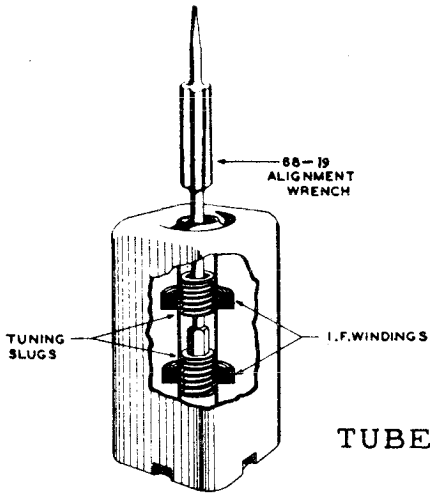
(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (full discriminator load).

(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.

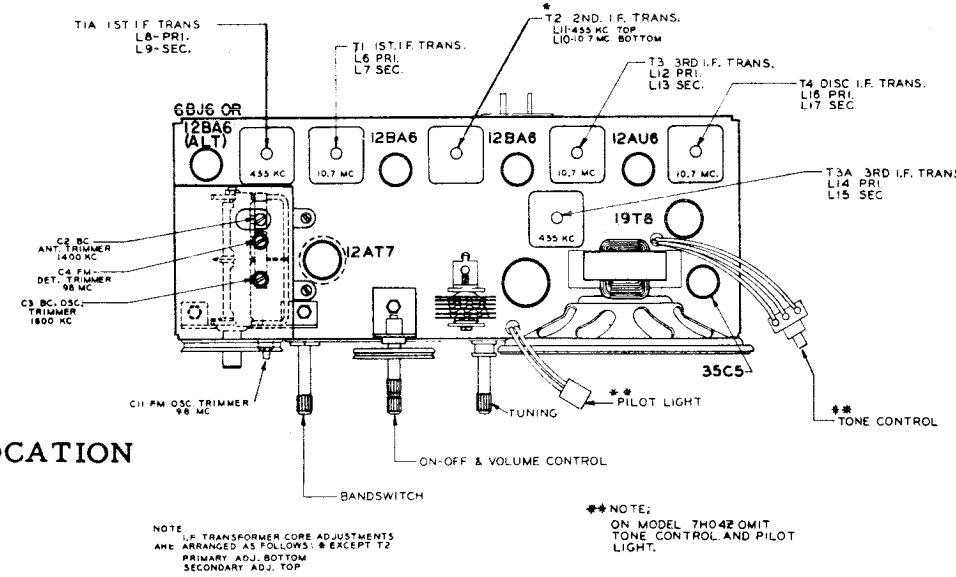
(d) Loosen Slugs by applying a hot iron to the cement.



DIAL CORD DRIVE



Detail of
IF Transformer

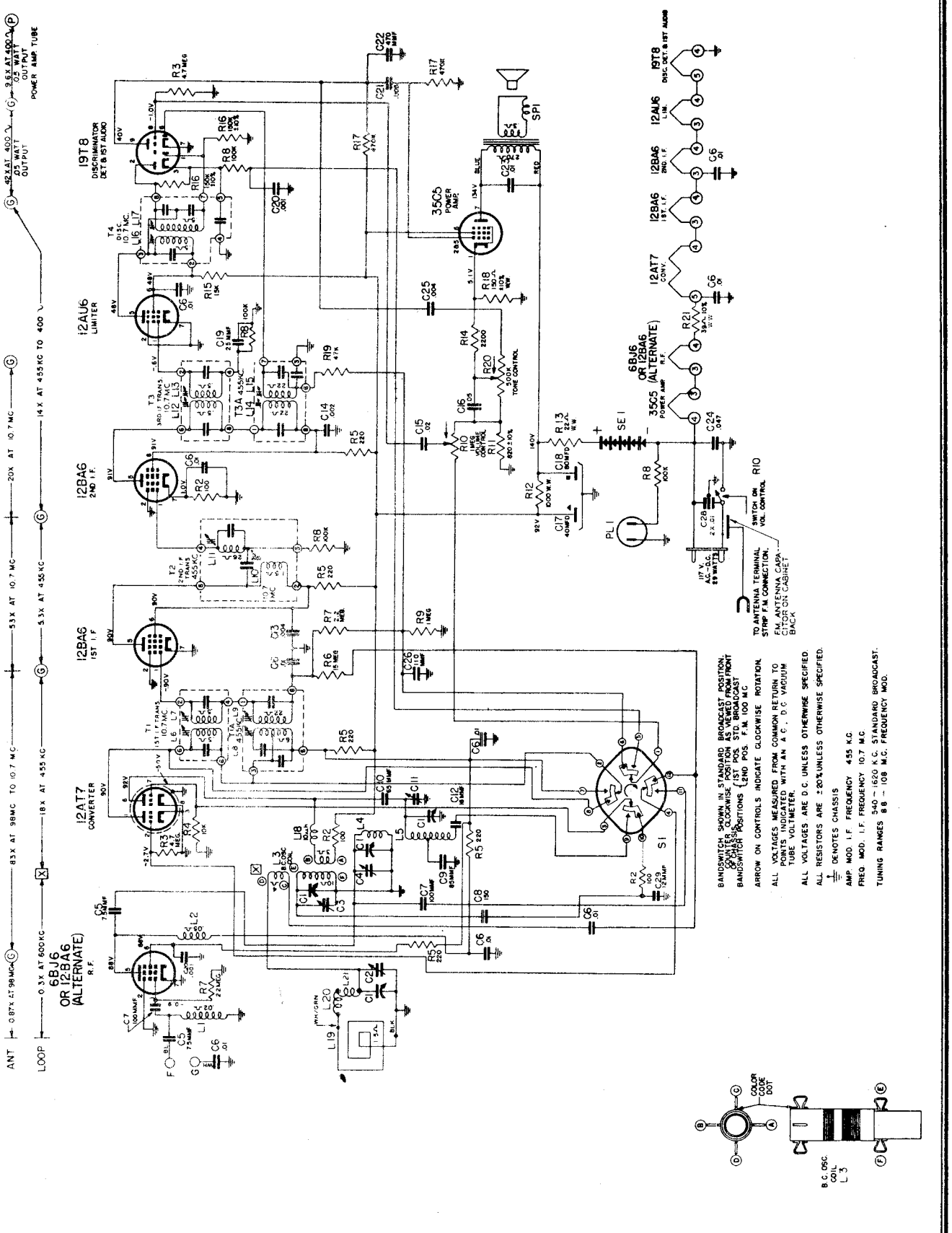


TUBE AND TRIMMER LOCATION

ALIGNMENT PROCEDURE

Operation	Connect Oscillator to	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 2 12AT7 Converter	.05 Mfd.	455 KC. Modulated	BC	600 Kc.	L8, 9,11,14,15	Align I. F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc. Modulated	BC	1600 Kc.	C 3	Set oscillator to dial scale.
3	2 turns loosely cpld. to wavemagnet		1400 Kc. Modulated	BC	1400 Kc.	C 2	Align antenna stage.
4 (a)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L16 coil slug Primary discr.	Align primary of discriminator for maximum reading.
5 (b)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L17 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading.
6 (c)	Pin 1 (grid) on 12BA6 2nd IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L12 and L13 Prim. and Sec. of 3rd IF trans.	Align 3rd IF transformer for maximum reading.
7 (c)	Pin 1 (grid) on 12BA6 1st IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L10 Prim. of 2nd IF transformer	Align 2nd IF transformer for maximum reading.
8 (c)	Pin 2 (grid) on 12AT7 converter tube socket.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L6 and L7 Prim. and Sec. of 1st IF transformer.	Align 1st IF transformer for maximum reading.
9 (c)	Antenna Post FM (Remove line ant.)	270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	C11 Osc. Coil Slug	Set Oscillator to dial scale.
10 (c) (d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	C4 Det. Coil Slug	Align det. stage to maximum reading.

MODEL H724Z,
Ch. 7H02Z



PARTS LIST

PART NO.	DIAG. NO.	DESCRIPTION	
		DIAL ASSEMBLY	
26-451		Dial Scale	
46-859		Band Switch Knob	
46-860		Tuning Control Knob	
46-900		Vol. Control Knob	
46-901		Tone Control Knob	
59-251		Dial Pointer	
78-904		Dial Light Socket & Wire	
80-69		Dial Cord Tension Spring	
100-105	PL1	Neon Indicator Bulb	
188-129		Retaining Ring (Used on S-17334 & S-17467)	
S-17334		Tuning Shaft & Pulley Assem.	
S-17336		Tuning Shaft Brkt. & Ins. Strip Assem.	
S-17350		Dial Cord & Eyelet Assem.	
S-17467		Brkt. & Pulley Assem.	
		COILS & CHOKES	
20-328	L5	F.M. Osc. Coil Assem.	
20-331	L4	F.M. Mixer Coil	
20-333	L18	R.F. Choke Coil	
20-335	L2	R.F. Plate Load Coil	
20-336	L1	F.M. Ant. Coil	
95-1102	T3A	3rd. I.F. Trans. 455KC	
95-1150	T3	1st. & 3rd. I.F. Trans. 10.7MC (2 Used)	
95-1153	T4	Disc. Trans. 10.7MC	
95-1250	T1A	1st. I.F. Trans. 455KC	
95-1251	T2	2nd. I.F. Trans. 10.7MC & 455KC	
S-17340	L3	B.C. Osc. Coil Assem.	
		CONDENSERS	
22-4	C25	.004 Mfd. Ceramic	500V
22-5	C26	110 Mmfd. Ceramic (Disc) (or 22-1669)	500V
22-6	C22	470 Mmfd. Ceramic	500V
22-229	C21	.005 Mfd.	500V
22-448	C13	.004 Mfd.	600V
22-830	C15	.02 Mfd.	600V
22-1126	C23	.01 Mfd.	400V
22-1158	C16	.05 Mfd.	200V
22-1220	C14	.002 Mfd.	600V
22-1507	C19	25 Mmfd. Ceramic	500V
22-1669	C7	100 Mmfd. Ceramic (2 Used)	500V
22-1675	C8	150 Mmfd. Ceramic	500V
22-1676	C20	.001 Mfd. Ceramic (2 Used)	500V

PART NO.	DIAG. NO.	DESCRIPTION	
		CONDENSERS Con't.	
22-1757	C17,C18	Elect. Cond. 40 Mfd. - 150V X 80 Mfd.	150V
22-1775	C-24	.047 Mfd.	400V
22-1852	C5	7.5 Mmfd. Ceramic (2 Used)	500V
22-2253	C11	Trimmer Cond. (Slug Tuned)	
22-2255	C1	Variable Gang Two Section B.C. & Two Section F.M.	
22-2256	C10	65 Mmfd. Ceramic	500V
22-2257	C12	16 Mmfd. Ceramic	500V
22-2258	C9	85 Mmfd. Ceramic	500V
22-2276	C28	Dual Ceramic .01 Mfd. - .01 Mfd.	500V
22-2278	C29	12 Mmfd. Ceramic	500V
		RESISTORS	
63-686	R18	150 Ohm W.W. 1/2W 10% Ins. Res.	
63-1450	R13	22 Ohm W.W. 1W 20% Ins. Res.	
63-1527	R12	1000 Ohm W.W. 3W 20% Ins. Res.	
63-1744	R2	100 Ohm 1/2W 20% Ins. Res. (3 Used)	
63-1758	R5	220 Ohm 1/2W 20% Ins. Res. (5 Used)	
63-1782	R11	820 Ohm 1/2W 10% Ins. Res.	
63-1800	R14	2200 Ohm 1/2W 20% Ins. Res.	
63-1828	R4	10K Ohm 1/2W 20% Ins. Res.	
63-1835	R15	15K Ohm 1/2W 20% Ins. Res.	
63-1856	R19	47K Ohm 1/2W 20% Ins. Res.	
63-1870	R8	100K Ohm 1/2W 20% Ins. Res. (4 Used)	
63-1876	R16	150K Ohm 1/2W 10% Ins. Res. (2 Used)	
63-1898	R17	470K Ohm 1/2W 20% Ins. Res. (2 Used)	
63-1912	R9	1 Megohm 1/2W 20% Ins. Res.	
63-1926	R7	2.2 Megohm 1/2W 20% Ins. Res. (2 Used)	
63-1940	R3	4.7 Megohm 1/2W 20% Ins. Res. (2 Used)	
63-1961	R6	15 Megohm 1/2W 20% Ins. Res.	
63-2143	R10	Vol. Control & Switch	
63-2144	R20	Tone Control	
63-2424	R21	39 Ohm W.W. 1W 10% Ins. Res.	
		MISCELLANEOUS	
11-85		Line Cord & Plug (6 ft.)	
12-1070		Wavemagnet Mtg. Brkt.	
14-1273		Plastic Cabinet for H724UZ	
16-657		Packing Carton	
19-175		Coil Mtg. Clip	
24-535		Line Cord Plug Cover	
43-165		Handle Housing	

PART NO.	DIAG. NO.	DESCRIPTION
		MISCELLANEOUS Con't.
49-689	SP1	5-1/4" PM Speaker ZC5091 Cone & Voice Coil
54-129		Speed Nut (9 used to mt. Grill & Baffle)
54-271		6-32 X 1/4" Palnut (1 used on ea. I.F.)
54-305		Palnut Steel Stat. Br. (Used on Chassis Mtg.)
57-1686		Emblem Plate
57-1690		Emblem Mtg. Plate
57-1717		Chassis Bottom Plate
58-188		Two Prong Plug (AC)
78-787		Two Contact Socket (Cabt. Back)
78-806		Miniature Tube Socket
78-869		Miniature Tube Socket
78-870		Miniature Tube Socket (3 Used)
78-871		Miniature Tube Socket
78-903		Miniature Tube Socket
83-1056		Wavemagnet Mtg. Strip
83-1789		Handle Strip (Rubber)
83-1829		Insulator Strip
85-501	S1	Band Switch
93-487		1/16 X .144 X 3/8 Washer Steel (2 Used on 43-165)
97-293		Chassis Mtg. Stud (2 Used)
110-152		Grill Cloth
112-281		#10 X 3/4" Truss Hd. S.T. Screw St. Br. (2 Used Chassis Mtg.)
114-356		#6-32 X 1-1/4" Hex Hd. S.T. Screw (Used on 212-7)
114-366		#6 X 3/8 Hex Hd. S.T. Screw (2 Used on 43-165)
126-618		Tube Shield
138-42		Cabinet Grille
139-91		Speaker Baffle
149-89		Iron Core (Used on S-17340)
159-69		Plug Button (4 Used on S-17841)
171-11		Pilot Light Jewel
196-153		Speaker Gasket
199-103		Flexible Handle Sleeve
202-697		F.M. Inst. Book
202-859		Inst. Book
212-7		Selenium Rectifier
S-13210		Strap & Rivet Assem.
S-17679		Gang Cond. Shield & Terminal Assem.
S-17696	L19	Wavemagnet Assem.
S-17841		Cabt. Back Assem. (Comp.)
S-17855	L21	Choke Coil Assem.
S-17856	L20	Loop Loading Coil Assem.

The 7G01Z chassis incorporates a superheterodyne circuit with two stages of IF, and one stage of RF amplification on all bands.

When adjustments are made on the 7G01Z or any AC-DC chassis, a line isolation transformer (110 V input to 110 V output) is recommended in order to avoid a "hot" chassis. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

AM Alignment: The alignment of this chassis on the standard broadcast band is conventional. The alignment slugs in the IF transformers are threaded and screw into the coil forms. The slugs are slotted for a small size fiber screw driver. Do not press hard on the aligning tool or the threads in the coil forms will strip and adjustments will be impossible.

FM RF Alignment: The tuning slugs are attached to threaded shafts and the slugs are varied in the field of the coils by turning the shafts clockwise or counter-clockwise. After adjustment the shafts must be secured with a drop of speaker cement.

FM IF Alignment: The same type of tuning slugs for aligning the AM IF Amplifier are used for the FM I.F.'s. Observe the same precautions when making adjustments.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

Alignment of this chassis will in most cases be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

Correct alignment can only be made if the following procedure is followed:

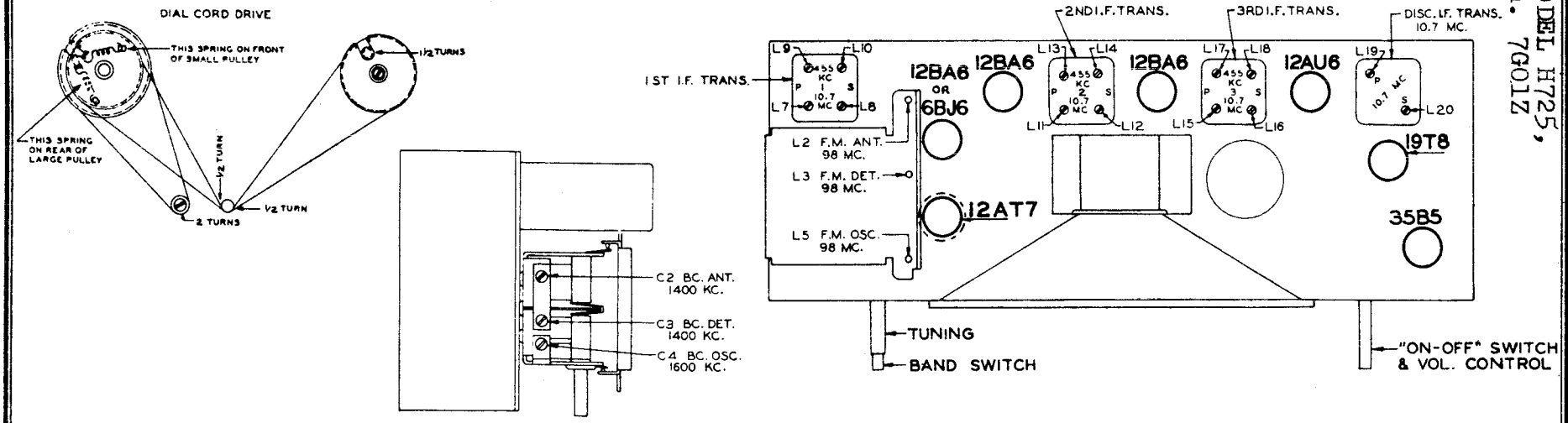
A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

The signal generator output should be kept just high enough to get an indication on the meter.

(a) Vacuum Tube Voltmeter Lug 6 on discriminator transformer to chassis (half discriminator load).
(b) Vacuum Tube Voltmeter Lug 3 on discriminator transformer to chassis (full discriminator load).
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.
(d) Loosen Slugs by applying a hot iron to the cement.

TUBE AND TRIMMER LOCATION



ALIGNMENT PROCEDURE

Operation	Connect Oscillator To	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 7 12AT7 Converter	.05 Mfd.	455 KC Modulated	BC	600 Kc	L-9, 10, 13, 14, 17 and 18	Align I.F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc Modulated	BC	1600 Kc	C4	Set oscillator to dial scale
3	2 turns loosely cpld. to wavemagnet		1400 Kc Modulated	BC	1400 Kc	C3 and C2	Align det. and ant. stages
4 (a)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc Unmodulated	FM 100		L19 coil slug Primary discr.	Align primary of discriminator for maximum reading
5 (b)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc Unmodulated	FM 100		L20 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading
6 (c)	Pin 1 (grid) on 12BA6 2nd. IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L15 and L16 Prim. and Sec. of 3rd IF transformer	Align 3rd, IF transformer for maximum reading
7 (c)	Pin 1 (grid) on 12BA6 1st, IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L11 and L12 Prim. and Sec. of 2nd. IF transformer	Align 2nd. IF transformer for maximum reading
8 (c)	Pin 7 (grid) on 12AT7 converter tube socket	.05 Mfd.	10.7 Mc Unmodulated	FM 100		L7 and L8 Prim. and Sec. of 1st IF transformer	Align 1st. IF Transformer for maximum reading
9 (c)(d)	Antenna Post F (Remove line ant.)	270 ohms	98 Mc Unmodulated	FM 100	98 Mc.	L5 Osc. Coil Slug	Set Oscillator to dial scale
10 (c)(d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L3 and L2 Det. and RF coil Slugs	Align det. and ant. stages to maximum reading

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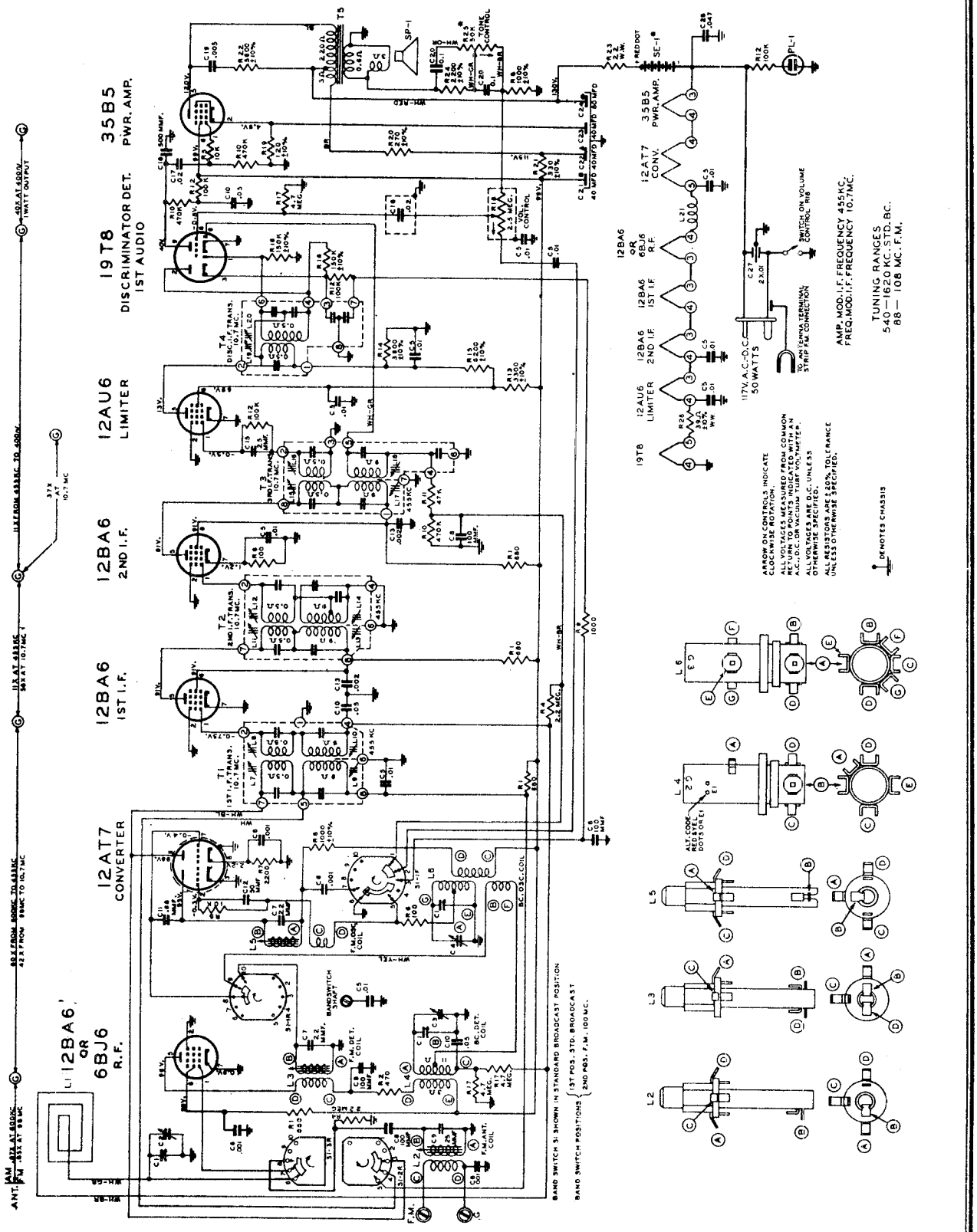

PARTS LIST

PART NO.	DIAG. NO.	DESCRIPTION	
		DIAL ASSEMBLY	
12-1768		Dial Light Socket Mtg. Brkt.	
26-445		Dial Scale	
46-538		Tuning Control Knob	
46-718		Band Switch Knob	
46-855		Tone Control Knob	
57-1613		Cabinet Emblem Plate	
57-1615		Dial Scale Clamping Plate	
57-1641		Name Plate	
59-245		Dial Pointer	
78-894		Dial Light Socket	
80-69		Dial Cord Spring	
80-209		Dial Cord Spring	
80-444		Tuner Arm Tension Spring	
80-580		Tuner Arm Stop Spring	
80-817		Tuner Spring	
80-818		Tuner Arm Pressure Spring	
80-865		Ground Spring (2 Used)	
93-475		Felt Washer (used on S-14129)	
93-1043		Spring Washer (used on S-16735)	
100-105	PL1	Neon Bulb	
114-26		8-18x1/4" lg. x 1/4" Hex Hd. S.T. (2 used on 12-1768)	
171-11		Pilot Light Jewel	
188-102		Clamping Ring (used on 46-538)	
S-13945		Cam, Pulley & Pushing Assembly	
S-13983		Dial Cord & Eyelet Assembly	
S-14129		Volume Control Knob Assembly	
S-14429		Tuner Arm Assembly	
S-16735		Pulley & Bushing Assembly	
S-16884		Tuning Shaft & Pulley Assembly	
S-16887		Dial Cord & Eyelet Assembly	
		COILS & CHOKES	
S-13971	T2	2nd I.F. Transformer Assembly	
S-13972	T3	3rd I.F. Transformer Assembly	
S-13973	T4	Discriminator Transformer Assembly	
S-13997	L21	Filament Choke Coil Assembly	
S-14192	L2	F.M. Antenna Coil Assembly	
S-15733	L5	F.M. Oscillator Assembly	
S-15743	L3	F.M. Detector Coil Assembly	
S-15981	T1	1st I.F. Transformer Assembly	
S-16344	L4	Broadcast Detector Coil Assembly	
S-16345	L6	Broadcast Oscillator Coil Assembly	
		CONDENSERS	
22-3	C5	.01 Mfd. Ceramic (Disc) (11 used)	500V
22-5	C8	110 Mmfd. Ceramic (Disc) (4 used) (or 22-1669)	500V
22-829	C10	.05 Mfd. (3 used)	200V
22-830	C17	.02 Mfd.	600V
22-854	C18	.0005 Mfd.	600V
22-1220	C13	.002 Mfd. (2 used)	600V
22-1367	C12	50 Mmfd. Ceramic	500V

PART NO.	DIAG. NO.	DESCRIPTION	
		CONDENSERS Cont'd.	
22-1506	C7	22 Mmfd. Ceramic (2 used)	500V
22-1507	C15	25 Mmfd. Ceramic	500V
22-1661	C21,22 C23,24	Elect. 80-40-40 Mfd. - 150V x 40 Mfd.	25V
22-1676	C6	.001 Mfd. Ceramic (4 used)	500V
22-1677	C1	Three Gang Variable	
22-1683	C16	.02 Mfd.	400V
22-1702	C19	.005 Mfd.	400V
22-1766	C11	.68 Mmfd. (Molded)	500V
22-1775	C26	.047 Mfd.	400V
22-2060	C9	25 Mmfd. Ceramic	500V
22-2084	C20	.1 Mfd. (2 used)	200V
22-2276	C27	Dual Ceramic - .01 Mfd. - .01 Mfd.	500V
		RESISTORS	
63-1202	R21	330 Ohm W.W. 2W 10% Ins. Res.	
63-1450	R23	22 Ohm W.W. 1W 20% Ins. Res.	
63-1452	R20	270 Ohm W.W. 2W 10% Ins. Res.	
63-1584	R18	Volume Control & Switch	
63-1744	R6	100 Ohm 1/2W 20% Ins. Res. (2 used)	
63-1747	R19	120 Ohm 1/2W 10% Ins. Res.	
63-1772	R2	470 Ohm 1/2W 20% Ins. Res.	
63-1779	R1	680 Ohm 1/2W 20% Ins. Res. (4 used)	
63-1785	R8	1000 Ohm 1/2W 10% Ins. Res. (2 used)	
63-1786	R9	1000 Ohm 1/2W 20% Ins. Res.	
63-1799	R24	2200 Ohm 1/2W 10% Ins. Res.	
63-1800	R7	2200 Ohm 1/2W 20% Ins. Res.	
63-1806	R13	3300 Ohm 1/2W 10% Ins. Res.	
63-1810	R14	3900 Ohm 1/2W 10% Ins. Res.	
63-1817	R22	5600 Ohm 1/2W 10% Ins. Res.	
63-1824	R15	8200 Ohm 1/2W 10% Ins. Res.	
63-1828	R5	10K Ohm 1/2W 20% Ins. Res. (2 used)	
63-1856	R11	47K Ohm 1/2W 20% Ins. Res.	
63-1870	R12	100K Ohm 1/2W 20% Ins. Res. (4 used)	
63-1876	R16	150K Ohm 1/2W 10% Ins. Res. (2 used)	
63-1898	R10	470K Ohm 1/2W 20% Ins. Res. (3 used)	
63-1926	R4	2.2 Megohm 1/2W 20% Ins. Res. (2 used)	
63-1940	R17	4.7 Megohm 1/2W 20% Ins. Res. (3 used)	
63-2108	R25	Tone Control	
63-2424	R26	39 Ohm W.W. 1W 10% Ins. Res.	
		MISCELLANEOUS	
11-85		A.C. Line Cord & Plug	
12-1070		Wavemagnet Mtg. Brkt. (2 used)	
14-1250		Plastic Cabinet for H725	
16-606		Packing Carton	
19-139		Cabinet Back Ret. Clip (4 used)	
43-165		Handle Housing	
49-608	SP1	7-1/2" P.M. Speaker ZC7121 Cone & Voice Coil	
54-139		3/8-32x9/16" Palnut (used to mt. 63-1584)	
54-140		3/8-32x9/16x3/32 Thk. Hex Hd. (used to mt. 63-2108)	

PART NO.	DIAG. NO.	DESCRIPTION
		MISCELLANEOUS Cont'd.
54-226		Speed Nut (1 ea. used on S-15743 - S-14192 & S-15733)
54-269		8-32x11/32" Palnut (1 ea. used on S-13971 S-13972 - S-13973 - S-15981)
57-1269		I.F. Trans. Terminal Plate (8 used)
58-128		Two Prong Plug
78-787		Two Contact Socket
78-788		Miniature Tube Socket (9 contact)
78-794		Miniature Tube Socket (3 used)
78-795		Miniature Tube Socket (7 contact)
78-870		Miniature Tube Socket (7 contact)
78-903		Miniature Tube Socket (9 contact)
83-1056		Wavemagnet Mtg. Strip (2 used)
83-1520		Rectifier Insulating Strip
83-1782		Tone Control Ins. Strip
83-1789		Handle Strip-Rubber
83-1898		Asbestos Strip
85-504	S1	Band Switch
93-415		#6 Ext. Shakeproof Lockwasher (used on 212-7)
93-487		1/16x.144x3/8 Steel Washer (2 used on 43-165)
94-334		Speaker Mtg. Bushing (4 used)
94-485		Fibre Bushing (1ea. used on 63-1584 & 63-2108)
95-1035	T5	Output Transformer
97-293		Insulating Stud (4 used on chassis)
112-281		Chassis Mtg. Screw (4 used)
112-697		6-20x7/16" S.T. Pan Hd. S.T. (4 used on S-17787)
114-26		8-18x1/4" lg. x 1/4" A.F. Hex Hd. S.T. (2 used on S-13977)
114-78		8-18x1/4" lg. x 1/4" A.F. Hex Hd. S.T. (2 used on S-13977)
114-356		6-32x1-1/4" lg. x 1/4" Hex Hd. S.T. (used on 212-7)
114-366		6-32x3/8" lg. x 1/4" A.F. Hex Hd. S.T. (2 used on 43-166)
126-618		Tube Shield
138-46		Speaker Grille
139-69		Speaker Baffle
139-88		Baffle Board
149-64		Tuning Core (3 used)
188-30		Retaining Ring (used on S-16884)
188-34		Retaining Ring (used on 63-2108)
188-136		Trim Ring (2 used)
199-103		Flexible Handle Sleeve
202-697		F.M. Instruction Book
202-871		Instruction Book
212-7	SE1	Selenium Rectifier
S-13210		Strap & Rivet Assembly (handle)
S-13977	L1	Wavemagnet Assembly
S-14358		Wavemagnet Cable Assembly
S-17787		Cabinet Back Assembly (Complete)

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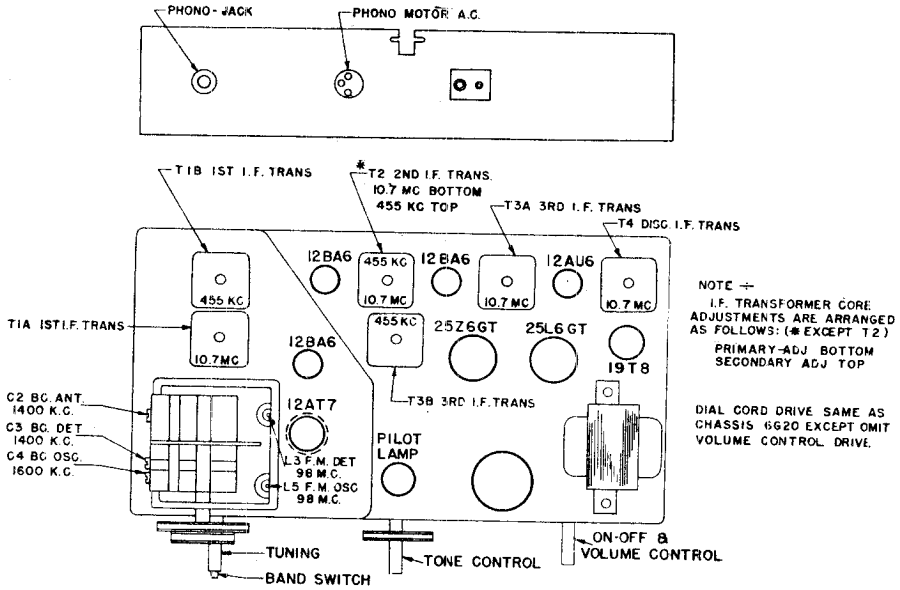
TUBE AND TRIMMER LOCATION



The 8H20Z chassis incorporates a superheterodyne circuit with two stages of IF, on the FM Band, and one stage on the AM Band. There is one stage of RF amplification on all Bands.

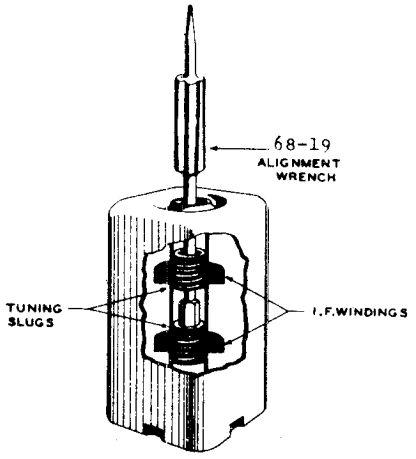
When adjustments are made on the 8H20Z chassis, a line isolation transformer (110 V input to 110V output) is recommended in order to avoid a "hot" chassis. If an isolation transformer is not available, check the AC voltage between chassis and bench ground and if there is any indication of voltage, reverse the plug before handling the set.

FM RF Alignment: The tunning slugs are attached to threaded shafts and the slugs are varied in the field of the coils by turning the shafts clockwise or counter-clockwise. After adjustment the shafts must be secured with a drop of speaker cement.

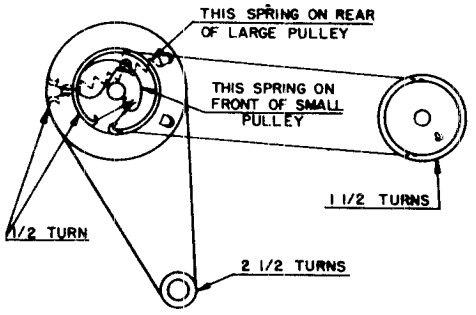
AM and FM IF Alignment: The AM and FM IF transformers in this receiver are of the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined below.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.



Detail of
IF Transformer



DIAL CORD DRIVE

ALIGNMENT PROCEDURE

Operation	Connect Oscillator To	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 2 12AT7 Converter	.05 Mfd.	455 Kc. Modulated	BC	600 Kc.	L9, 10, 12 15 & 16	Align I. F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc. Modulated	BC	1600 Kc.	C4	Set oscillator to dial scale.
3	2 turns loosely cpld. to wavemagnet		1400 Kc. Modulated	BC	1400 Kc.	C3, C2	Align detector and antenna stage.
4 (a)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L17 coil slug Primary discr.	Align primary of discriminator for maximum reading.
5 (b)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L18 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading.
6 (c)	Pin 1 (grid) on 12BA6 2nd. I F..	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L13 and L14 Pri. & Sec. of 3rd. IF trans.	Align 3rd. IF transformer for maximum reading.
7 (c)	Pin 1 (grid) on 12BA6 1st. IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adjust L11 for maximum reading.	Align 2nd IF transformer for maximum reading.
8 (c)	Pin 2 (grid) on 12AT7 converter tube socket.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L7 and L8 Prim. and Sec. of 1st. IF transformer.	Align 1st. IF transformer for maximum reading.
9 (c)	Antenna Post FM (Remove line ant.)	270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L5 Osc. Coil Slug.	Set Oscillator to dial scale.
10 (c) (d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L3 Det. Coil Slug	Align det. stage to maximum reading.

IMPORTANT

Alignment of this chassis will in most cases be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

The signal generator output should be kept just high enough to get an indication on the meter.

(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (half discriminator load).

(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (full discriminator load).

(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.

(d) Loosen Slugs by applying a hot iron to the cement.

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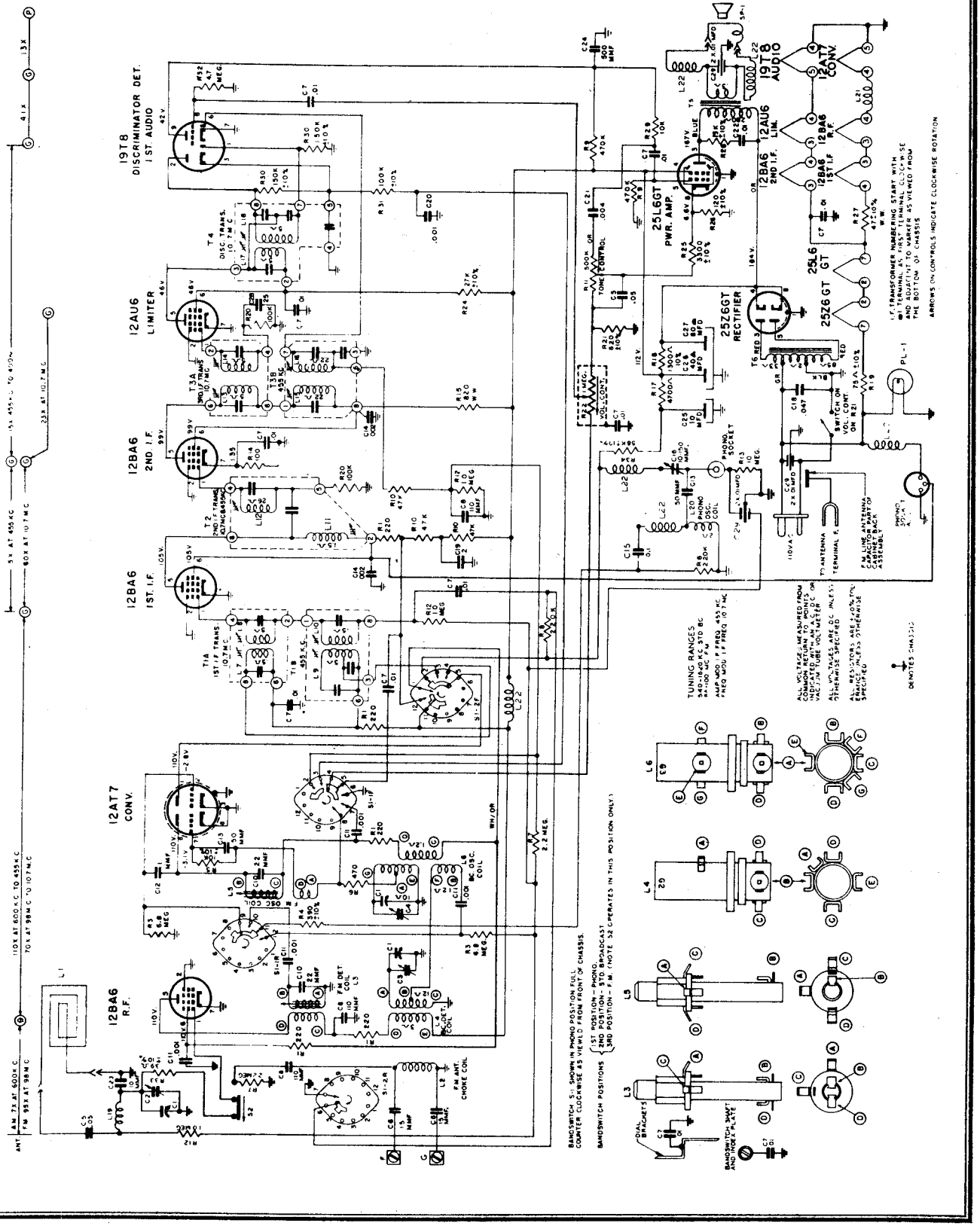

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PARTS LIST

Dial Assembly

Part No.	Diag. No.	Description
78-895		Dial Light Socket & Wire
80-69		Dial Cord Spring
80-746		Pulley Retaining Spring
80-747		Dial Cord Spring
100-97	PL-1	Pilot Light Bulb
114-262		8-32x7/16"x1/4" A.F. Hex Hd. S.T. (2 used on S-17149)
114-297		6-32x1/4" lg. x 1/4" A.F. Hex Hd. (2 used on S-17165)
148-122		Tuner Arm
188-30		Retaining Ring (used on S-17155)
S-17149		Dial Scale & Brkt. Assem.
S-17155		Tuning Shaft & Pulley Assem.
S-17157		Pointer & Pulley Assem.
S-17158		Dial Cord & Eyelet Assem. (Long)
S-17159		Dial Cord & Eyelet Assem. (Short)
S-17165		Brkt. & Pulley Bushing Assem.

Coils & Chokes

20-337	L22	R. F. Choke Coil (6 used)
95-1102	T3B	2nd I. F. Transformer
95-1150	T3B	2nd I. F. Transformer
95-1153	T4	Discriminator Transformer
95-1201	T1A	1st I. F. Transformer
95-1248	T1B	1st I. F. Transformer
95-1251	T2	2nd I. F. Transformer
S-12603	L20	Phono Oscillator Coil Assem.
S-13997	L21	Filament Choke Coil Assem.
S-15691	L5	F. M. Oscillator
S-15743	L3	F. M. Detector Coil Assem.
S-16344	L4	Broadcast Detector Coil Assem.
S-16345	L6	Broadcast Osc. Coil Assem.
S-16408	L2	Antenna Choke Coil Assem.

Condensers

22-3	C7	.01 Mfd. Ceramic	(11 used)	500V
22-4	C21	.004 Mfd. Ceramic		500V
22-5	C8	110 Mmfd. Ceramic (or 22-1669)	(3 used)	500V
22-177	C19	.2 Mfd.		400V
22-669	C22	.01 Mfd.		600V
22-827	C15	.1 Mfd.		200V
22-829	C5	.05 Mfd.	(2 used)	200V
22-854	C24	.0005 Mfd.		600V
22-1220	C14	.002 Mfd.	(2 used)	600V
22-1367	C13	50 Mmfd. Ceramic	(2 used)	500V
22-1506	C10	22 Mmfd. Ceramic	(2 used)	500V
22-1507	C28	25 Mmfd. Ceramic		500V
22-1676	C11	.001 Mfd. Ceramic	(4 used)	500V
22-1717	C20	.001 Mfd.		200V
22-1762	C12	1 Mmfd. Ceramic		500V
22-1775	C18	.047 Mfd. (Molded)		400V
22-1863	C23	10 Mmfd. Ceramic		500V
22-2104	C1	Three Section Variable		
22-2105	C26,C27	Elect. 80-40		250V
22-2140	C6	15 Mmfd. Ceramic	(2 used)	500V
22-2154	C25	Elect. 10 Mfd.		250V
22-2240	C16	Trimmer Cond.		
22-2276	C29	Dual Ceramic .01 Mfd. - .01 Mfd.	(3 used)	500V

Resistors

63-1726	R33	39 Ohm	1/2W	10%	Ins. Res.
63-1744	R14	100 Ohm	1/2W	20%	Ins. Res.
63-1758	R1	220 Ohm	1/2W	20% (5 used)	Ins. Res.
63-1768	R4	390 Ohm	1/2W	10%	Ins. Res.
63-1772	R6	470 Ohm	1/2W	20%	Ins. Res.
63-1782	R21	820 Ohm	1/2W	10%	Ins. Res.
63-1806	R25	3300 Ohm	1/2W	10%	Ins. Res.
63-1814	R17	4700 Ohm	1/2W	20%	Ins. Res.
63-1827	R5	10K Ohm	1/2W	10%	Ins. Res.
63-1828	R29	10K Ohm	1/2W	20%	Ins. Res.
63-1834	R28	15K Ohm	1/2W	10%	Ins. Res.
63-1845	R24	27K Ohm	1/2W	10%	Ins. Res.
63-1856	R10	47K Ohm	1/2W	20% (3 used)	Ins. Res.
63-1859	R34	56K Ohm	1/2W	10%	Ins. Res.
63-1869	R31	100K Ohm	1/2W	10%	Ins. Res.
63-1870	R20	100K Ohm	1/2W	20% (2 used)	Ins. Res.
63-1876	R30	150K Ohm	1/2W	10% (2 used)	Ins. Res.
63-1884	R8	220K Ohm	1/2W	20% (2 used)	Ins. Res.
63-1898	R9	470K Ohm	1/2W	20% (2 used)	Ins. Res.
63-1912	R12	1 Megohm	1/2W	20% (3 used)	Ins. Res.
63-1926	R7	2.2 Megohm	1/2W	20% (2 used)	Ins. Res.

Resistors (Cont'd.)

Part No.	Diag. No.	Description
63-1940	R32	4.7 Megohm 1/2W 20% Ins. Res.
63-1947	R3	6.8 Megohm 1/2W 20% (2 used) Ins. Res.
63-1954	R13	10 Megohm 1/2W 20% Ins. Res.
63-1981	R26	120 Ohm 1W 10% Ins. Res.
63-2068	R18,R19	Two Section Candohm
63-2091	R15	820 Ohm W.W. 1/2W 20% Ins. Res.
63-2131	R22	Volume Control & Switch
63-2132	R11	Tone Control
63-2428	R27	82 Ohm W.W. 2W 10% Ins. Res.

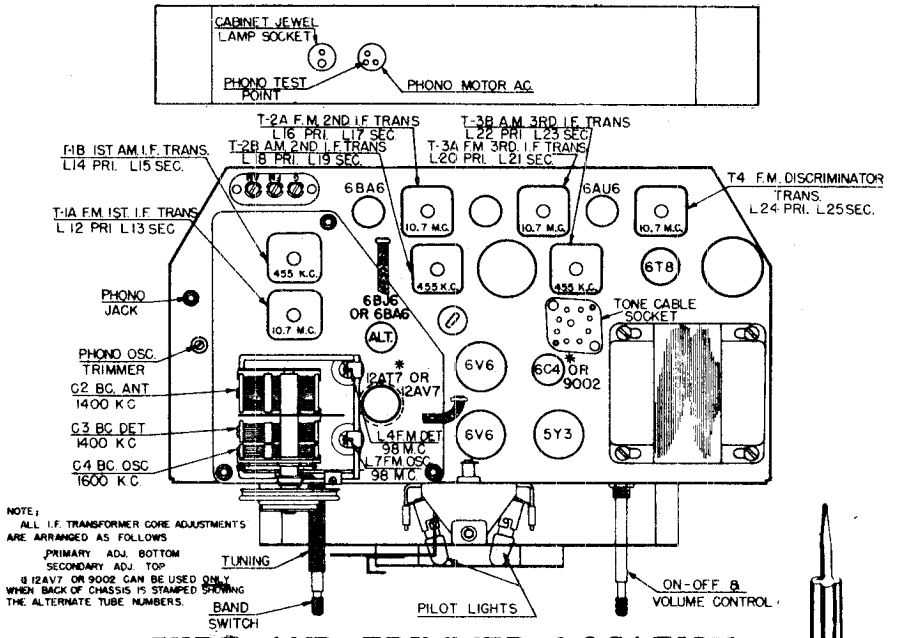
Miscellaneous

44-25		Phono Jack
54-139		3/8-32x9/16 Palnut (1 ea. used on 63-2131 & 63-2132)
54-271		6-32x1/4" Palnut Steel Cad. (1 ea. used on 95-1102-1150-1251-1153 & 2 ea. used on 95-1201 & 1248)
58-128		Two Prong Plug
78-755		Octal Tube Socket (2 used)
78-869		Miniature Tube Socket
78-870		Miniature Tube Socket (3 used)
78-871		Miniature Tube Socket
78-896		Three Contact Socket
78-903		Miniature Tube Socket (9 contact)
80-780		Iron Core Tension Spring (3 used)
80-781		Tuner Arm Tension Spring
80-865		Ground Spring (2 used)
80-868		Ground Spring (2 used)
95-505	S-2	S.P.D.T. Switch (ant.)
95-506	S-1	Band Switch
95-1039		Gang Mtg. Cup Washer (2 used)
95-1188	T6	Auto Trans.
95-1272	T5	Speaker Output Trans.
126-618		Miniature Tube Shield
149-95		Iron Core & Spring
S-16838		Speaker Cable & Eyelet Assem.

Cabinet Parts

2-196	Cabinet Back (Phono Section)
11-106	Line Cord & Plug (9 ft. long)
14-1254R	Cabinet for H880R Console Comb. Model
14-1254	Cabinet for H880 Console Combination Model
16-632	Packing Carton
19-169	Record Changer Mounting Clip
46-872	Dummy Knob
46-873	Tone Control Knob
46-876	Tuning Knob
46-877	Volume Control Knob
46-899	Band Switch Knob
49-702 SP-1	10" P.M. Speaker ZC-1061 Cone
57-1481	Esc. Clamping Ring (4 used)
57-1658	Escutcheon
57-1731	Chassis Bottom Plate
70-86	#6 x 5/8 Washer Hd. Wood Screw Steel Stat. Br. (12 used to Mt. Backs)
78-847	Two Contact Socket
80-604	Hinge Spring (2 used)
93-1059	Felt Washer (used on 46-873)
97-293	Chassis Mtg. Ins. Stud (3 used)
112-809	Record Changer Mtg. Screw (3 used)
114-128	#10 x 1/16" Hex Washer Hd. S.T. (3 used Chassis Mtg.)
114-350	#8 x 7/16" Hex Hd. Sl. S.T. (4 used on 57-1658)
125-56	Rubber Grommet (4 used Speaker Mtg.)
156-35	Bullet Catch
159-50	Cinch Plug Button (4 used on 192-138)
165-9	Glides (2 used)
165-14	Glides (2 used)
188-54	Knob Clamping Ring (46-876)
192-138	Dial Glass
202-697	F.M. Instruction Book
202-878	Radio & Phono Instruction Book
S-14029	Record Changer Variable Speed
S-15536	Record Changer Compt. Hinge Brkt. & Link Assembly (2 used)
S-15780	Cobra Tone Arm Cartridge Assembly
S-17005	Record Changer Mtg. Frame & Arm Assembly
S-16419	Package of 6 - 45 RPM Center Hole Adaptors
S-16841 L1	Low Impedance Loop & Clip Assembly
S-17167	Volume Control Knob Assembly
S-17871	Cabinet Back Assembly (Radio Section)
S-17328 L19	Loop Loading Coil Assembly

MODELS H1083E, H1084E, H1086R, H1087R, Ch. 10H20Z



TUBE AND TRIMMER LOCATION

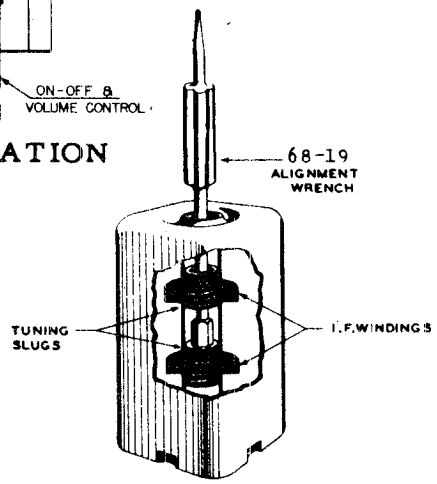
The 10H20Z chassis incorporates a superheterodyne circuit with two stages of IF, on the FM Band, and two stages on the AM Band. There is one stage of RF amplification on all Bands.

FM RF Alignment: The tuning slugs are attached to threaded shafts and the slugs are varied in the field of the coils by turning the shafts clockwise or counter-clockwise. After adjustment the shafts must be secured with a drop of speaker cement.

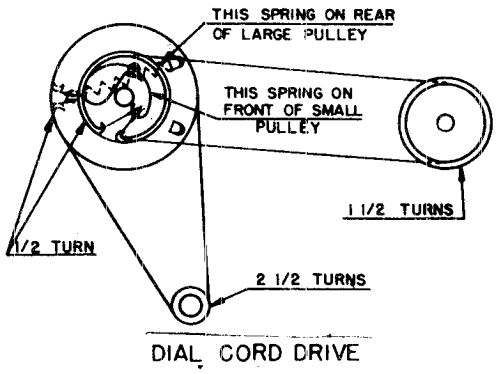
AM and FM Alignment: The AM and FM IF transformers in this reciever are of the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined below.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.



Detail of IF Transformer



DIAL CORD DRIVE

IMPORTANT

* Alignment of this chassis will in most cases be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

NOTE: If 12AT7 is replaced by a 12AV7 or vice versa the RF portion of this receiver must be realigned.

Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000-000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

The signal generator output should be kept just high enough to get an indication on the meter.

In the event the receiver oscillates during phono operation, adjust C16 4-60 mmf. capacitor to a point at which the oscillation ceases.

This position of no oscillation will sometimes vary with different cartridges, and in this case readjustment of C16 must be made.

(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (Half discriminator load).
(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (Full discriminator load).
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.
(d) Loosen Slugs by applying a hot iron to the cement.

ALIGNMENT PROCEDURE

Operation	Connect Oscillator To	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 2 12AT7 or 12AV7 Converter	.05 Mfd.	455 Kc. Modulated	BC	600 Kc.	Adj. Pri. and Sec. T1B, T2B, T3B	Align I. F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc. Modulated	BC	1600 Kc.	C4	Set oscillator to dial scale.
3	2 turns loosely cpld. to wavemagnet		1400 Kc. Modulated	BC	1400 Kc.	C3, C2	Align detector and antenna stage.
4 (a)	Pin 1 (grid) on 6 AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adj. Primary of Discriminator T4	Align primary of discriminator for maximum reading.
5 (b)	Pin 1 (grid) on 6 AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adj. Secondary of Discriminator T4	Adjust secondary of discriminator for zero reading.
6 (c)	Pin 1 (grid) on 6 BA6 2nd. I F.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adj. Pri. and Sec. T3A	Align 3rd. IF transformer for maximum reading.
7 (c)	Pin 1 (grid) on 6BJ6 1st. IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adj. Pri. and Sec. T2A	Align 2nd IF transformer for maximum reading.
8 (c)	Pin 2 (grid) on 12AT7 or 12AV7 converter tube socket	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		Adj. Pri. and Sec. T1A	Align 1st. IF transformer for maximum reading.
9 (c)	Antenna Post FM (Remove line ant.)	270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L7 Osc. Coil Slug.	Set Oscillator to dial scale.
10 (c) (d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L4 Det. Coil Slug	Align det. stage to maximum reading.

PARTS LIST

Dial Assembly

Part No.	Diag. No.	Description
78-898		Dial Light Socket & Wire
80-69		Dial Cord Spring
80-746		Pulley Retaining Spring
80-747		Dial Cord Spring
100-67	PL-1	Dial Light Bulb
188-30		Retaining Ring (used on S-17155)
S-17155		Tuning Shaft & Pulley Assem.
S-17157		Pointer & Pulley Assem.
S-17158		Dial Cord & Eyelet Assem. (Long)
S-17159		Dial Cord & Eyelet Assem. (Short)
S-17258		Dial Scale & Brkt. Assem.
S-17261		Brkt. & Pulley Bushing Assem.

Coils and Chokes

20-337		R. F. Choke Coil (10 used)
95-1150	T3A	2nd & 3rd I.F. Trans. (F.M.)
95-1153	T4	Discriminator Trans.
95-1201	T1A	1st. I.F. Trans. (F.M.)
95-1248	T1B	1st. I.F. Trans. (B.C.)
95-1249	T2B	2nd. I.F. Trans. (B.C.)
95-1254	T3B	3rd. I.F. Trans. (B.C.)
S-12603	L8	Phono Oscillator Coil Assem.
S-13800	L9	Tone Choke Assem.
S-13997	L10	Filament Choke Coil Assem.
S-15691	L7	F.M. Osc. Coil Assem.
S-15743	L4	F.M. Det. Coil Assem.
S-16344	L5	Broadcast Det. Coil Assem.
S-16345	L6	Broadcast Osc. Coil Assem.
S-16408	L3	Ant. Choke Coil Assem.

Condensers

22-3	C13	.01 Mfd. Ceramic (9 used)	500V
22-5	C22	110 Mmfd. Ceramic (or 22-1669)(4 used)	500V
22-171	C10	.05 Mfd.	600V
22-178	C33	.05 Mfd.	200V
22-348	C32	.001 Mfd. (Molded)	500V
22-492	C14	.002 Mfd.	600V
22-829	C5	.05 Mfd. (2 used)	200V
22-830	C23	.02 Mfd. (2 used)	600V
22-1203	C28	.001 Mfd. (2 used)	600V
22-1220	C17	.002 Mfd. (2 used)	600V
22-1256	C27	75 Mmfd. (Molded)	500V
22-1367	C12	50 Mmfd. Ceramic	500V
22-1506	C9	22 Mmfd. Ceramic (2 used)	500V
22-1531	C24	.2 Mfd.	200V
22-1612	C29AB-C29BB	Elct. 40 Mfd. 40 Mfd.	450V
22-1645	C25	330 Mmfd. (Molded)	500V
22-1668	C21	200 Mmfd. Ceramic	500V
22-1676	C7	.001 Mfd. Ceramic (4 used)	500V
22-1761	C31	50 Mmfd. Ceramic	500V
22-1762	C11	1 Mmfd. Ceramic	500V
22-1782	C19	.0047 Mfd. (Molded)	600V
22-1802	C26	.002 Mfd.	1600V
22-1863	C15	10 Mmfd. Ceramic	500V
22-1887	C20	25 Mmfd. Ceramic	500V
22-2104	C1	Three Section Variable	
22-2140	C6	15 Mmfd. Ceramic (2 used)	500V
22-2243	C30AB-C30BB	Elect. 20 Mfd.-350V x 40 Mfd.	450V
22-2251	C16	Trimer Cond.	
22-2276	C34	Dual Ceramic .01 Mfd.-.01 Mfd.	500V

Resistors

63-966	R12	4700 ohm 2w 20%	Carb. Res.
63-1193		5600 ohm 2w 10% (used only when 12AV7 is used or 63-2064)	Ins. Res.
63-1452	R26	270 ohm w.w. 2w 10%	Ins. Res.
63-1716		22 ohm 1/2w 20% (or 63-2446 if req.)	Ins. Res.
63-1722	R16	33 ohm 1/2w 10%	Ins. Res.
63-1723	R2	33 ohm 1/2w 20%	Ins. Res.
63-1744	R17	100 ohm 1/2w 20%	Ins. Res.
63-1758	R3	220 ohm 1/2w 20% (3 used)	Ins. Res.
63-1764	R24	330 ohm 1/2w 10%	Ins. Res.
63-1771	R8	470 ohm 1/2w 10%	Ins. Res.
63-1772	R7	470 ohm 1/2w 20%	Ins. Res.
63-1786	R9	1000 ohm 1/2w 20% (used only when 12AT7 is used)	Ins. Res.
63-1793	R14	1500 ohm 1/2w 20%	Ins. Res.
63-1799	R32	2200 ohm 1/2w 10%	Ins. Res.
63-1820	R36	6800 ohm 1/2w 10%	Ins. Res.
63-1827	R6	10K ohm 1/2w 10% (2 used)	Ins. Res.
63-1842	R22	22K ohm 1/2w 20% (2 used)	Ins. Res.
63-1845	R23	27K ohm 1/2w 10%	Ins. Res.
63-1848	R30	33K ohm 1/2w 10%	Ins. Res.
63-1849		33K ohm 1/2w 20%	Ins. Res.
63-1856	R10	47K ohm 1/2w 20%	Ins. Res.
63-1869	R29	100K ohm 1/2w 10%	Ins. Res.
63-1870	R21	100K ohm 1/2w 20%	Ins. Res.
63-1876	R27	150K ohm 1/2w 10% (2 used)	Ins. Res.
63-1884	R11	220K ohm 1/2w 20% (3 used)	Ins. Res
63-1890	R25	330K ohm 1/2w 10% (2 used)	Ins. Res

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63-1897	R33	470K ohm 1/2w	10%	Ins. Res.
63-1898	R34	470K ohm 1/2w	20%	Ins. Res.
63-1912	R1	1 Megohm 1/2w	20%	Ins. Res.
63-1926	R5	2.2 Megohm 1/2w	20% (4 used)	Ins. Res.
63-1940	R28	4.7 Megohm 1/2w	20%	Ins. Res.
63-2091	R18	820 ohm ww 1/2w	20%	Ins. Res.
63-2138	R37AB-R37BB	Candohm		
63-2139	R31	Volume Control & Switch		
63-2141	R15	22K ohm 2w	20%	Ins. Res.
63-2142	R35	130 ohm 5w	10% Zipohm	

Miscellaneous

11-85		Line Cord & Plug (6 ft. lg.)
19-212		Trans. Mtg. Clip (2 used on 95-1252)
54-306		Speed Nut (used on S-13800)
57-1736		Chassis Bottom Plate
78-580		Nine Contact Socket
78-644		Phono Connector Socket
78-755		Octal Tube Socket (3 used)
78-807		Miniature Tube Socket
78-869		Miniature Tube Socket
78-870		Miniature Tube Socket (3 used)
78-871		Miniature Tube Socket
78-896		Three Contact Socket
78-897		Two Contact Socket
78-903		Miniature Tube Socket (9 contact)
80-780		Iron Core Tension Spring (3 used)
80-781		Tuner Arm Tension Spring
80-865		Ground Spring
80-868		Grounding Spring
85-505	S2	S.P.D.T. Switch (ant)
85-508	S1	Band Switch
93-965		Rubber Washer (used on S-13800)
93-1039		Gang. Cond. Mtg. Cup Washer (2 used)
95-1252	T5	Speaker Output Trans.
95-1253	T6	Power Trans.
113-43		6-32x5/16 Hex Hd. S. T. (used on S-17258)
114-39		8-32x1/4" lgx 1/4" Hex Hd. (2 used on S-17258 & 4 used on 57-1736
126-618		Miniature Tube Shield
148-122		Tuner Arm
149-95		Iron Core & Spring (2 used)
S-17257		Speaker Cable & Eyelet Assem.

Radiorgan Esc. Parts Used on H1087R-H1086R

76-444	Radiorgan Knob Shaft (2 used)
114-297	#6 x 1/4 Hex Hd. S1. S.T. (2 used on S-17252 & S-17253)
S-14255	Radiorgan Mtg. Brkt. Assembly (2 used)
S-17246	Radiorgan Knob & Eyelet Assembly (Treble)
S-17247	Radiorgan Knob & Eyelet Assembly (Voice)
S-17248	Radiorgan Knob & Eyelet Assembly (Alto)
S-17249	Radiorgan Knob & Eyelet Assembly (Bass)
S-17250	Radiorgan Knob & Eyelet Assembly (Lo-Bass)
S-17251	Radiorgan Knob & Eyelet Assembly (Normal)
S-17252	Radiorgan Esc. & Knob Assembly (R.H.)
S-17253	Radiorgan Esc. & Knob Assembly (L.H.)

S-17255 Radiorgan Cable Assembly

15-79		Plug Cap & Insulator
22-1745		250 Mmfd. Ceramic 500V
58-195		9 Prong Plug
63-1722	R16	33 ohm 1/2W 10% Ins. Res.
63-1778	R20	680 ohm 1/2W 10% Ins. Res.
63-1813	R19	4700 ohm 1/2W 10% Ins. Res.
63-1862	R38	68K ohm 1/2W 10% Ins. Res.
63-1912	R1	1 Megohm 1/2W 20% Ins. Res.
S-14261		Radiorgan Strip & Contact Assembly (2 used)
S-17255		Radiorgan Cable Assembly

Cabinet Parts H1087R

2-214		Cabinet Back (Phono Section)
14-1279R		Cabinet for H1087R Console Combination Model
16-662		Packing Carton
19-9		Cable Clip
19-169		Record Changer Mtg. Clip (2 used)
19-210		Loop Connector Clip (2 Used)
46-872		Volume Control Knob
46-876		Tuning Control Knob
46-877		Dummy Knob
46-899		Band Switch Knob
49-693	SP-1	12" PM Speaker ZC12161 Cone & Voice Coil
57-1284		Strike Plate (3 used)
57-1481		Escutcheon Clamping Plate (4 used)
57-1666		Radio Dial Escutcheon
70-3		#5 x 1/2 R.H.W.S. Steel N.P. (1 used 19-9 & 2 used 83-1220)
70-86		#6 x 5/8 Washer Hd. Wood Screw St. Br. (8 used to Mt. 2-214)
78-891		Pilot Light Socket & Wire
80-604		Hinge Spring (2 used)
80-830		Record Changer Mtg. Spring (4 used)
83-1220		Pilot Light Socket Mtg. Strip
90-367		Pilot Light Tube
93-168		Rubber Shoulder Washer (4 used)
100-36	PL1	Pilot Light Bulb
112-808		#6 x 5/16 Phillips Rd. Hd. S.T. (4 used on Esc. Mtg.)
112-809		Record Changer Mtg. Screw (3 used)
114-350		#8 x 7/16 Hex Hd. S1 S.T. (4 used on Esc. Mtg.)
114-354		Chassis Mtg. Screw (4 used)
156-35		Bullet Catch (3 used)
159-50		Plug Button Black Oxide (2 used)
165-9		Metal Glide (2 used)
165-14		Metal Glide (2 used)
166-55		Tack Bumper (3 used)
171-7		Pilot Light Lens
188-54		Knob Clamping Ring (46-876)
192-138		Dial Glass
202-697		F. M. Instruction Book
202-882		Radio-Phono Instruction Book
S-14029		Variable Speed Record Changer
S-15528	L1	Low Impedance Loop Assembly
S-15536		Record Changer Compt. Hinge Brkt. & Link Assembly (2 used)
S-15780		Cobra Tone Arm Cartridge
S-16419		Record Adapter Plug & Envelope Assembly
S-17005		Record Changer Mtg. Fram Assembly
S-17167		Volume Control Knob Assembly
S-17255		Radiorgan Cable Assembly
S-17328	L2	Loop Loading Coil Assembly

Cabinet Parts H1086R

Model H1086R is the same as H1087R except the following:

2-192	Cabinet Back (Phono Section)
14-1251R	Cabinet for H1086R Console Combination Model
16-641	Packing Carton

Cabinet Parts H1083E

2-215	Cabinet Back (Phono Section)
14-1280E	Cabinet for H1083E Console Combination
16-666	Packing Carton
19-9	Cable Clip
19-169	Record Changer Mtg. Clip (2 used)
19-210	Loop Connector Clip (2 used)
46-876	Tunning Control Knob
46-899	Band Switch Knob
49-693	12" P.M. Speaker ZC12161 Cone & Voice Coil
57-1270	Strike Plate (2 used)
57-1481	Esc. Clamping Plate (4 used)
57-1666	Radio Dial Esc.
70-3	#5 x 1/2 R.H.W.S. Steel N.P. (1 used on 19-9 & 2 used 83-1220)
70-86	#6 x 5/8 Washer Hd. Wood Screw St. Br. (8 used to mt. 2-215)
78-891	Pilot Light Socket & Wire
80-604	Hinge Spring (2 used)
80-830	Record Changer Mtg. Spring (4 used)
83-1220	Pilot Light Socket Mtg. Strip
90-367	Pilot Light Tube
93-168	Rubber Shoulder Washer (4 used on Chassis)
100-36	Pilot Light Bulb
112-808	#6 x 5/16 Phill. Rd. Hd. S.T. (4 used esc. mtg.)
112-809	Record Changer Mtg. Screw (3 used)
114-350	#8 x 7/16 Hex Hd. S1 S.T. (4 used esc. mtg.)
114-354	Chassis Mtg. Screw (4 used)
156-33	Bullet Catch (2 used)
159-50	Plug Button (2 used)
165-9	Metal Glide (2 used)
165-14	Metal Glide (2 used)
171-7	Pilot Light Lens
188-54	Knob Clamping Ring (46-876)
192-138	Dial Glass
202-697	F.M. Instruction Book
202-882	Radio-Phono Instruction Book
S-14029	Variable Speed Record Changer
S-15528	Low Impedance Loop Assembly
S-15536	Record Changer Compt. Hinge Brkt. & Link Assembly (2 used)
S-15780	Cobra Tone Arm Cartridge
S-16419	Record Adapter Plug & Envelope Assembly
S-17005	Record Changer Mtg. Frame Assembly
S-17167	Volume Control Knob Assembly
S-17255	Radiorgan Cable Assembly (Complete)
S-17328	Loop Loading Coil Assembly

Radiorgan Esc. Parts Used on H1083E

76-444	Radiorgan Knob Shaft (2 used)
114-297	#6 x 1/4 Hex Hd. S1 S. T. (2 used on S-17252 & S-17253)
S-14255	Radiorgan Mtg. Brkt. Assembly (2 used)
S-17246	Radiorgan Knob & Eyelet Assembly (Treble)
S-17247	Radiorgan Knob & Eyelet Assembly (Voice)
S-17248	Radiorgan Knob & Eyelet Assembly (Alto)
S-17249	Radiorgan Knob & Eyelet Assembly (Bass)
S-17250	Radiorgan Knob & Eyelet Assembly (Lo-Bass)
S-17251	Radiorgan Knob & Eyelet Assembly (Normal)
S-17252	Radiorgan Esc. & Knob Assembly (R.H.)
S-17253	Radiorgan Esc. & Knob Assembly (L.H.)

MODELS H1083E, H1084E,
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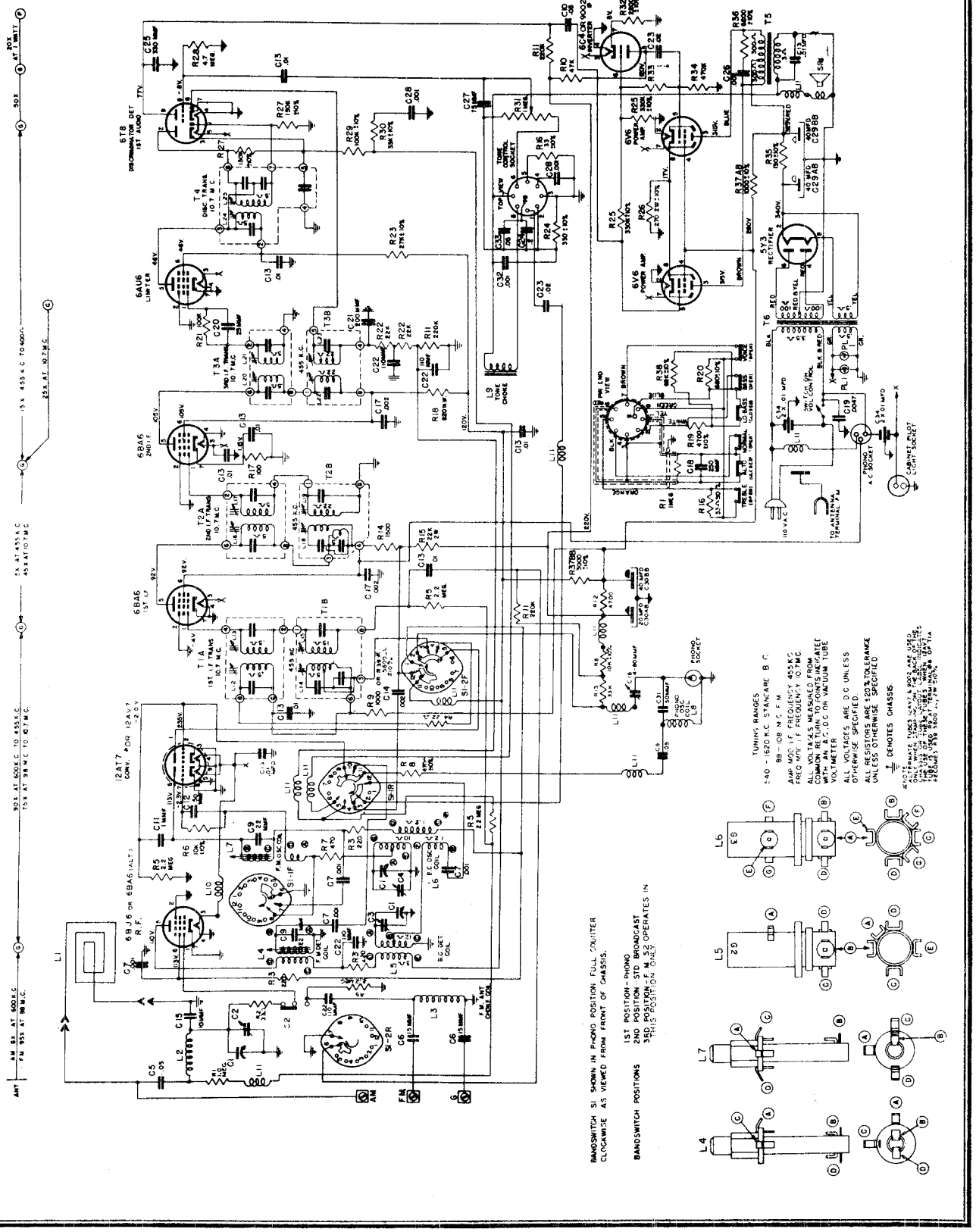
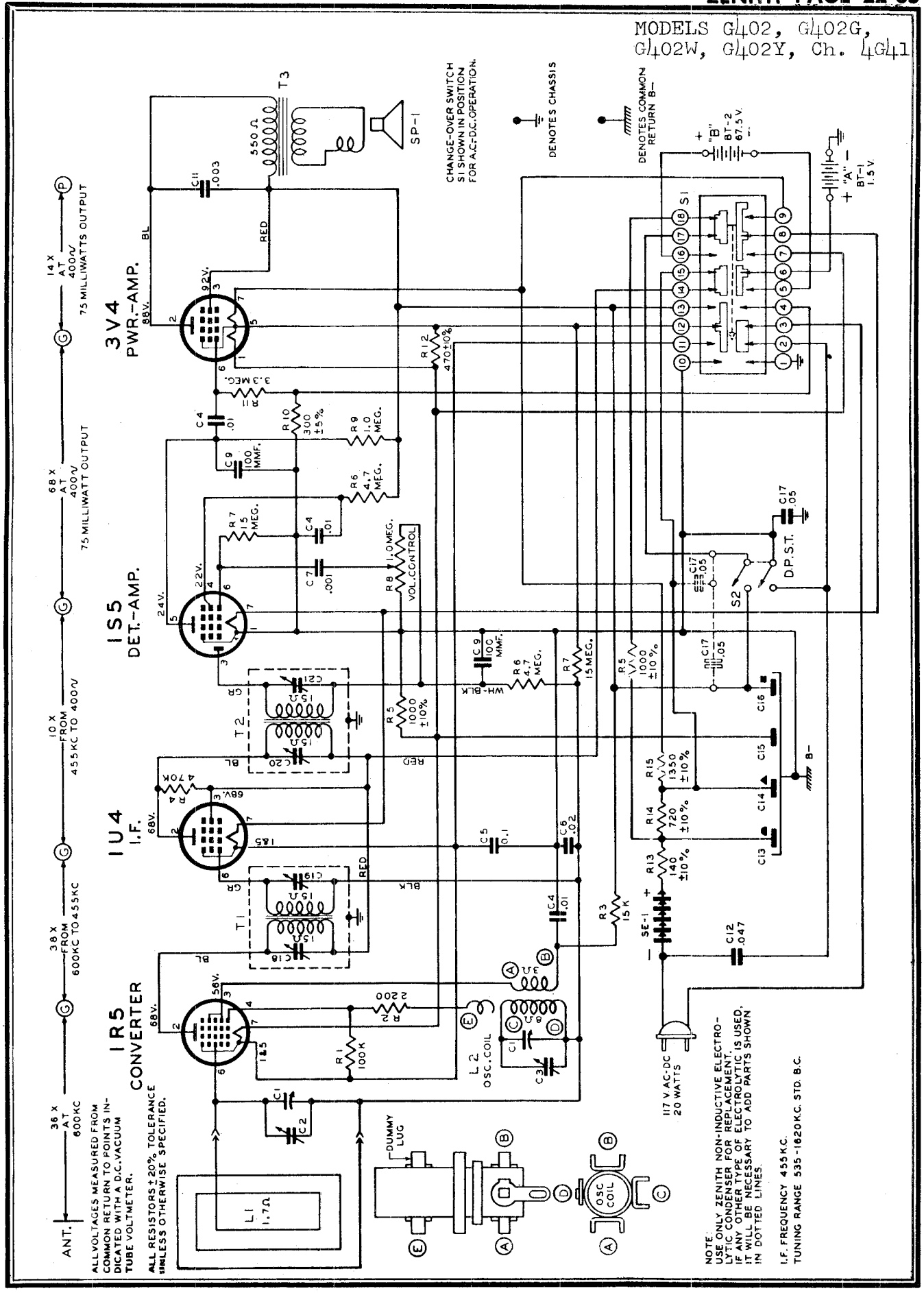
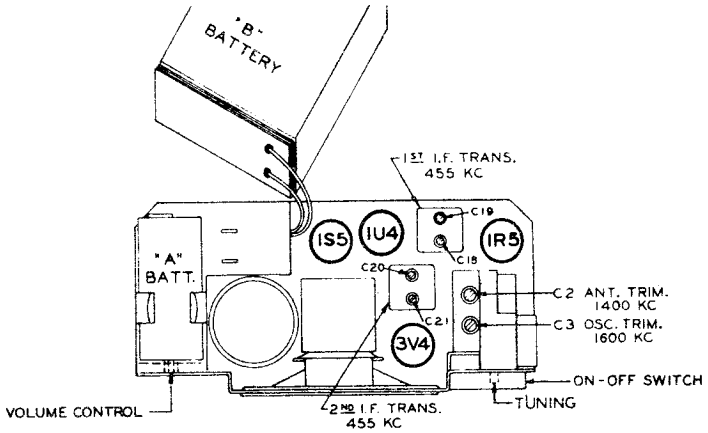
10H20Z



MODELS G402, G402G, G402W, G402Y, Ch. 4G41



TUBE AND TRIMMER LOCATION



Final alignment of the 4G41 chassis should be made with the chassis installed in the cabinet. Tune in a weak station in the vicinity of 1400 KC and adjust the antenna trimmer for maximum.

ALIGNMENT PROCEDURE

Operation	Connect Oscillator To	Dummy Antenna	Input Sig. Frequency	Set Dial At	Trimmers	Purpose
1	Converter Grid	1 MFD	455 Kc.	600 Kc.	C18, C19, C20, C21	Align I.F.
2	One Turn Loosely		1600 Kc.	1600 Kc.	C3	Set Oscillator To Scale --
3	Coupled to Wavemagnet		1400 Kc.	1400 Kc.	C2	Adjust for Maximum.

PARTS LIST

PART NO.	DIAG. NO.	DESCRIPTION
		DIAL ASSEMBLY
12-1374		Volume Control Mtg. Brkt.
46-683		Front Cover Latch Knob
46-684		Tuning Control Knob
46-684Y		Tuning Control Knob (W & Y Model only)
46-736		"On-Off" Switch Knob
46-736Y		"On-Off" Switch Knob (Y Model only)
46-736W		"On-Off" Switch Knob (W Model only)
46-737		Volume Control Knob
46-737Y		Volume Control Knob (W & Y Model only)
59-200		Dial Pointer
		COILS & CHOKES
95-1243	T1	1st I.F. Transformer
95-1244	T2	2nd I.F. Transformer
S-13774	L2	Osc. Coil Assembly
		CONDENSERS
22-3	C4	.01 Mfd. Ceramic (Disc) 500V
22-326	C11	.003 Mfd. 400V
22-827	C5	.1 Mfd. 200V
22-829	C17	.05 Mfd. 200V
22-1386	C6	.02 Mfd. 200V
22-1457	C1	Two Section Variable Cond.
22-1669	C9	100 Mmfd. Ceramic 500V
22-1676	C7	.001 Mfd. (Molded) (or 22-1343) 500V
22-1775	C12	.047 Mfd. (Molded) (or 22-1756) (or 22-1914) 400V
22-2036	C13,14	Four Section Elect. 40-40-20 Mfd.
	C15,16	150V - 200 Mfd. 10V
		RESISTORS
63-1651	R8	Volume Control
63-1762	R10	300 Ohm 1/2W 5% Ins. Res.
63-1771	R12	470 Ohm 1/2W 10% Ins. Res.
63-1785	R5	1000 Ohm 1/2W 10% Ins. Res.
63-1800	R2	2200 Ohm 1/2W 20% Ins. Res.
63-1835	R3	15K Ohm 1/2W 20% Ins. Res.
63-1870	R1	100K Ohm 1/2W 20% Ins. Res.
63-1898	R4	470K Ohm 1/2W 20% Ins. Res.
63-1912	R9	1 Megohm 1/2W 20% Ins. Res.
63-1933	R11	3.3 Megohm 1/2W 20% Ins. Res.

PART NO.	DIAG. NO.	DESCRIPTION
63-1940	R6	4.7 Megohm 1/2W 20% Ins. Res.
63-1961	R7	15 Megohm 1/2W 20% Ins. Res.
63-1999	R13	140 Ohm 3W (Zipohm) 10% Ins. Res. (or 63-2014).
63-2024	R14,15	Two Section Candohm
		MISCELLANEOUS
11-102		Line Cord & Plug
12-1379		Handle Support Brkt. (R.H.)
12-1380		Handle Support Brkt. (L.H.)
14-907		Cabinet for 4G800
14-907Y		Cabinet for 4G800 (Black)
14-907W		Cabinet for 4G800 (White)
19-164		"A" Battery Retaining Clip
24-462		Switch Cover
24-525		Wavemagnet Cover
24-525Y		Wavemagnet Cover (Y Model only).
24-526		Wavemagnet Cover (W Model only).
24-522		Cabinet Cover
24-522Y		Cabinet Cover (Y Model only)
24-522W		Cabinet Cover (W Model only)
43-149		Handle End Pieces (2 used)
49-665	SP1	3-1/2" P.M. Speaker
		208-665 Cone & Voice Coil
54-254		Speed Nut - Tinnerman (3 used on 83-1416)
57-1314		Cabinet Front Plate
57-1315		Chassis Bottom Plate
78-274		Elect. Cond. Socket
78-781		Miniature Tube Socket
78-782		Miniature Tube Socket
80-564		"B" Battery Retaining Spring
80-567		Latch Spring
80-611		Latch Spring
80-612		"A" Battery Front Contact Spring
83-1416		Decorative Strip
83-1417		Rubber Strip - Handle
83-1428		Wavemagnet Retaining Strip
83-1513		"B" Battery Terminal Strip
85-433	S2	On-Off Switch
85-454	S1	Power Change-Over Switch
93-870		Fibre Shoulder Washer
93-935		.015 x 7/16" x 3/4" Armite Washer
94-295		Gang Cond. Mtg. Bushing (3 used)
95-1014	T3	Output Transformer
110-127		Grill Cloth
112-56		#6 x 1/4" Hex Hd. S.T. Screw Cad. (3 used S-15482, 2 used 126-539)
		MISCELLANEOUS Cont'd
112-322		#2 x 3/16" Phill. Oval Hd. S.T. Screw (4 used on Wavemagnet & Cover)
112-407		#6 x 3/8" Rd. Hd. S.T. Screw Cad. Pl. (2 used to mount ea. 43-149)
112-685		#4 x 3/16" Flt. Hd. S.T. Screw Cad. (4 used on Wavemagnet & Cover)
112-711		#4 x 1/4" B.H. S.T. Screw Stat. Br. (8 used)
113-17		#6-32 x 1/4" R.H. M.S. Steel N.P. (2 used Chassis Mtg.)
114-58		#6-32 x 3/8" Hex Hd. MS Steel (3 used 22-1457)
125-17		Rubber Grommet (3 used 22-1457)
125-58		Strain Relief Grommet
125-59		Strain Relief Grommet
126-539		Volume Control & Power Switch Shield
199-79		Flexible Handle Sleeve
199-79Y		Flexible Handle Sleeve (Y & W Model only)
202-757		Instruction Book
212-5	SE1	Selenium Rectifier
S-13777		Power Switch Shield Assembly
S-13786	L1	Wavemagnet Winding Assembly
S-13848		Hinge & Wire Assembly (R.H.)
S-13849		Hinge & Wire Assembly (L.H.)
S-13850		Spring & Insulator Strip Assembly
S-14755		Handle Strip Assembly
S-15485		Shield & Battery Retaining Spring Assembly
S-16125		Bottom Cover & Latch Assembly
		BATTERIES
Z-67		"B" Battery
Z-2NL		"A" Battery (or Z-4NL or two Z-3NL)
		CABINET PARTS for MODEL G402G (Chassis 4G41) ONLY
14-1252		Plastic Cabt. for G402G Portable Model
16-561		Packing Carton
24-551		Wavemagnet Cover
24-552		Cabinet Cover
43-192		Handle End Pieces (2 used)
46-868		Front Cover Latch Knob
46-869		Tuning Control Knob
46-870		"On-Off" Switch Knob
46-871		Volume Control Knob
57-1659		Cabinet Front Plate
83-1793		Decorative Strip
99-139		Flexible Handle Sleeve

MODEL H503,
Ch. 5H41

The 5H41 chassis is an AC, DC or battery operated superheterodyne. The chassis is isolated from the DC circuit, and all measurements must be made from a common negative point. The most convenient place to reach this negative point is the negative side or container of the electrolytic. When the change-over Switch S1 is in AC position, the DC resistance from chassis to any circuit must be almost infinite. If any circuit becomes grounded a hum will result. Microphonic tubes will cause audio howl. Check the 1L6 and 1S5.

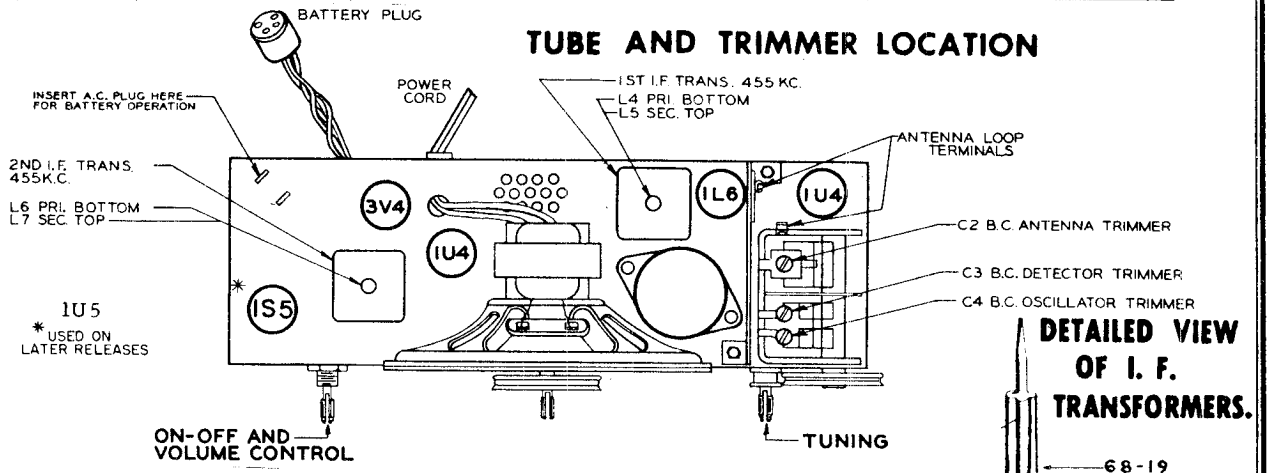
If the R.F. becomes weak or dead, check the D.C. resistance of the wavemagnet. This D.C. resistance should be approximately .9 ohm. If it is open check the wavemagnet.

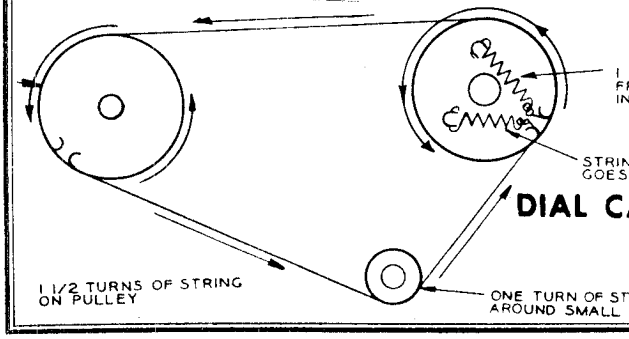
IF Alignment: Remove the chassis from the cabinet and arrange the units so that the wavemagnet can be connected. All the connections and adjustments can be made from the top of the chassis. Connect a signal generator, through a .1 mfd. dummy antenna, to the converter grid and B - (common return). Connect an output meter across the voice coil of the speaker (two lugs provided). Set the signal generator to 455 Kc. and adjust L4, L5, L6 and L7 for the maximum indication on the output meter. Always keep the signal output from the generator just high enough to get an indication, otherwise excessive loading may result.

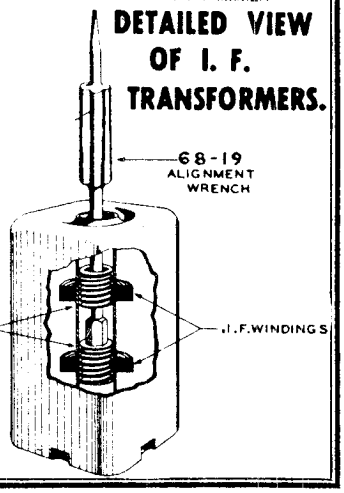
RF Alignment: Connect a two turn loop across the leads of the signal generator, loosely couple this loop to the wavemagnet. Set the signal generator and the dial pointer of the receiver to 1600 Kc. and adjust C4 oscillator trimmer to resonance. Set the signal generator and dial pointer to 1400 and adjust C2 and C3 antenna detector trimmers to resonance. These trimmers are on the top of gang condenser. Check operation and re-install set in cabinet. Tune in a weak station near 1400 Kc. or use background noise and re-adjust antenna trimmer for maximum sensitivity.

The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I.F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I.F. transformers the tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

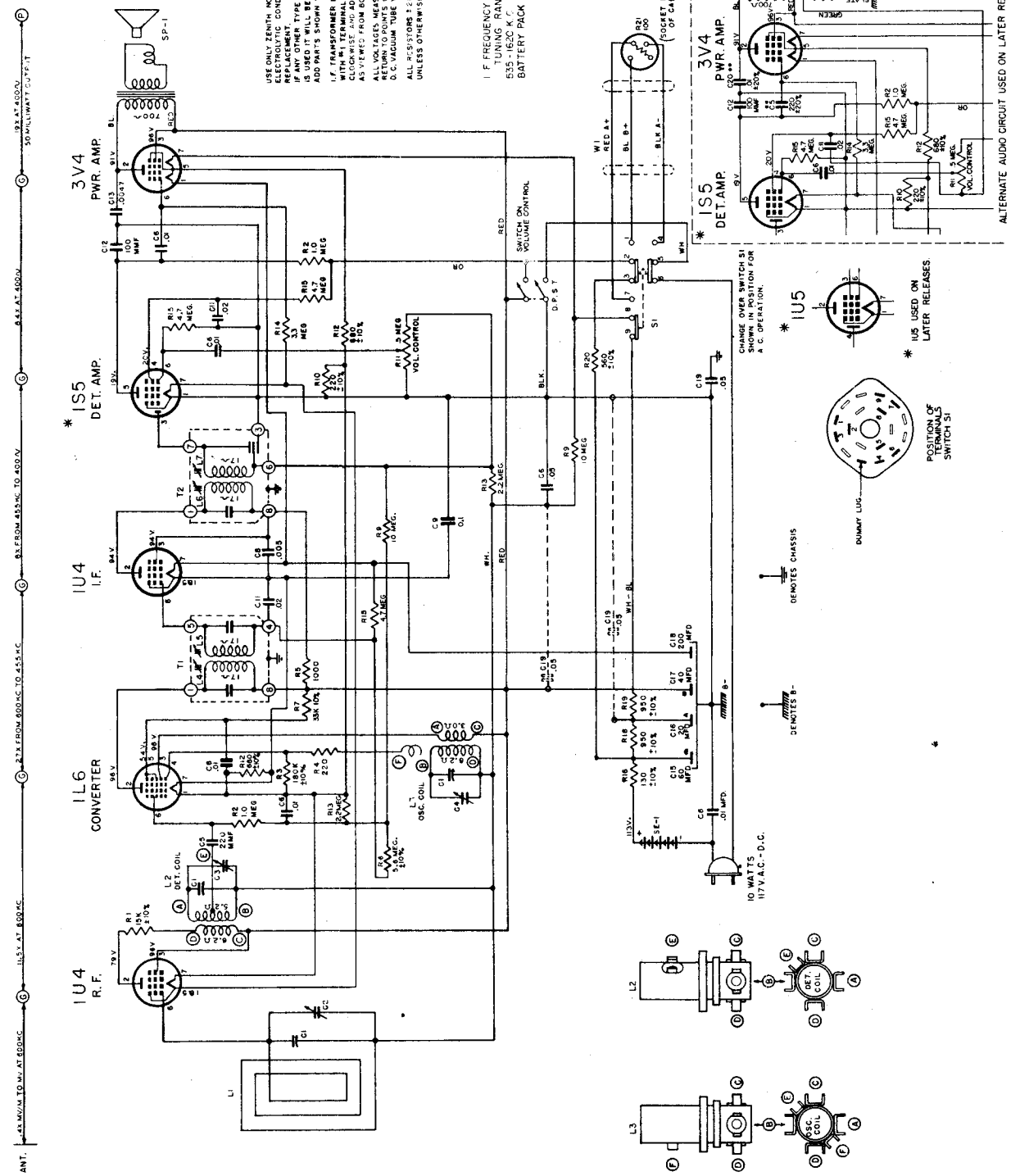
OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	BAND	SET DIAL TO	TRIMMERS	PURPOSE
1	Converter Grid	.1 Mfd	455 Kc.	BC	600 Kc.	L4, 5, 6 & 7	I.F. Alignment
2	Two turns loosely coupled to Wavemagnet		1600 Kc.	BC	1600 Kc.	Osc. Trim. C4	Set Oscillator to scale
3	Two turns loosely coupled to Wavemagnet		1400 Kc.	BC	1400 Kc.	Ant. & Det. Trims. C2 & C3	Align Wavemagnet





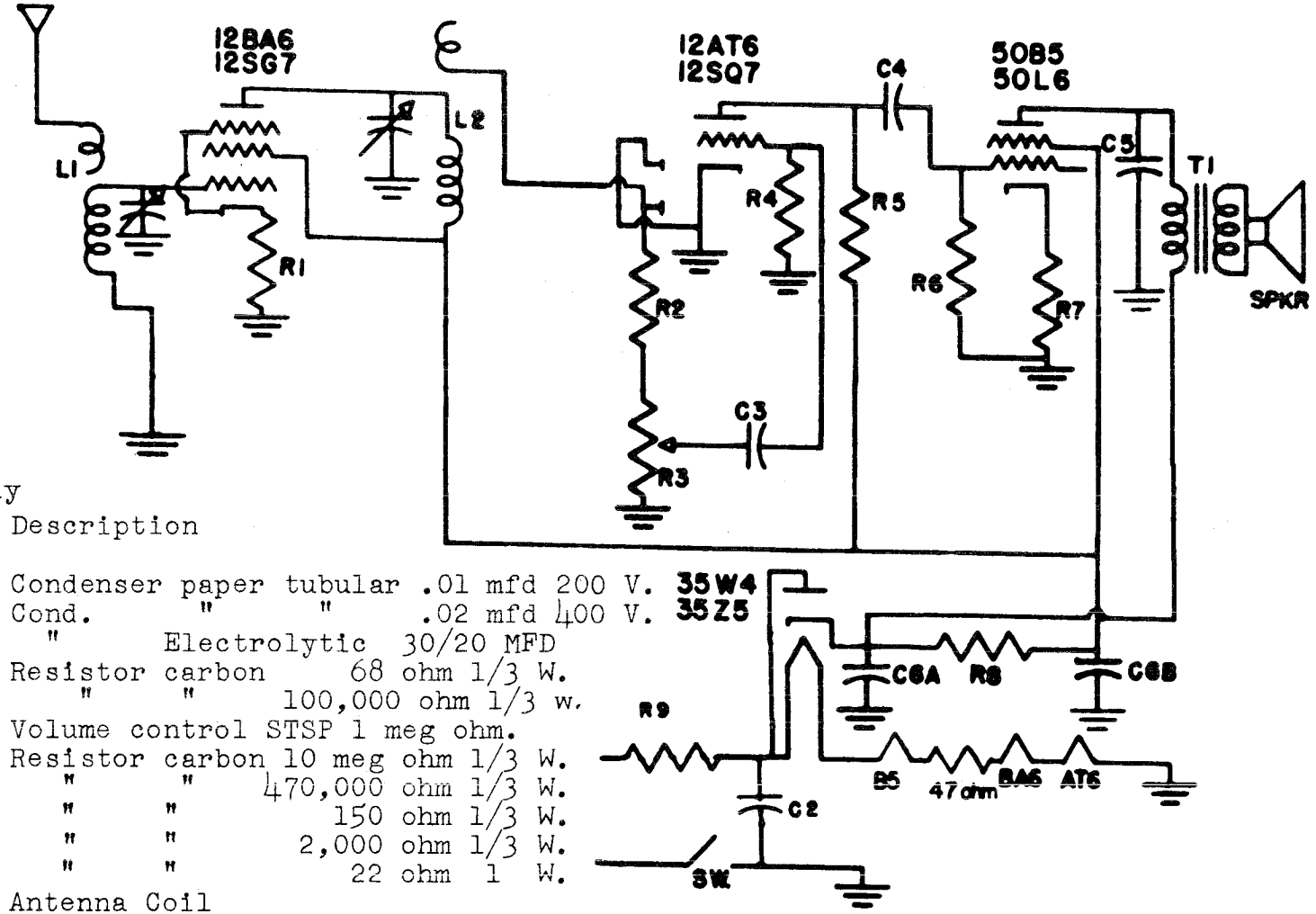


MODEL H503,
Ch. 5H41



Part No.	Diag. No.	Description					
		Dial Assembly					
46-933		Tuning & Vol. Control Knob (2 used)					
59-261		Dial Pointer					
80-209		Dial Cord Tension Spring (2 used)					
188-32		Retaining Ring (2 used on Pointer Shaft Assy.)					
S-18101		Pointer Shaft & Pulley Assy.					
S-18102		Tuning Shaft & Pulley Assy. (used S-17845)					
S-18103		Pulley Mtg. Strip & Bushing Assy.					
S-18104		Dial Cord & Eyelet Assy.					
S-18186		Esc. & Dial Scale Assy. (Complete)					
		Coils & Chokes					
95-1132	T1	1st. I.F. Transformer					
95-1133	T2	2nd. I.F. Transformer					
S-15811	L2	Detector Coil Assembly					
S-15812	L3	Osc. Coil Assembly					
		Condensers					
22-3	C6	.01 Mfd. Ceramic (Disc) (5 used)					500V
22-182	C5	220 Mmfd. (Molded) Mica					500V
22-319	C8	.005 Mfd.					200V
22-827	C9	.1 Mfd.					200V
22-829	C19	.05 Mfd. (2 used)					200V
22-1182	C20	.01 Mfd.					400V
22-1386	C11	.02 Mfd. (2 used)					200V
22-1669	C12	100 Mmfd. Ceramic					500V
22-1741	C15,16 17, 18	Four Section Elect. Cond.					
22-1782	C13	.0047 Mfd. (Molded)					600V
22-2323	C1	Three Section Gang Cond.					
		Resistors					
63-1362	R18,19	Two Section Candohm					
63-1744	R21	100 ohm	1/2W	20%	Ins.	Res.	
63-1757	R10	220 ohm	1/2W	10%	Ins.	Res.	
63-1758	R4	220 ohm	1/2W	20%	Ins.	Res.	
63-1775	R20	560 ohm	1/2W	10%	Ins.	Res.	
63-1778	R12	680 ohm	1/2W	10%	Ins.	Res.	(2 used)
63-1786	R5	1000 ohm	1/2W	20%	Ins.	Res.	
63-1834	R1	15K ohm	1/2W	10%	Ins.	Res.	
63-1848	R7	33K ohm	1/2W	10%	Ins.	Res.	
63-1880	R3	180K ohm	1/2W	10%	Ins.	Res.	
63-1912	R2	1 Megohm	1/2W	20%	Ins.	Res.	(2 used)
63-1926	R13	2.2 Megohm	1/2W	20%	Ins.	Res.	(2 used)
63-1933	R14	3.3 Megohm	1/2W	20%	Ins.	Res.	
63-1940	R15	4.7 Megohm	1/2W	20%	Ins.	Res.	(3 used)
63-1943	R6	5.6 Megohm	1/2W	10%	Ins.	Res.	
63-1954	R9	10 Megohm	1/2W	20%	Ins.	Res.	(2 used)
63-2018	R16	130 ohm	3W WW	10%	Ins.	Res.	
63-2371	R11	Volume Control & Switch					
		Miscellaneous					
11-104		Line Cord & Plug					
14-1337		Cabinet for H503 - Portable Model					
14-1338		Cabinet for H503Y - Portable Model					
15-51		Cable Socket Cap & Insulator (part of S-18111)					
16-721		Packing Carton					
24-576		Wavemagnet Cover					
40-113		Cabinet Back Cover Hinge (2 used)					

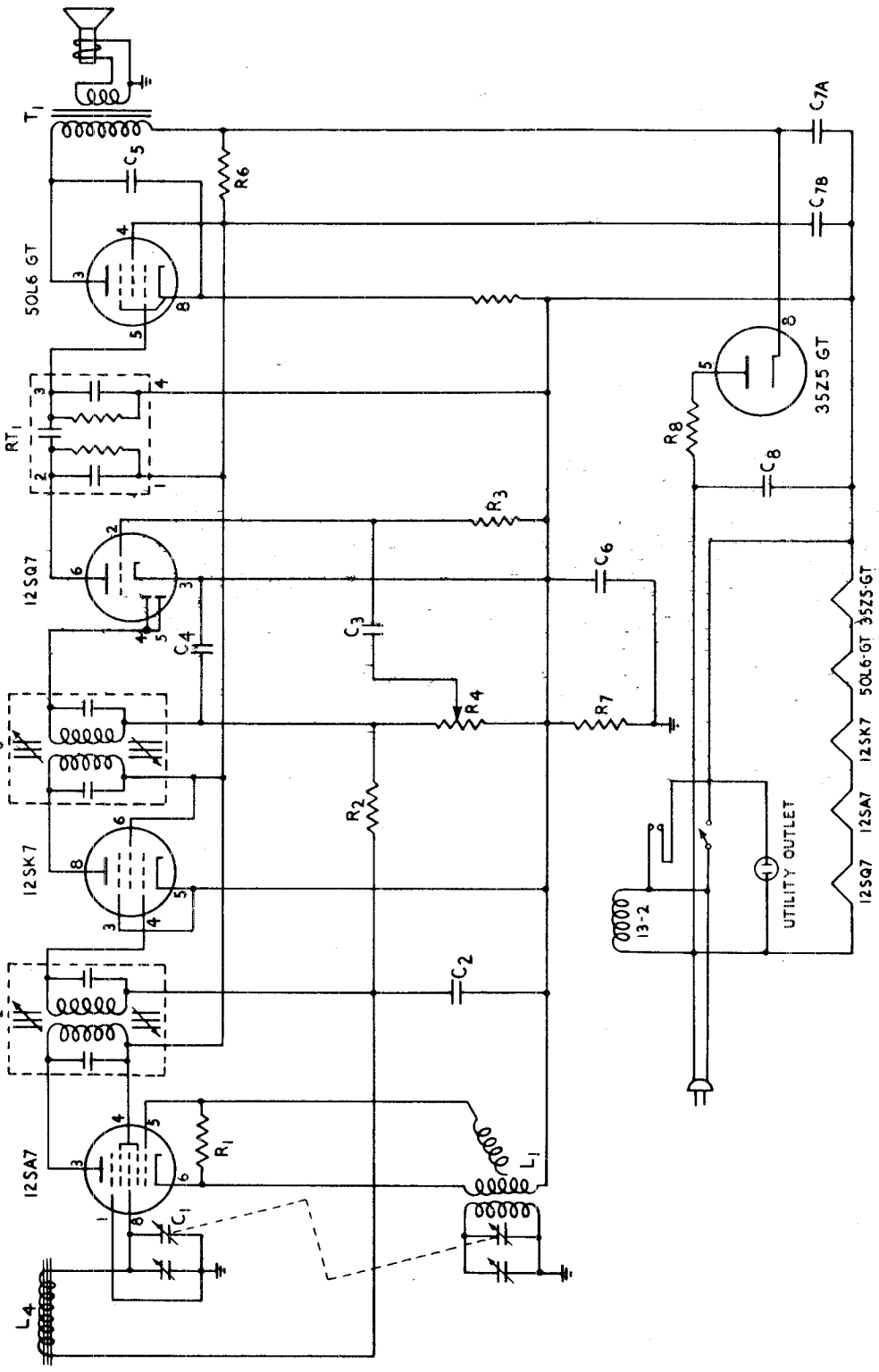
Part No.	Diag. No.	Description
43-206		Handle Housing (2 used)
49-709	SP1	5 1/4" PM Speaker ZC529G Cone & Voice Coil 206CZ709 Output Transformer
49-711	SP2	5 1/4" PM Speaker ZC529G Cone & Voice Coil 206CZ711 Output Transformer
54-31		10-32 x 3/8" x 1/8" Hex Nut Steel (used on 112-835)
54-34		#6-32 x 1/4" x 3/32" Hex Nut Steel (used on 212-10)
57-1721		Emblem Plate
70-162		#6 x 5/8 Phill R.H. Wood Screw (4 used to Mt. Esc.)
70-172		#4 x 1/4 Phill R.H. Wood Screw (2 used to Mt. Wavemagnet)
70-173		#6 x 3/8 Phill R.H. Wood Screw (4 used to Mt. Esc.)
70-174		#2 x 5/16 Phill R.H. Wood Screw St. Br. (6 used to Mt. 24-576)
78-274		Elect. Cond. Socket
78-543		Battery Cable Socket (4 contact)
78-782		Miniature Tube Socket (2 used)
78-807		Miniature Tube Socket (2 used)
78-912		Miniature Tube Socket
80-461		Contact Spring
82-33		Handle Strap
85-511	S1	Power Change-over Switch (or 85-515)
93-125		#6 Int. Shakeproof Lockwasher (used on 212-10)
93-369		#10 Int. Shakeproof Lockwasher #1210 (1 used on each 112-835)
93-1081		.031 x 1 3/64 x 5/8 Steel Washer Cad. & Tin Plate (1 used on ea. 112-835)
94-334		Gang Cond. Mtg. Bushing (3 used)
112-835		Handle Mtg. Screw (2 used)
112-836		4-40 x 1/4" Phill R.H.S.P. screw (2 used on Mtg. Wavemagnet)
114-251		10-32 x 5/8" Hex Sl. Washer Hd. M.S. Steel (2 used chassis Mtg.)
114-311		6-32 x 1" Lg. x 1/4" A.F. Hex Hd. M.S. (used on 212-10)
125-81		Strain Relief Grommet - Male
125-82		Strain Relief Grommet - Female
157-7		Strike Fastener (2 used)
157-8		Strike Fastener (2 used) (or 156-19)
159-81		Snap Fastener Stud
166-44		Rubber Bumper
166-68		Rubber Feet (4 used)
196-181		Speaker Gasket
202-889		Instruction Book
212-10	SE1	Selenium Rectifier
S-18111	W1	Btry. Cable & Socket Assy.
S-18190	L1	Wavemagnet Assy.
S-18193		Cover Latch & Brkt. Assy.
S-18194		Cover Latch & Brkt. Assy. (Y Model only)
S-18205		Front Cover Hinge & Wire Assy. (R.H.)
S-18206		Front Cover Hinge & Wire Assy. (L.H.)



For CW-500 Assembly

Ck Sym.	Part No.	Description
C5	CP-12103	Condenser paper tubular .01 mfd 200 V.
C2	CP-14203	Cond. " " .02 mfd 400 V.
C6A,C6B	CL-10017	" Electrolytic 30/20 MFD
R1	RC-10680	Resistor carbon 68 ohm 1/3 W.
R2	RC-11003	" " 100,000 ohm 1/3 w.
R3	VC-12106	Volume control STSP 1 meg ohm.
R4	RC-11005	Resistor carbon 10 meg ohm 1/3 W.
R5, 6	RC-14703	" " 470,000 ohm 1/3 W.
R7	RC-11500	" " 150 ohm 1/3 W.
R8	RC-32001	" " 2,000 ohm 1/3 W.
R9	RC-40220	" " 22 ohm 1 W.
L1	TRF-10047-A	Antenna Coil
L2	TRF-10011-B	Interstage coil 15 uuf capacity turn
T1	TO-10000	Output Transformer
SPKR.	SR-10005	Round 3" speaker
C4	CP-12502	Condenser paper tubular .005 mfd 200V.
C3	CP-12202	" " " .002 mfd 200V.

MODELS 51C3,
51CU4



R1=22000 OHM 1/4 W
R2=2.2 MEGOHM 1/4 W
R3=10 MEGOHM 1/4 W
R4=.5 MEGOHM VOLUME CONTROL
R5=150 OHM 1/4 W
R6=1500 OHM 1W
R7=150000 OHM 1/4W
R8=22 OHM 1/4 W
C1=VARIABLE 290/105 MMFD.
C2=.05 MFD. 200V
C3=.005 MFD. 600 V
C4=100 MMFD.
C5=.02 MFD. 400 V
C6=2 MFD. 200 V
C7A C7B=40 MFD. 150 V
C8=.05 MFD. 400 V
RT1=COUPLING NETWORK-YA-400-001A
L1=OSC. COIL
L2 L3=455 KC. I.F.
L4=ANT.
T1=OUTPUT TRANSFORMER

DATE:- 4-27-51

Admiral 6C71-71A, Ch. 10A1; 7C62-62A, Ch. 6M1; 7C63-63A, Ch. 7C1

Model 6C71-71A is a console combination using radio chassis 10A1 and record changer RC200. Model 7C62A-62A, Ch. 6M1, and Model 7C63A-63A, Ch. 7C1, are console combinations and use either record changer RC17(or RC170A.

Admiral 6P32, Ch. 6E1; 7P35, Ch. 5H1

Model 6P32 uses chassis 6E1 and Model 7P35 uses chassis 5H1. These models are leatherette portables using an a-c—d-c battery.

Admiral 6RT41, 6RT42, 6RT43, Ch. 5B1-PH

Models 6RT41, 6RT42, and 6RT43 use radio chassis 5B1-PH. The 6RT41 is a plastic table combination using record changer RC160 or RC160A. The 6RT42 and the 6RT43 are wood table combinations using radio chassis 5B1-PH and record changers RC160 or RC160A. In addition to the RC160 and RC160A, the 6RT42 may use an RC150 record changer.

Admiral 6RT41A, 6RT42A, 6RT43A Ch. 5B1A

Model 6RT41A is a plastic table combination using radio chassis 5B1A and record changers RC160 or RC160A. Models 6RT42A and 6RT43A are wood table combinations using radio chassis 5B1A and record changer RC160 or RC160A.

Admiral 6T01, 6T05, Ch. 6A1

Model 6T01 is a plastic table model using chassis 6A1. Model 6T05 is a wood table model using chassis 6A1.

Admiral 6T02, 6T04, Ch. 5B1

Models 6T02 and 6T04 are table models using chassis 5B1. Model 6T02 has a plastic cabinet, while Model 6T04 has a wood cabinet.

Admiral 6T06, 6T07, Ch. 4A1

Models 6T06 and 6T07, Ch. 4A1, are wood table models using a farm battery.

Arvin 540T, Ch. RE-278

Model 540T is the same as model 440T, chassis RE-278, except for the part numbers listed below.

Ref. No.	*Part No.*	*Description*
R3	C23068	Resistor, Volume Control, 2 meg.
C2A,	C2BA20375	Condenser, I. F. Trans. Trimmers
T2	C22878-1	Output Transformer
T1	C22863-1	I. F. Transformer
L1	C22864-1	Antenna Coil
L2	C22865-1	Oscillator Coil
—	E24328-1	Cabinet with grille cloth, Ivory
—	C24096-1	Ivory cabinet, rear cover
—	E24328-1	Cabinet with grille cloth, citron
—	C24096-8	Citron cabinet, rear cover
—	E24328-7	Cabinet with grille cloth, flame
—	C24096-7	Flame cabinet, rear cover
—	E24328-9	Cabinet with grille cloth, cherry
—	C24096-9	Cherry cabinet, rear cover
—	E24328-10	Cabinet with grille cloth, Avocado, green
—	C24096-10	Cabinet rear cover, Avocado, green
—	E24328-11	Cabinet with grille cloth, Pebble
—	C24096-11	Cabinet, rear cover, Pebble
—	A24372-1	Arvin Name—on cabinet
—	A24084	Couplate
—	A24330-1	Knob, volume
—	C24331-1	Knob, dial
—	A18136	Antenna hank

Capehart-Farnsworth P-777

The rubber belt may run off the 78-rpm drive, due to the motor mounting frame being bent slightly, causing misalignment of the shafts. This should not be difficult to check and if bent, to correct. If, for some reason, it proves impossible to effect permanent correction, then the only solution would obviously be replacement of the motor assembly.

Also check for excessive friction in the 45-rpm bearing. This pulley may be removed, and, if there is any tendency to excess friction, ream it out slightly, apply lubricant, wipe off the excess lubricant and replace. This may also be the correction for one of those hard to locate sources of "wow" or speed variation, noticeable especially on 33- and 45-rpm records.

Farnsworth P71, P72, P73; Capehart-Farnsworth P77, P777

The failure of the changer to shut off after playing the last record may be caused by dust or foreign particles collecting between the inner tube (No. 11379) and the outer tube (No. 55334) or by corrosion on the two parts, making their movement sluggish. This may be checked easily. The weight of a 10" record on the single speed changer and a 7" record on the dual and triple speed changed should hold the spindle down. When the record is dropped to the turntable, the unloaded spindle should raise up approximately 1/16". If the spindle does not raise freely, it should be disassembled and cleaned. If corrosion is discovered after disassembly of the spindle, it may be removed from the compression rod (part of No. 13674) and from the outer surface of No. 11379 by polishing with crocus cloth. The best way to remove corrosion from the inner wall of part No. 11379 is to use a pipe cleaner, rouge and a rust solvent. After cleaning thoroughly in this manner, an unused pipe cleaner should be inserted in order to remove any remaining rouge and rust solvent before re-assembly of the parts. *Do not use any lubricant.* The same will apply to the inner wall of the outer tube No. 55334. When re-assembling, be sure that the small washer, No. 55345, between the spring collets and the rubber is installed cup side down. If installed with the cup side up, two or more records will drop. As a final note on this point, spindle corrosion has nothing whatsoever to do with failure to drop records properly, unless, of course, the spindle parts are completely "frozen."

Failure of the changer to drop records properly may be caused by a spring collet, or by improper adjustments. In checking for proper adjustment, there are three dimensions which must be observed closely. Adjusting nut No. 37344 on the bottom of No. 13674 spindle must be set so that rubber washer, part No. 62152, when fully compressed does not exceed 0.337 inches in diameter. Original engineering specifications on this part were 0.312 to 0.325. In order to operate more satisfactorily on older records, this was later increased to 0.335 to 0.337, although the original specifications should be entirely satisfactory on new records which are in good condition. If necessary to change adjusting nut No. 37344, be sure locknut No. 2015-002 is tightened securely.

Chevrolet 986067

Model 986067 is designed expressly for 1947, '48, '49, and '50 Chevrolet trucks. In checking voltages of the 986067, it will be necessary to remove the rear cover of receiver and remove radio chassis from the case. Hook up radio on the service bench to a 6-volt power unit or a fully charged battery. The master selector switch of the volt-ohm-milliammeter should be set to the 12 position and the voltage selector switch to D.C. 1K/v position. Place test leads in jacks marked "test leads," ground the negative lead to the radio chassis for ground, with the red lead check all tube pins marked "H" which show a reading on voltage chart. Now set the Master selector switch to the 600 position and the voltage selector switch to A.C. 1K/v position. With red lead check the two terminals marked "P" on the OZ4 tube, both should read 270 to 280 volts a.c. each. If incorrect or no voltage check the following:

1. Check or replace capacitors (Illus. Nos. 31 and 32).
2. Check or replace resistor (Illus. No. 47).
3. Check or replace power transformer.
4. Check or replace vibrator.
5. Check or replace OZ4 tube socket.

Now change the Master selector switch to the 300 position and the voltage selector switch to D.C. 1K/v position. Pin "K" on OZ4 should read 245 to 255 volts d.c. If incorrect or no voltage, check or replace OZ4 tube.

Pin "P" on the 6V6GT tube should read 235 to 245 volts d.c. If incorrect or no voltage, check the following:

1. Check or replace electrolytic capacitor (Illus. No. 24B).
2. Check or replace resistors (Illus. Nos

Pin "S" on the 6V6GT tube should read 200 to 210 volts d.c. If incorrect or no voltage, check the following:

1. Check or replace electrolytic capacitor (Illus. No. 24C).
2. Check or replace resistors (Illus. Nos. 48 and 49).

Pin "K" on the 6V6GT tube should read 10 to 14 volts. If incorrect or no voltage check the following:

1. Check or replace electrolytic capacitor (Illus. No. 25A).
2. Check or replace resistor (Illus. No. 45).

Pin "P" on 6SQ7 tube should read 65 to 75 volts d.c. If incorrect or no voltage check the following:

1. Check or replace capacitors (Illus. Nos. 25, 26, and 32).
2. Check or replace resistor (Illus. No. 43).

Pin "P" on 6SK7 intermediate frequency amplifier tube should read 200 to 210 volts d.c. If incorrect or no voltage, check or replace the intermediate frequency transformer

Pin "S" on 6SK7 i-f amplifier tube should read 60 to 70 volts d.c. If incorrect or no voltage, check the following:

1. Check or replace resistor (Illus. No. 38).
2. Check or replace capacitor (Illus. No. 17).

Pin "P" on the 6SA7 tube should read 200 to 210 volts d.c. If incorrect or no voltage, check or replace intermediate frequency transformer.

Pin "S" on the 6SA7 tube, should read 60 to 70 volts d.c. If incorrect or no voltage check the following:

1. Check or replace capacitor (Illus. No. 17).
2. Check or replace resistor (Illus. No. 38).

Pin "P" on the radio frequency amplifier 6SK7 tube should read 155 to 165 volts d.c. If incorrect or no voltage check the following:

1. Check or replace capacitor (Illus. No. 18).
2. Check or replace resistor (Illus. No. 39).

Pin "S" on r-f amplifier 6SK7 tube should read 60 to 70 volts d.c. If incorrect or no voltage check the following:

1. Check or replace resistor (Illus. No. 38).
2. Check or replace capacitor (Illus. No. 17).

If the tubes, vibrator, and voltages are correct and radio does not play the trouble will be in the grid circuit of the radio. To continue, it will be necessary to check the grid circuit by means of signal tracing.

Turn on signal generator on and off switch, place the modulation switch in the modulated position set signal generator tone control to 0.5 and place shielded lead assembly in jack marked "audio." Ground the black lead to the radio chassis. Turn on radio receiver with volume to maximum position.

With red lead touch pin marked "P" on the 6V6GT tube. If you have no signal, check the following:

1. Check or replace speaker.
2. Check or replace audio transformer.

Touch pin "G" on 6V6GT tube. If no signal check or replace 6V6GT tube.

Touch pin "P" on the 6SQ7 tube. If no signal check the following:

1. Check or replace capacitors (Illus. Nos. 25, 26, 27, and 28).
2. Check or replace tone control.

Touch pin "G" on 6SQ7 tube. If no signal, check or replace 6SQ7 tube.

Touch the two pins marked "DP" on 6SQ7 tube. A signal should be heard on each one. If no signal check or replace 6SQ7 tube.

Change the signal generator shielded lead to the intermediate frequency "I.F." jack. Tune signal generator to exactly 262 and set band switch in "A" position. Turn the signal generator volume control about one-third open and touch pin "P" on intermediate frequency 6SK7 amplifier tube. If no signal, check the following:

1. Check or replace intermediate frequency transformer.
2. Check or replace volume control.
3. Check or replace capacitor (Illus. No. 23).
4. Check or replace resistor (Illus. No. 44).

Touch pin "G" on i-f 6SK7 amplifier tube. If no signal check or replace 6SK7 tube.

Touch pin "P" on 6SA7 tube. If no signal check the following:

1. Check or replace intermediate frequency transformer.
2. Check or replace sensitivity control.

Touch pin marked "G" on 6SA7 tube. If no signal check or replace 6SA7 tube.

Change the signal-generator shielded lead to the radio frequency "R.F." jack, tune signal generator to exactly 1000 kc and set band switch to "B" position. Tune radio to 1000 kc. Touch pin "P" on 6SK7 amplifier tube. If no signal check the following:

1. Check or replace radio frequency coil (Illus. No. 3).
2. Check or replace oscillator coil (Illus. No. 4).
3. Check or replace capacitors (Illus. Nos. 18, 19A, 19B, 20 and 21).

Touch pin "G" on r-f 6SK7 tube. If no signal check or replace 6SK7 tube.

Place a 0.000075-μf capacitor on the end of red lead and plug in antenna socket. If no signal check the following:

1. Check or replace antenna coil (Illus. No. 1).
2. Check or replace choke coils (Illus. No. 2).
3. Check or replace antenna trimmer (Illus. No. 16).
4. Check or replace resistors (Illus. Nos. 37 and 42).

Crosley 11-100U, 11-101U, 11-102U, 11-103U, 11-104U, 11-105U, Ch. 330

Chassis 330 is similar to Chassis 301, which is also used with the above models, except that the 330 uses a 12SQ7GT (V3) in the detector—avc 1st a-f amplifier stage, whereas the 301 uses a 12AV6. The 12SQ7GT is connected in the following way: pin 1 goes to the shield; pin 2 goes to the junction of R5 and C8B; pin 3 goes to the junction of ground, pin 4, and C8A; pin 5 goes to tap 2 of the 2nd i-f transformer T2, pin 6 goes to the junction of R8, C8C, and C8D; pin 7 goes to pin 3 of V1, and pin 8 is grounded. The voltage readings are as follows: pins 1, 3, 4, and 8 are 0 volts; pin 2 is —0.8 volt; pin 5 is —0.6 volt; pin 6 is 52 volts; pin 7 is 12 volts a.c.

The following part should be added to the parts list: TS2, Part No. W-46447-1, Shield, tube (V3).

The following procedure should be used when installing an idler spring (part no. 151085) on the drive shaft:

1. Remove cotter from end of shaft under chassis.
2. Pull drive shaft straight out from chassis being careful to keep drive cord on shaft and pulley.
3. Remove spring washer from shaft.
4. Place idler spring on shaft and then hook one end of the spring under the chassis. The other end of the spring hooks around the portion of drive cord that is between the drive shaft and the tuning capacitor pulley.
5. Place spring washer on the drive shaft, insert drive shaft in chassis, and insert cotter on end of shaft.

Emerson 559, Ch. 120059A

The schematic diagram for Chassis 120059A shows two resistors marked R15. The one going to pin 6 of the 117Z3 should be marked R10.

Emerson 672B, Ch. 120097-B

The 672B is similar to Model 634B in that both models use a 120097-B chassis. The service data and Parts List for 672B, Ch. 120097-B, are the same as those for the 634B except for the cabinet parts listed below:

Part No.	Description
140396	Cabinet
470092	Lid support
620145	Chassis mounting board
580138	Shielded lead wire (25")
450099S	Knob
450099	Knob
587011	Spring insert
700053	Loop antenna
410807-1	Dial back plate
530002	Drive cord (37")
525022-1	Pointer.

Farnsworth P-63

Record changer P-63 is basically the same as the P-62 record changer—the difference lies in the type of trip mechanism. The P-62 changer employs a fixed position trip; the P-63, a velocity trip.

Farnsworth 36P10, Capehart

Model 36P10 employs the Farnsworth P-10 a-m—f-m radio chassis and the Farnsworth P-73 intermix record changer in a mahogany chairside cabinet with a 12-inch high-fidelity p-m speaker. For information on the radio chassis and record changer used in this instrument see Farnsworth Chassis P7, P9, and P-10 and the Farnsworth P-72 and P-73 Record Changers.

Following is a list of parts which pertain to the Model 36P10 only. Parts for the integral parts of the chassis and record changer are included under their respective chassis.

Part No.	Description
H-328	Cabinet (36P10)
750000A	Dial escutcheon
59373	Knob (2)
59316	Knob (2)
650011A-1	Speaker and output transformer
13908	Loop antenna assy.
750004A-1	A-m dial glass
750004A-2	F-m dial glass.

Farnsworth P-860

The alignment procedure and table, the chassis component layout, suggested batteries, and dial-cord stringing diagram for Model P-860 are the same as those for Farnsworth Model GP-350.

Farnsworth "N" Series, Capehart

In order to permit the use of the "Magnetic True Timbre" pickup in the N series instruments, a modification kit has been prepared, No. 41141.

A separate phono preamplifier (2-stage) using a 6SC7 twin triode tube, and mounted on a separate chassis, is used in place of the 6J7 preamplifier stage included on the tuner chassis. The schematic diagram for this stage is shown in Fig. 1. The 6J7 tube has been removed and the power cable to the preamp chassis is brought through the unused socket and connections made on the underside of the socket. The 6J7 stage is not used, so a shielded lead is connected directly from the phono input socket to the phono lug on the auxiliary bandswitch.

The noise eliminator, which is furnished with the record changer modification kit, is also included in these modified N series instruments. The circuit diagram of the noise eliminator is the same as that in the P4 series.

The voltage and resistance readings for the 6SC7 are given below:

Pin	Voltage (volts)	Resistance (ohms)
1	0	0
2	150	200 K
3	—0.3	inf
4	—0.3	inf
5	135	200 K
6	0	0
7	0	0
8	5.4ac	2.5

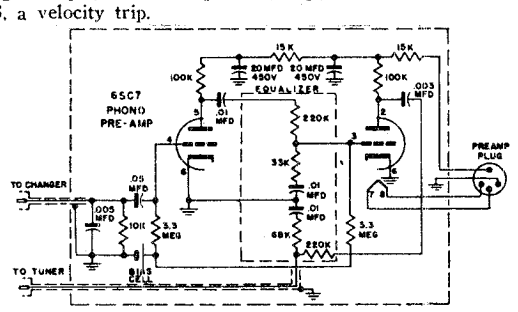


Fig. 1. Schematic for the 6SC7 phono-preamplifier stage used in the Farnsworth "N" Series, Capehart.

Farnsworth 1000-M, Capehart, Ch. P8

Model 1000-M is similar to Models 1002-F, 1003-M, and 1004-B, and uses a-m—f-m radio chassis P-8.

Gamble-Skogmo 43-7661, 43-7852

Model 43-7661 is the same as Model 43-7660 except that the 7661 uses a blond cabinet. Model 43-7852 is the same as Model 43-7851 except that it uses a blond cabinet.

Gamble-Skogmo 43-8101, 165, 197, 197U

Model 165 is the same as Model 94RA31-43-8115A. Model 197 is the same as Model 94RA31-43-8115B. Model 197U is the same as Model 94RA31-43-8116A. Model 43-8101 is electrically the same as Models 94RA31-43-8115A, -8115B, and -8116A.

Gamble-Skogmo 43-9841A

Model 43-9841A is the same as Model 94RA31-43-9841A.

Gamble-Skogmo 94RA4-43-8129A, 94RA4-43-8130A, 94RA4-43-8130B, 94RA4-43-8131A, 94RA4-43-8131B, 94RA4-43-8132A

Model 94RA4-43-8129A is the same as Model 43-8129A. Models 94RA4-43-8130A and 94RA4-43-8130B are the same as Models 43-8130A and 43-8130B, respectively. Model 94RA4-43-8131A is the same as Model 43-8131A. Model 94RA4-43-8131B is the same as Model 43-8131B. Model 94RA4-43-8132A is the same as Model 94RA4-43-8131A except that it employs a maroon cabinet.

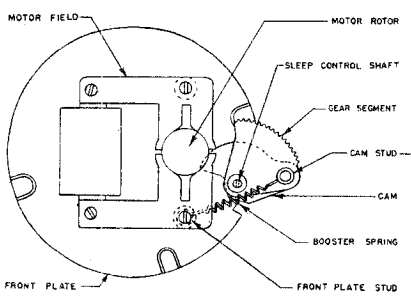
Gamble-Skogmo 94RA33-43-8135

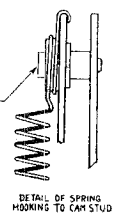
The 94RA33-43-8135 is the same as Models 94RA33-43-8130C and 94RA33-43-8131C except for the differences mentioned below. The physical difference is the cabinet, larger drum on the tuning gang, speaker bracket, dial glass, dial bracket and power-cord strain relief. The parts list for Model 94RA33-43-8135 is the same as that for the 8130C and 8131C except for the following parts.

Part No.	*Description*
E81650-2	Tuning gang
E81645-S2	Speaker
M1607-2	Dial bracket
P1602-2	Dial glass
SR-2P	Strain relief
P1601A-2	Cabinet, walnut
M1605-2	Chassis.

General Electric P15

To further clarify the identity of the three spindles for the record speeds for which they are to be used, the following descriptions have been added to the Parts List for record changer P15: RMU-060 Spindle, offset spindle for 7 inch, 33-1/3 rpm records; RMX-162 Spindle, for 10 or 12 inch, 33-1/3 or 78 rpm records; RMX-163 Spindle, for 7 inch, 45 rpm records.





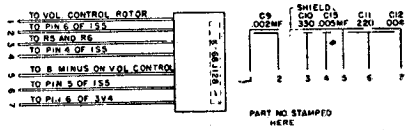
Rear view of clock mechanism in General Electric Models 64 and 65, showing position of booster spring.

General Electric 145

In late productions, resistors R13 and R14 have been combined into one tapped resistor, R25A and R25B. This new resistor is mounted in place of R14. The catalogue number for R25 is RRW-047. R25A is 1,000 ohms and should be wired in place of R14. R25B is 1,300 ohms and should be wired in place of R13.

Late production Models 145 have an automatic shutoff when the cabinet front is closed. New parts for these models are interchangeable and will be carried in replacement stock in place of the original early production items as shown below:

Part No.	*Description*
RDE-049	Escutcheon replaces RDE-034
RDK-166	Knob and knob clip replaces RDK-149
RAC-067	Cabinet front cover replaces RAC-055
RMC-036	Nameplate and catch, with 2 stud mount for maroon or white cabinets
RMC-038	Nameplate and catch, with 3 stud mount for maroon or white cabinets
RMC-039	Nameplate and catch, with 3 stud mount for brown cabinet.



Lead identification for ceramic capacitor RCW-3015.

The accompanying illustration of the four-section ceramic capacitor, catalogue number RCW-3015, is added to aid in capacitor-terminal identification of C9, C10, C11 and C12.

General Electric 64, 65

Late production receivers incorporate a helical spring in the clock mechanism which provides a more positive trip action to the switch contact assembly when operating the sleep control. Failure of switch contacts to open may be due to the incomplete travel of the sleep control gear segment and cam assembly after its release by the segment gear's drive pinion. Normally, the spring action of the switch contacts through the sleep control switch lever should be sufficient to allow sleep control cam and gear segment to spring outward completely after it becomes disengaged from its pinion drive gear. However, if binding or position of control parts results in failure of segment gear and cam to swing completely outward properly releasing switch control lever and contacts, the addition of the booster spring (catalogue no. RMS-203) will provide the additional tension to correct segment gear and cam operation.

To install the booster spring, remove the case and draw the clock mechanism forward from the front of the radio cabinet, just far enough to permit installation of the booster spring. The accompanying illustration shows the position of the booster spring as viewed from the rear of the clock mechanism. One end of the spring is fastened to the cam stud, the other end to the brass front plate stud.

General Electric 60, 62, 64, 65, 66, 67

The stock item RAB-054, Cabinet back and loop, is no longer available and Stock No. RAB-097, Cabinet back and loop, is substituted in its place. For those receivers produced, employing RAB-054 with connections made to the primary antenna winding, the black wire to chassis ground is removed when RAB-097 is substituted for replacement.

General Electric 123, 124, 125

A self-tapping screw, #4 x ¼ inch, Cat. No. RHS-044, Shakerproof type 25, has been added to the Parts List for the above models. Cabinets of later production receivers were tapped for these screws to mount the loudspeaker in lieu of the Tinnerman clip, RHM-061, used in earlier speaker mountings.

General Electric 140

The rectifier assembly, REX-004, is no longer stocked riveted to a mounting bracket. The new rectifier may be screw mounted to the original rectifier bracket as follows: remove wires at the connecting lugs of the old rectifier; using screwdriver blade between plates of rectifier to be removed, pry plates off from rectifier mounting bracket; assemble new rectifier to bracket, using a #6-32 x 1 inch long screw through rectifier and bracket hole and fasten using lock washer and nut; replace wire connections to new rectifier.

General Electric 143

In late production receivers, C5 was changed to 0.25 μf, 200 volts, Cat. No. UCC-050. This change was made to reduce regeneration which resulted in unstable operation.

General Electric 165

A tube shield has been added in late production receivers to the 1S5 tube, improving its stability. This item is carried in parts replacement stock at RHS-010.

General Electric 218, 218H

A 15,000-ohm, ½-watt resistor R33 has been added between the high side of the volume control and the arm of the band switch S1D. This improves receiver stability. The following changes should be made in the Parts Lists for these models:

Delete Stock No. RLI-084; Add RLI-088, Choke, f-m antenna (L2), used in 218 only; Add URD-077, Resistor, 15,000 ohms, ½ w, carbon.

Stock No. RLI-088 has been deleted from the Parts List and Stock No. RLI-084, Coil, f-m antenna choke, L2, added in its place.

General Electric 402

R2, shown connected to B+, should cross over the vertical B+ lead to pin 6 of V2, and a dot connection should be drawn at the vertical B— lead to pin 2.

General Electric 505, 506, 507, 508

Catalogue items RWL-009 and RWL-016 should be deleted from the Parts List and replaced by the following items: RWL-025, Cord, power cord and plug (brown, heavy duty type) for Models 505, 507, 508; RWL-026, Cord, power cord and plug (ivory, heavy duty type) for Model 506.

General Electric 505, 506, 507, 508, 509, 530

Change Step 1 (column 2) of the Alignment Chart to read "12BA6 grid pin (1)," and Step 2 (column 2) to read "12SA7 grid pin (8)." Change the tube type numbers of the I-F Stage Gains to read: 12SA7 grid to 12BA6 grid—50 at 455 kc; 12BA6 grid to 12SQ7 diode plate—50 at 455 kc.

General Electric 509, 530

Catalogue items RWL-009 and RWL-106 should be deleted from the Parts List and replaced by the following items: RWL-025, Cord, power cord and plug (brown, heavy duty type) for Model 530; RWL-024, Cord, power cord and plug (white, heavy duty type) for Model 509.

General Electric 515, 516, 517, 518

Catalogue items RWL-009 and RWL-016 should be deleted from the Parts List and replaced by the following items: RWL-025, Cord, power cord and plug (brown, heavy duty type) for Models 515, 517, 518; RWL-026, Cord, power cord and plug (ivory, heavy duty type) for Model 516.

General Electric 521, 522

Delete items RDK-217, RDS-090 and RWL-009 from the Parts List, and add the following items: RDK-237, Knob, tuning dial wheel with scale embossed; RWL-025, Cord, power cord and plug (brown, heavy duty, type).

General Electric 600, 601, 603, 604

The description "maroon for Models 600 and 601" should be added to Stock items RAB-096, RAU-308, RHY-010, and RHB-006. The following additional replacement parts have been added to the Parts List for Models 600, 601, 603, and 604.

Part No.	*Description*
RAB-125	Back, cabinet back, tan, less hinges (603)
RAB-126	Back, cabinet back, green, less hinges (604)
RAU-327	Cabinet, cabinet body, tan (less back, handle and hardware) (603)
RAU-328	Cabinet, cabinet body, green (less back, handle and hardware) (604)
RDK-204	Knob, volume or tuning, green (604)
RDK-205	Knob, volume or tuning, tan (603)
RHB-014	Button, plug button, tan, in cabinet over alignment trimmers (603)
RHB-015	Button, plug button, green, in cabinet over alignment trimmers (604)
RHM-052	Clip, for rim-mounting speaker
RHM-062	Clip, for hole-mounting speakers
RHW-024	Cup washer, retaining washer for item RMS-217, handle shock spring
RHY-016	Handle, cabinet handle, tan (603)
RHY-017	Handle, cabinet handle, green (604)
RJP-028	Plug, battery connecting plug P1
RMS-216	Guide spring, used with item RMC-040
RMS-217	Spring, shock spring for cabinet handle
UCG-022	Capacitor, 56 $\mu\mu$f, mica, C15.

General Electric 752

A 47-$\mu\mu$f, silver mica capacitor, C3, was added to the circuit of later receivers to prevent parasitic oscillation. C3 has been added from ground to the junction of R6 and the f-m terminal of S1E. In the Visual Alignment Chart, Step 5 of FM-IF Alignment, change adjustment "Core of T4" to read "Core of T9."

Hallicrafters S-41G, S-41W

In the Alignment Data Table for these models, under the column headed Adjust Trimmers, add C-4A to Step 1, C-4B to Step 2, and C-4C to Step 3. In some models the two capacitors marked C2 have been replaced by variable iron core T6.

Jewel 349, 949

Model 349 is the same as Model 949. The Alignment Procedure for these models is the same as that for Models 921, 935 and 936, except that "Reduce input as needed to keep output near 1.28 volts (0.5 watt)" should read "to keep output near 0.4 volt (0.5 watt)," and in the third column, 12BE6 grid (mentioned twice) should read 1R5 grid. The Parts List for Models 349 and 949 is given below:

Ref. No.	*Part No.*	*Description*
C1	30-17A	Variable capacitor, 2 gang, 420 & 162 $\mu\mu$f
C2, 3, 11	32-4	Tubular paper capacitor, 0.05 μf, 200 v
C4, 6	32-29	Tubular paper capacitor, 0.01 μf, 200 v
C5, 7	32-17	Tubular paper capacitor, 0.002 μf, 200 v
C8	32-20	Tubular paper capacitor, 0.005 μf, 200 v
C9	32-5	Tubular paper capacitor, 0.05 μf, 400 v
C10	32-32	Tubular paper capacitor, 0.2 μf, 200 v
C12, 13	35-4	Mica capacitor, 100 $\mu\mu$f, 500
C14	31-16A	Electrolytic capacitor, 50 x 30 μf, 150 v
C15	31-17	Electrolytic capacitor, 200 μf, 15 v
R1	20-49	100K, ¼ w, 20%
R2	20-46	3.3M, ½ w, 20%
R3	20-6	2.2M, ½ w, 20%
R4	20-42	8.2K, ½ w, 20%
R5	20-57	10M, ¼ w, 20%
R6	20-53	4.7M, ¼ w, 20%
R7	20-74	220K, ¼ w, 20%
R8	20-14	1M, ½ w, 20%
R9	20-31	47 ohms, 1 w, 10%
R10	20-143	2.5K, 8 w, 5% ww
R11	20-134	2.7K, 1 w, 10%
R12	20-109	1.5K, ½ w, 10%
R13, 14	20-67	1K, ½ w, 10%
R15	50-17	Volume control, 1 megohm, DPST switch (S2)
T1	61-12	Input i-f transformer
T2	61-13	Output i-f transformer
L1	62-16	Loop
L2	60-10	Oscillator coil
S1	65-4	Manual slide switch, DPDT
	73-3	Selenium rectifier, 65 ma
	80-15	4" p.m. speaker with output transformer
	120-28	Leatherette cabinet
	120-29	Front panel and baffle board
	W122-24	Volume knob
	W122-19	Selector knob
	123-9	Plastic dial.

Jewel 920A

The Alignment Procedure and Parts List for Model 920A is the same as that for Models 921, 935, 936.

Jewel 964

In later Model 964 receivers, pin 5 of the 12AT6 is connected to the junction of the i-f transformer and pin 6, instead of to the junction of the antenna coil and the 4.7-megohm resistor (going to the i-f transformer). The Alignment Procedure is the same as that given for Models 921, 935, and 936, except that 1500 kc, under Coupling Capacitor, should read 50 $\mu\mu$f; under Connections to Receiver should be Antenna (Disconnect antenna hank by unsoldering), and under Ground Connection should be B—. The seven markings on the dial represent 550 kc, 650 kc, 750 kc, 900 kc, 1100 kc, 1400 kc, and 1600 kc, respectively.

Jewel 955

The Alignment Procedure for Model 955 is the same as that given for Model 964. Model 955 also uses 12SA7, 12SQ7, 50L6, and 35Z5. The Parts List is as follows:

Ref. No.	*Part No.*	*Description*
C1,	32-17	Tubular paper capacitor, 0.002 μf, 200 v
C2	32-4	Tubular paper capacitor 0.05 μf, 200 v
C4,	32-29	Tubular paper capacitor, 0.01 μf, 200 v
C6	32-5	Tubular paper capacitor, 0.05 μf, 400 v
C7	35-4	Mica capacitor, 100 μf, 500 v
C8	31-20	Electrolytic capacitor 50 x 30 μf 150 v
C9	30-18	Variable capacitor, 420 & 162 $\mu\mu$f
R1	20-3	22K, ½ w, 20%
R2	20-7	4.7M, ½ w, 20%
R3	20-8	10M, ½ w, 20%
R4	20-19	470K, ½ w, 20%
R5	20-14	330K, ½ w, 20%
R6	20-73	1.5K, 1 w, 20%
R7	20-93	22 ohms, ½ w, 20%
R8	20-96	22 ohms, 1 w, 20%
R9	50-11B	Volume control, 2 megohms, SPST switch
	60-12	Oscillator coil, with spring clip
61-5 or	61-14	I-f transformer, with solder tabs
	62-17	Antenna coil
	47-3	Antenna hank, 15'
	80-17	4" p.m. speaker with output transformer
	120-30A	Cabinet (specify color)
	122-15	Knob (2) (specify color)

Midwest KC-16

The mixer coil plate should be grounded to the front apron of the chassis with tinned copper braid to reduce f-m—r-f regeneration

Montgomery Ward 94GSE-3011B

Model 94GSE-3011B differs from Model 84GSE-3011A only in type of cabinet covering and cabinet hardware as listed below:

Part Number	*Description*
MW7E179-3	Cabinet
MW20E449-2	Rear door with hinges, antenna post and line cord
MW20E461	Handle with mounting brackets.

Motorola BKOA, CT8A, GM9TA, GMOT, HNO, ILOTC, KR9A, OEO, PCO, PC9A, SR9A, Ch. 10A

The above models all use Chassis 10A. Model BKOA is used in 1950 Buick Special, Super and Roadmaster cars. It will also accommodate 1949 Buick Super and Roadmaster; also the 50-70 Series 1948, '47, '46, and '42 Buick cars. Model CT8A is used in 1948 Chevrolet. It will also accommodate 1947, '46, '42, and '41 Chevrolet cars. Model GM9TA is used in 1949 and 1948 GMC and Chevrolet trucks. Model GMOT is used in 1950, '49, and '48 GMC and Chevrolet trucks. Model HNO is used in 1950 Hudson (Pacemaker, Super, and Commodore). Model ILOTC is used in International L-Line trucks. Model KR9A is used in 1949 Kaiser and Frazer. Model OEO is used in 1950 Series 76 and 88, all 1949 and 1948 Futuramic Oldsmobile cars. Model PCO is used in 1950 and 1949 Pontiac cars. Model PC9A is used in 1949 Pontiac cars. Model SR9A is used in 1949 Studebaker cars.

Philco 50-621

This model completed production without change and appears as Run #1 only. The following corrections and additions have been made to the Parts List:

Part No.	*Description*
34-8003-1	Selenium rectifier, 100 ma, CR1
10761-3	Cabinet, brown
10761-4	Cabinet, beige
10761-5	Cabinet, green
54-4712-3	Back, brown
54-4712-4	Back, beige
54-4712-5	Back, green
Delete	Front
Delete	Shield base.

National HRO-7

To eliminate oscillator drift occurring during stand-by periods, the following changes have been made. These changes allow the h-f oscillator, bfo oscillator and output tubes to remain on all the time whether the B+ switch is turned on or off.

1. Move the B+ end of R24 from the B+ tie-point to pin 6 of V9, 6J7.

2. Connect pin 6 of V9 to pin 5 of S1 using 8¾ inches of red wire.

3. Move red lead supplying pin 4 of S1 from the cold terminal of bsw to the hot terminal.

4. Move red lead running to tie-point located on chassis between C31 and C37 from pin 4 of S1 to the cold terminal of bsw.

5. Change the value of R21 to 3500 ohms, 5 watts.

National 686S, 686SB, SPU686S, 1286S

The 686SB power unit is the same as the 686S except that it is equipped with mounting brackets. The SPU686S is the same as the 686S except that it is designed for rack mounting. The 1286S is similar to the 686S except that it is designed to operate from 12 volts d.c. The voltages available at the output socket are 12 volts d.c. and 165 volts at 45 milliamperes d.c.

The following capacitors have been added to the 686S and 1286S power units:

1. C203, 0.01 μf, 300 vdcw, added from the junction of fuse F101 and switch S101 to ground.

2. C204, 0.0043 μf, 500 vdcw, from the B+ terminal to ground.

3. C205, 0.0001 μf, 500 vdcw, across output socket, from L201 to A+.

RCA A-82, Ch. RC-1094; A-91, Ch. RC-1095; A-108, Ch. RC-1096; 45-W-9, Ch. RC-1095A

The original carriage in all of the above models used a pull-out handle on the top front, the carriage now in use has a handle under the lower front edge. The same plastic frame may be used for all models. A plug button (supplied with each plastic frame) is used to cover a center hole which is unused on all models except A-108.

Frame—Stock No. 76161 is used as a replacement for frame Stock No. 75549 or 75571 (maroon).

Frame—Stock No. 76162 is used as a replacement for frame Stock No 75683 or 75684 (light brown).

The new type of pull-out handle (lower front) is available as Stock No. 76125. If the original pull-out handle (top front) is desired it will be necessary to drill two holes in the frame. The holes are .203" diameter and are located .625" each side of the center line and 13/64" down from the top.

In Models A-91 and A-108 the color of wire used in the connecting cable has been changed. A black-white wire has been used as a substitute for the black wire (pin 1 to speaker) and a brown-white wire has been used as a substitute for the brown wire (pin 8 to speaker). A brown wire goes from pin 2 to the jewel lamp and a black wire goes from pin 3 to the jewel lamp.

In Model A-82 a substitute speaker (stamped 92569-9B) has been used in some instruments. It requires a different speaker cone than the one listed in the A-82 Parts List. Speaker 92569-9B uses Stock No. 75875 cone, Speaker 92569-9W uses Stock No. 74901 cone.

RCA Q10-3, Q10 Series, Ch. RC-549C

Model Q10-3 is identical to other sets of the Q10 series with the exception of the cabinet which is black and uses ivory color knobs.

The output transformer mounting has been revised to minimize the possibility of breakdown, especially in tropical areas. The transformer in later production sets is mounted on insulation board which is, in turn, mounted on the dial back plate support.

RCA BX55, Ch. RC-1088; BX57, Ch. RC-1088A

Capacitor C11, 0.047 μf, must be dressed away from the metal chassis and in such position that inserting the chassis into the case will not change its position. The side of C11 which may short to chassis is the side which connects directly to the selenium rectifier. If this side contacts the chassis it will place the chassis at power line potential.

The 2600-ohm, 6-watt resistor R13 now being used in Model BX57 is of improved design. The original resistor was a ceramic type and the type now being used is a flat armored type. When the new type is used to replace the original type, it is necessary to drill a .120" diameter hole in the front apron of the chassis to accommodate a self-tapping screw for mounting purposes.

RCA Ch. RC-1065C, RC-1065D

The value of capacitor C3 in these chassis is 9.1-113.8 $\mu\mu$f. C3 is located across oscillator coil L2.

RCA Record Changers RP-176A, RP-176B

The record changers are the same as the RP-176 except for the following differences. The pickup and arm assembly for the RP-176A is: Stock No. 72716, Arm, Pickup arm complete, less pivot arm, crystal and cable. The motorboard sub-assemblies, complete with all welded and riveted parts, less detachable operating parts, are designated as stock numbers 72717 and 70844, for RP-178A and RP-178B, respectively.

RCA X551, Ch. RC-1089B; X552, Ch. RC-1089C

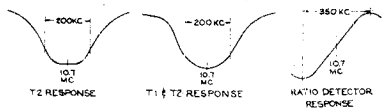
R4, the 3.3-megohm avc filter resistor previously connected to the junction of R12, 47,000 ohms, and the phono jack J1, is now connected to the junction of R12 and terminal 2 of the 2nd i-f transformer T2.

RCA 8V90, Ch. RC-618, RC-618A; 8V91, Ch. RC-616A, RC-616H

Under Alignment Procedure, Critical Lead Dress, the following additions should be made:

17. The f-m oscillator coil should be cemented to its support. Amphenol No. 912 cement is recommended for this purpose. If it is necessary to loosen the coil, use Amphenol No. 916 solvent.

18. Capacitor C41 should be waxed or cemented to the chassis apron. The f-m response curves are shown in the accompanying diagram.



F-m response curves for Models 8V90 and 8V91.

In Chassis RC-618 the value of R35 is 560 ohms; and R31, the 1-megohm resistor across C4, is used only on early chassis.

Chassis RC-618A is the same as Chassis RC-618 except for the following changes which have been made. A filament choke coil L6 has been added from pin 2 of V8 to pin 2 of the 6AV6 a-f amplifier V5. A 0.005-$\mu\mu$f ceramic capacitor has been added from pin 3 of the 6AU6 driver V3 to ground. A 0.005-$\mu\mu$f ceramic capacitor has been added from pin 5 of V7 to ground. A 100-ohm, ½-watt, fixed composition resistor R36 has been added from pin 4 of V8 to pin 4 of V6. Capacitor C11, 5 $\mu\mu$f, has been added in parallel with C12, and C13 across taps D and B of the oscillator coil L4

RCA 8R71, 8R74, 8R75, Ch. RC-1060; 8R72, 8R76, Ch. RC-1060A

A 15,000-ohm ½-watt resistor, R1, is sometimes used between pin 7 of S1 Rear and the phono outlet. R33, 1000 ohms, ½ watt, has been added from F to G of the a-m oscillator coil. A 0.005-μf capacitor, C10, has been added from pin 3 of the 6AU6 driver, V3, to ground. Filament choke coil L6 has been added from pin 3 of V5 to pin 2 of V6. A 5-$\mu\mu$f capacitor, C11, has been added in parallel across C12 and C13. A 0.005-μf capacitor, C44, has been added from pin 5 of tube V5 to ground.

RCA 8X541, Ch. RC-1065L; 8X542, 8X547, Ch. RC-1065M

These instruments are almost identical to the previous production of these instruments which used Chassis RC-1065J and RC-1065K.

RCA 9EY3, Ch. RS13½

To aid in hum reduction in Record Changer 9EY3, resistor R8 and capacitor C4 have been changed in value. R8 has been changed from 470,000 ohms to 270,000 ohms. C4 has been changed from 0.002 μf to 0.0047μf, 600 volts, tubular.

Regal 7151

Model 7151 is electrically the same as Model 205.

Sparton 130, 132, 135, 139, Ch. 5A10

Inability to procure type 12AV6 tubes in production quantities for the above models using radio chassis type 5A10 made it necessary to make the following production substitution. In the future, these models will use a 12AT6 tube in the 2nd detector and avc circuit in place of the original 12AV6 as shown in the schematic diagram. As these tubes are interchangeable, a change in other components of the circuit is not necessary.

Sears 220, Ch. 528.173

A quantity of model 220 portable radios was shipped on which a corner boss in the cabinet body became broken. Breakage of either or both bosses released the spring (Littlefuse) clip preventing the secure latching of the back in the closed position. When this condition is found a new case (cabinetless back) should be used. Follow instructions below to prevent repetition of the same trouble.

Remove the handle from the case. Save all parts. Discard the case with the broken bosses, the support brackets and the screws that held the Littlefuse clips in place. Retain the Littlefuse clips and screws, flat washers and grommets that secured the brackets at the bottom to the rear apron of the chassis.

Replace the items that were discarded with the following new items. Order from source number 528.

Part No.	*Description*	*Amount Required*
T42-467	Case	1
797-147	Screw - No. 4-24 x ½ thread cutting	2
T11-420	Bracket - chassis support	2
T47-118	Grommet - 5/16 pure gum rubber	2
T86-74	Washer - flat ⅜" O.D.	2

The new support bracket has a larger diameter hole at the top for the new grommet. The mounting screw is longer and a flat washer has been added.

Sears 8260, Ch. 101.823 series

The loop antenna lead wires in the front cover of the above portable have continued to break despite careful assembly and inspection at the source. An analysis of a large number of these radios on life test showed that variations in the spring tension which takes up the slack in the leads is the greatest contributing factor in these failures.

It is recommended that this spring be disconnected on every model 8260 in store stock prior to sale and delivery to the customer. The only purpose of the spring is to hold the wires taut for better appearance. The slightly different appearance of slack wires is more desirable than the potential complaint due to broken leads.

Open the back cover and find the lug in the outer case (in line with the loop leads) to which the small spring is attached. With a small screwdriver or knife bend the lug out enough to slip off the spring loop. Use a paper clip bent to form a hook, if necessary. It is not essential to remove the spring, but merely to disconnect one end as described. When this spring is disconnected the possibility of broken loop leads is reduced to a minimum.

Sparton 1080A, 1081A, Ch. 8L10

Model 1080A in mahogany and Model 1081A in blond are radio-phonograph combinations using radio chassis type 8L10. All of the information on Chassis 8L10 is contained in the service notes for this chassis.

Sparton 141XX, 142XX, 1040XX, 1041XX, 1085, 1086, 1090, 1091, Ch. 8W10

Chassis 8W10 is similar to Chassis 8M10, and the service notes for the 8M10 apply also to the 8W10. The schematic diagram for the 8W10 is the same as that for the 8M10 except that a 68-ohm resistor, R38, has been added from the junction of C1B and C2B to pin 7 (a.m.) of switch S1-R. Models 141XX in mahogany and 142XX in blond are straight table model radio receivers. A new dial, front panel, and control knobs distinguish these models from Models 141X and 142X. Models 141XX and 142XX are equipped with a 6" x 9" p-m oval speaker.

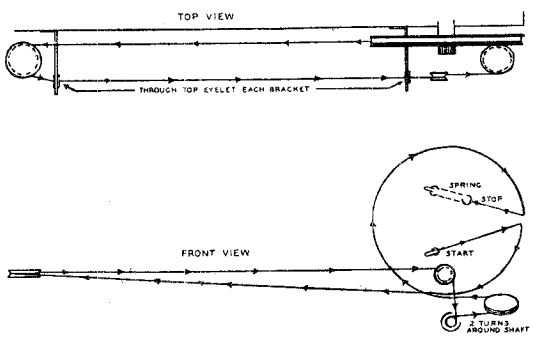
Models 1040XX in mahogany and 1041XX in blond are radio-phonograph combinations. The models also have new dials, front panels, and control knobs and are equipped with a three-speed record changer. The cabinet styling is the same as Models 1040X and 1041X. The receiver chassis is mounted to the tilting front panel in the right-hand cabinet compartment. A 10-inch p-m speaker is standard equipment.

Models 1085 in mahogany and 1086 in blond are radio-phonograph combinations. The receiver chassis is mounted in the top center compartment with the record changer directly below. A compartment either side of the units has been reserved for record album storage. The record changer is stationary mounted. These models employ a 10-inch p-m speaker.

The accompanying illustration shows the dial stringing for these models.

The Chassis Parts List for these models is the same as the Parts List for the 8M10 Chassis. The following parts apply to Chassis 8W10 and the models which use this chassis:

Part No.	*Description*
PA5654	Knob, maroon, 4 req'd (1085 only)
PA5625-1	Knob, black, 4 req'd (1086 only)
PA5654-1	Knob, volume (all other models)
PA5654-2	Knob, tone, on-off
PA5654-3	Knob, f-m, a-m, ph.
PA5654-4	Knob, tuning
PB30017	Dial scale
PB40150	Escutcheon, black (1086 only)
PB40150-1	Escutcheon, maroon (1085 only)
PD93012-1	Escutcheon, maroon and gold (141XX, 1040XX, 1090)
PD93012-2	Escutcheon, gold (142XX, 1041XX, 1091)
PC63000-12	Speaker, 10" round p-m (all consoles)
PC63000-19	Speaker, 6" x 9" oval p-m (table models)



Dial stringing for Sparton Chassis 8W10.

Stromberg-Carlson 1121, 1135

When f-m drift is encountered the following steps can be taken to assure better grounding and better receiver performance.

1. On the variable tuning capacitor, connect short lengths of wire braid from the shaft wiping contacts to the r-f tube shelf. Also at the four points, where the tie-bar of the variable capacitor is connected to the r-f tube shelf, use wire braid (heavy) and solder with a heavy duty soldering iron to insure a well soldered connection.

2. At the converter end of the r-f tube shelf, where it is mounted to the chassis mounting bracket, use a heavy duty iron and sweat in solder along the butting junction.

3. The f-m trimmers on the r-f shelf may be loose, permitting heat, vibration, etc., to cause them to change slightly. If they can be turned easily, unsolder the lock-nut, run it down a fourth or half turn, as necessary to get a smooth but secure hold on trimmer screw, and resolder. Pay particular attention to the oscillator section.

4. At the oscillator end of the range switch, check the contact of the metal spacers to the tie rods between wafer sections. If they are floating or only grounding intermittently, crimp them down tightly against the tie rods and tighten the tie bolts.

5. Substitute wire braid in grounding connections from r-f shelf to main chassis and solder well.

6. Check alignment of the f-m—i-f and discriminator and get proper bandwidth. At the same time be sure that the iron core slugs fit snug so that they will hold alignment. A Vistac compound can be obtained that acts as a non-hardening filler. Particular emphasis should be given on the discriminator transformer secondary where a slight movement gives the same effect as oscillator drift.

United Motors 980899, Buick

The value of the 7259128 (Illustration No. 35) electrolytic capacitor has been changed so that all sections are now 20 μf. Thus, the cathode bypass capacitance on the output tubes has been raised from 10 μf to 20, and the schematic should be altered to comply with this change.

The 470-ohm resistor (Illustration No. 63) in the cathode string of the 6R8 bucking diode circuit has been eliminated after Serial No. 94295.

United Motors 980980, Buick

The 1951 Buick Model 980980 is identical to the 1950 Model 980899 except that the antenna trimmer compensation is for antennas between 0.000061 and 0.000088 μf. The parts list is identical to that for the 980899 except for the following service parts. The service part numbers are the same as the production part numbers except where the service part number is shown in parenthesis.

Illus. No.	*Production Part No.*	*Description*
63	1219487	470 ohms, ½ w, insulated (removed)
85	1211118 (A104)	100,000 ohms, ½w, insulated (removed)
119	7260856	Transformer, output
128	7260454	Escutcheon assy
129	7260455	Dial
130	7260422	Dial backplate
133	7260456	Pointer backplate
134	1219847	Pointer tip pkg.
	1219846	Station selector bar pkg.
139	7260709	Station selector bar.

United Motors 980979, Buick

Model 980979 is used in all 1951 Buick cars, and is identical to the 1950 Model 980868 Buick except for the parts listed below. The antenna trimmer compensation is for antennas between 0.000061 and 0.000088 μf. In the Parts List given below, the service part number is identical to the production part number except where the service part number is given in parenthesis.

Illus. No.	Production No.	Description
4	7260499	Oscillator coil
13	7258221 (G390)	Capacitor 0.000039 μf molded
49	7234563	Resistor 360 ohms, 1w, ww
62	7259502	Speaker, 8", round p.m.
64	7260855	Transformer, output
81	7260421	Backplate pointer
90	7260420	Pointer assembly
	1219845	Pointer tip pkg.
92	7260416	Escutcheon Assy.
93	7260423	Dial
94	7260422	Dial backplate
98	1219840	Push button and slide assy "B"
99	1219841	Push button and slide assy "U"
101	1219842	Push button and slide assy "I"
102	1219843	Push button and slide assy "G"
103	1219844	Push button and slide assy "K"
104	7260414	Worm gear and bracket assy.

United Motors 982421, Oldsmobile

Capacitance drift of the 0.0012-μf mica capacitor used in the oscillator tank circuit (Illustration No. 20) sometimes occurs. This appears as intermittent oscillator frequency drift which seems to be the result of high temperature which may be caused by high input voltage or other extreme conditions. It may be necessary to cover the set or run at a high input voltage when bench testing in order to have the intermittent condition reappear. Since a fixed mica capacitor is usually considered a very stable unit, this condition is not a common occurrence. However, when oscillator frequency drift is encountered this capacitor should be considered as a possible source.

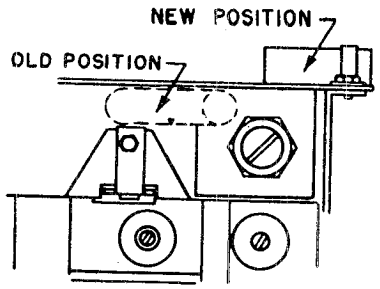
United Motors 982582, 982583, Oldsmobile

The tuner solenoid capacitor (Illustration No. 43) has been moved to a new position and is now secured by a circular mounting bracket. The new location is directly above the solenoid on the top of the tuner frame, as shown in the accompanying diagram, and eliminates any tendency for the rear cover to bind on this capacitor when located on the rear of the tuner.

The clamp fastens around the capacitor approximately ½-inch from the ground end and this lead is soldered to the clamp for grounding. A self-tapping screw secures the clamp to the liner frame. The hot lead to the capacitor is insulated by a heavy sleaving to the tuner return switch.

The value of the 7259128 electrolytic capacitor (Illustration No. 35) has been changed so that all sections are now 20 μf. Thus, the cathode bypass capacitance on the output tubes has been raised from 10 μf to 20 μf and the schematic should be altered to comply with this increase.

The oscillator coil is now the same as that which is used on both the Cadillac and Buick signal seeking tuner type radios. The part number for this coil is now 7259184.



New position of tuner solenoid capacitor on United Motors Models 982582, 982583.

United Motors 984570, Pontiac

A 7Q7 may be used as the oscillator modulator tube in place of the 6SA7. 7C5's may be used as output tubes in place of 6V6GT's. These substitutions do not require any circuit changes.

Westinghouse H-210, H-211, Ch. V-2144, V-2144-1

For convenience in later production, capacitor C11 that is connected between the common negative line and the chassis is changed to 0.15 μf, 200 volts, part no. V-6066-2154M.

Westinghouse H-305C8, H-306C8, Ch. V-2137-4

The first two items in the parts list for these models should be changed to read as follows

Part No.	Description
V-5982-2	Antenna assembly, a-m loop
V-598604	Antenna assembly, f-m loop.

Westinghouse H-312P4, H-312P4U, H-313P4, H-313P4U, H-314P4, H-314P4U, H-315P4, H-315P4U, Ch. V-2153-1

The following part should be added to the parts list for these models: R13 (Part No. RC30AE332K), 3300 ohms, 1 watt.

Westinghouse H-166C

The main chassis used in Model H-166C is the same as that used in Model H-166. A dual-speed record changer is used in Model H-166C. The changer employs a crystal pick-up cartridge which has a higher output level than the variable reluctance cartridge used in the other models. For this reason, the phonograph pre-amplifier V-2138-1 in Model H-166C (see accompanying diagram) differs from those used in the other models. It functions mainly as a tone compensating device rather than an amplifier. Replacement parts for the V-2138-1 pre-amplifier are as follows:

Part No.	Description
V-4930	Cable, power
V-4931	Cable, output
V-5765	Capacitor, dry electrolytic, 20 μf, 300 v (C1)
RCP10W4103A	Capacitor, 0.01 μf, 400 v (C2, C3)
RCP10W6502A	Capacitor, 0.0005 μf, 600 v (C4, C5)
RCP10W6102A	Capacitor, 0.0001 μf, 600 v (C6)
V-3254S	Connector, phono
V-3345S-5	Grommet, power cord
V-3345S-10	Grommet, socket mtg
RC10AE333M	Resistor, 33,000 ohms (R1)
RC20AE564K	Resistor, 560,000 ohms (R2)
RC10AE104M	Resistor, 100,000 ohms (R3, R4)
RC20AE685M	Resistor, 6.8 megohms (R5)
V-4933	Socket, molded octal.

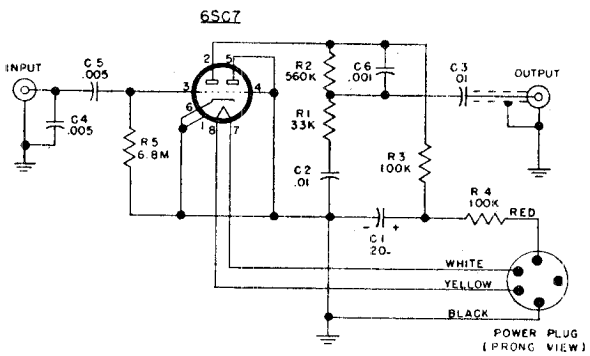
Westinghouse H-316C7, H-317C7, H-326C7, Ch. V-2136-1, V-2136-1A

Model H-317C7 is the same as Models H-316C7 and H-326C7 except that an additional by-pass capacitor of 0.003 μf, 0.004 μf, or 0.007 μf, is connected across the output section of the filter capacitor C36 in some chassis. This additional capacitor is used in cases where the output section of C36 has excessively high impedance at radio frequencies. The chassis parts are listed in the H-316C7 service data. The cabinet and miscellaneous parts are the same as those for Model H-316C7 except for the parts listed below:

Part No.	Description
V-5982-4	Antenna assembly, a-m loop
V-6120	Background, dial
V-1223-2	Cabinet (blond)
V-9075-2	Clip, spring (ball head strike)
V-8568	Doors (matched pairs)
V-8569	Drawer, record changer (complete less hardware)
V-9832-2	Grille assembly, panel
V-9091-3	Hinge, L.H.
V-9091-4	Hinge, R.H.
V-10122-1	Pull, door
V-3246	Socket, octal wafer
V-9076-2	Strike, ball head.

In later production of the V-2136-1 chassis, the following changes were incorporated:

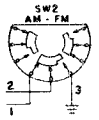
1. The oscillator injection capacitor (C24), which is connected between the top of the f-m oscillator coil and the top of the f-m—r-f coil, is changed in value to 0.68 μμf (Part No. V-5658-4). This change improves the mixer efficiency and increases the sensitivity.
2. A 0.05-μf, 200-volt capacitor C44 (Part No. RCP10W2503M) is inserted in the line that extends between point "Y" on the schematic diagram and the selector switch SW2. In addition, R34 (Part No. RC20AE224M), a 220,000-ohm ½-watt resistor, is inserted between the selector switch side of C44 and ground. These changes improve the tuning characteristics of the f-m band.



Phonograph pre-amplifier used in Model H-166C.

Some chassis used in later production of the subject models are designated V-2136-1A. These chassis are the same as the V-2136-1 except for the differences mentioned in the following paragraphs. These chassis use a 19T8 tube in place of the 12AL5 and 12AV6 tubes used in the V-2136-1 chassis. Tap 1 of ratio detector transformer T3, that was connected to pin 1 of the 12AL5, is now connected to pin 3 of the 19T8; and tap 4 of T3 is connected to pin 1 of the 19T8. A 33,000-ohm resistor R35 (R5, 22,000 ohms which was in this position has been removed), is connected from pin 2 to pin 7 of the i-f-m detector 19T8. C30 is connected across R35, and the two 100,000-ohm resistors used for alignment purposes only are still connected to the junction of C30 and R35. R24, the 220,000-ohm resistor that was connected to C30 and the junction of R25 (4.7 megohms) and R2 (470,000 ohms), and the lead from R24 to SW2 have been deleted. Pin 6 of the 19T8 is connected to tap 1 of T6, the 2nd i-f—a-m transformer. Pin 7 is grounded; pin 9 goes to the junction of R31 and C19C and D; and pin 8 goes to the junction of R10 and C19A. R25, that was connected from R3 to the junction pin 6 of the 12AV6 and R24 and R2, has been deleted. R2, 470,000 ohms, is now connected from ground to the junction of R19 (the 2.2-megohm resistor going to tap 4 of 1st i-f—a-m transformer) and R6 (the 47,000-ohm resistor going to tap 2 of T6). C13, the 0.05-μf capacitor that went from terminal lug 4 of the antenna terminal board, is now located from tap 4 of T5 to ground, in place of C16, the 0.01-μf capacitor which has been removed. The positions of C31 and C19B have been reversed. Capacitor C31, 150-$\mu\mu$f, is now located from ground to tap 2 of T6, and capacitor C19B, 220 $\mu\mu$f, is now located from ground to the junction of R2, R6, and R19. A 470,000-ohm resistor R33 (Part No. RC20-AE484K) and a 100-$\mu\mu$f capacitor C43 (Part No. RCM20B101K) have been added in parallel from tap 3 of T2 to ground.

The accompanying diagram shows switch SW2. Only the middle wafer contains changes that have been made in the V-2136-1A chassis.



Switch SW2 used in Chassis V-2136-1A.

The first and last wafers are wired as shown in the schematic for V-2136-1. (The numbers in the illustration were added for reference only.) Contact 1 goes directly to B and A of C33, and thence to L10. Contact 2 goes directly to R20, 47 ohms, and thence to pin 7 of 12BE6. The 47,000-ohm resistor R26 and the 0.001-μf capacitor C2 connected to R20 have been deleted from the circuit, and contact 3 is grounded.

In the 50L6/GT output circuit capacitor C4, 0.005 μf, is connected to pin 8 rather than to pin 4. The 3.3-megohm resistor R27, that is connected from terminal lug 4 to SW2 in the V-2136-1 chassis, has been deleted in the V-2136-1A chassis.

Zenith H615, H615W, H615Y, Ch. 6G05

These models and chassis are the same as Model G615, Chassis 6G05, except for the differences in their cabinets. Model H615 has a plastic cabinet (part number 14-1274). Model H615W has a white plastic cabinet (part number 14-1275); and Model H615Y has a black plastic cabinet (part number 14-1276).

Zenith 6MF780, Ch. 6D80, Ford; 6MF780E, Ch. 6D80E, Ford; 6MM790, Ch. 6D90, Mercury; 6MM790E, Ch. 6D90E, Mercury

Model 6MM790, Mercury, is erroneously listed in the Indexes and in Volume XVIII as Model 6MN790.

Mercury Model 6MM790E is the export model of the 6MM790. Model 6MF780E, Ford, is the export model of the 6MF780. In these export models the circuit breaker capacitor 22-1148 should be installed as shown in Fig. 1.

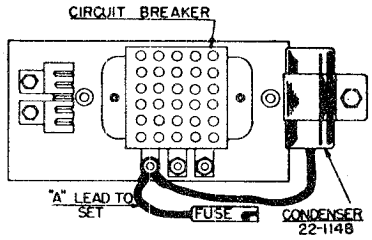


Fig. 1. Circuit breaker used on Mercury Model 6MM790E.

Top and bottom views for Chassis 6D80, 6D80E, 6D90, and 6D90E, are shown in Figs. 2 and 3. The i-f alignment procedure for these chassis is as follows:

1. Remove top and bottom covers from receiver.
2. Set signal generator to 265 kc.
3. Apply signal from generator through a 0.1-μf dummy to the 7B8 converter grid. (Pin 6 on the socket.)
4. Adjust the i-f trimmers, A, B, C, and D (shown in Fig. 2) in the order named for maximum output. Repeat the operation to assure accurate alignment.

The r-f and oscillator alignment is as follows:

1. Connect signal generator leads through dummy antenna lead in socket on receiver.
2. Set the signal generator to 535 kc.
3. Place set in manual tuning position and set dial to 535 kc.
4. Adjust oscillator trimmer C-9 (shown in Fig. 3) for maximum response.
5. Set signal generator to 1200 kc.
6. Tune set to 1200 kc.
7. Adjust converter trimmer C-7 and antenna trimmer C-2 for maximum response.
8. If dial calibration is off after making above adjustments, a correction can be made by loosening dial scale mounting screws and sliding scale to desired position.

When replacing the core or coil the following adjustments should be made:

1. Replace coil or core.
2. Set signal generator to 1700 kc.
3. Connect signal generator leads through dummy antenna to antenna receptacle on the receiver.
4. Set receiver dial to 1600 kc (maximum high-frequency end of dial).
5. Screw the core completely out of the antenna coil, the converter coil, and the oscillator coil.
6. Adjust oscillator trimmer C-9 at 1700 kc.
7. Adjust converter trimmer C-7, and antenna trimmer C-2 for maximum output reading.
8. Replace cores to their approximate original position.
9. Set signal generator dial and receiver dial to 1200 kc.
10. Adjust oscillator core L-5 to scale at 1200 kc.
11. Adjust the antenna core L-2 and converter core L-3 for maximum output reading.

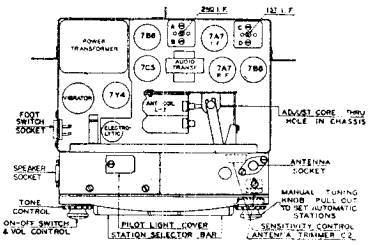


Fig. 2. Top view of Chassis 6D80, 6D80E, 6D90, and 6D90E.

12. Set signal generator to 600 kc.
13. "Rock in" shunt oscillator coil L-6 for maximum output reading. This should be done only as a last resort. This is the same as rocking in the padder capacitor on a ganged capacitor receiver.
14. Check receiver at 1200 kc for calibration and gain. If the receiver is off scale or weak, repeat operations 9, 10, and 11.

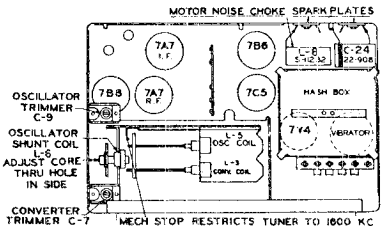
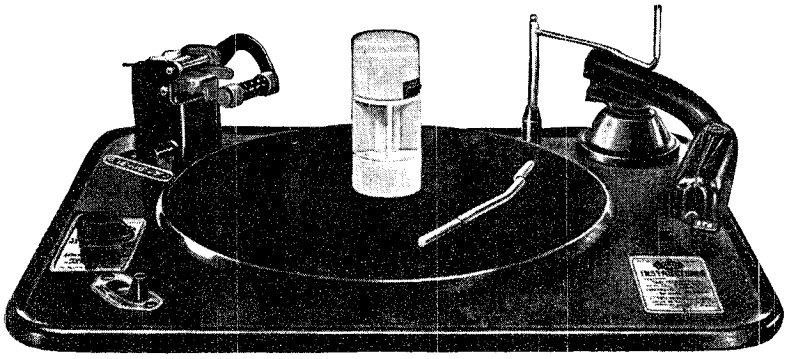


Fig. 2. Bottom view of Chassis 6D80, 6D80E, 6D90, and 6D90E.

15. After alignment is complete, the maximum high-frequency tuning range should be checked. If the range is greater or less than 1605 kc, the mechanical stop for the tuner cross arm should be bent to limit the frequency coverage to 1605 kc. After all adjustments have been made, glue core screws with speaker cement.



The "Garrard" Model R.C.80 Record Changer

OPERATING INSTRUCTIONS

The "GARRARD" Model R.C.80 Automatic Record Changer will play any number of records up to 10, of any of the following types (not mixed):—

10″ or 12″	-	78 r.p.m.
7″, 10″ or 12″	-	33.1/3 r.p.m.
7″	-	45 r.p.m.

To operate the Record Changer proceed in the following order:—

1 See that the correct pick-up is in position for the type of record to be played, i.e., one having a standard .002″ to .003″ radius needle for 78 r.p.m. records, or .001″ radius needle for 33.1/3 and 45 r.p.m. records. The pick-up head is plugged into the arm and a slight pull is all that is necessary to remove it.
2 Place the correct record spindle in position, i.e. stepped sloping spindle for 78 or 33.1/3 r.p.m. records, or large spindle for 45 r.p.m. records. (See diagrams 12 and 14).
3 Set lever at side of platform to size of record it is desired to play, 7″, 10″ or 12″. Also turn subsidiary platform to forward position if it is desired to play 7″ records with small hole. (See diagram 2, 3, 4 and 5.)
4 Turn speed control knob to desired speed, 78, 45 or 33.1/3 r.p.m.
5 Place any number of records up to 10, (not mixed) on record spindle, lower overarm, and switch on by moving the front left hand knob to "Start"

Note: The overarm is not used when playing 7″ records.

To reject a record, move the left hand knob to the "Reject" position.

The changer can be switched off by moving the left hand knob to the "Stop" position. If this is done while a record is playing, when switching on again, that record will be automatically rejected and the next record commenced.

NOTE:

Should the record changer be stopped with the pick-up arm not on its rest, the pick-up should not be handled, but the left hand knob moved to "Start," when the pick-up will automatically lift and return to its rest position and stop if no records are on the record spindle.

The pick-up arm will not move from its rest unless one or more records are placed on the record spindle. This is a safety device designed to prevent the pick-up being damaged should the changer be switched on without being loaded with records.

RECORDS.

To obtain the best results from your records and record changer, care should be taken to see that the records are stored so that they keep reasonably flat and clean. Dust or dirt in the record grooves causes abrasive action and shortens the life of the record, whilst badly warped records will give trouble in dropping, poor reproduction, and even damage the pick-up stylus.

INSTALLATION

Dimensions.

The cabinet space required for fitting is 15½″ long, x 13¾″ wide, with 5.3/4″ clearance above and 3.1/2″ clearance below the plate. With a slight alteration to the motor board cut out, the "GARRARD" Model R.C. 80 is a direct replacement for the "GARRARD" Models R.C. 60, 65, 65A, 70 and 70A Record Changers.

FITTING TO CABINET.

First, the motor board should be cut out and drilled as shown on the template enclosed with each changer. If the changer is to replace one of the "GARRARD" Models mentioned above, only the piece marked on the left hand side of the template need be cut out. A small clearance should be left between the edges of the unit plate and the cabinet sides, to allow the record changer to float freely when mounted on its suspension springs.

Having opened the carton, remove the turntable found on the top liner and the box containing the record spindles, then, after disposing of the side liners, carefully lift out the changer by the string loops. A bag containing the fixing screws and spring mountings will be found in one corner of the carton. The spare pick-up head and accessories, if supplied, will be found in a box fixed to the bottom liner. Assemble the spring mountings to the motor board as shown on the template and diagram 1. Next, assemble the long fixing screws to the changer mounting plate, fitting the spring washer under the nut, then assemble a nut on each screw, leaving 3/8″ of thread below.

Before placing the changer in position, the final switch off arm at the rear of the changer, which on unpacking will be found in a downward position, should be turned to a vertical position as shown in the illustrations. To do this, loosen the round headed screw at the top of the auto switch spindle, turn the arm to a vertical position and re-tighten the screw.

The changer can now be placed in position on its suspension springs. Still using the string loops for lifting, the changer should be levelled by first fitting the turntable, then placing a spirit level on a record on the turntable, the changer can be adjusted by raising it and adjusting the lower nuts. When level, the nuts should be assembled under the springs and locked in position with the lock nuts. The string loops may now be removed and the changer connected to the power supply and pick-up to the reproducer.

It is essential to use the spring suspension assemblies on this model changer to prevent extraneous vibration from reaching the unit.

If two record spindles are used, a hole can be drilled in the wooden motor board to take the spindle not in use.

If two "GARRARD" pick-up heads are used, the plastic box in which one of the heads is supplied, can be screwed down into the cabinet to act as a dust free container for the pick-up head not in use.

If the plug-in feature is to be used to change pick-ups, the cheese headed screw under the pick-up arm at rear of pick-up should be removed. This screw should be replaced and tightened up for transit purposes only.

TRANSIT SCREWS.

Two plated wood screws are supplied for use in clamping the record changer rigid to the motor board for transit purposes. The small bakelite washers should be fitted under these screws to prevent marking the mounting plate. These screws should be removed before using the record changer. The position of the screws is shown on template and diagram 11.

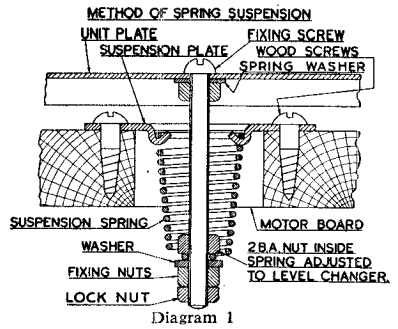
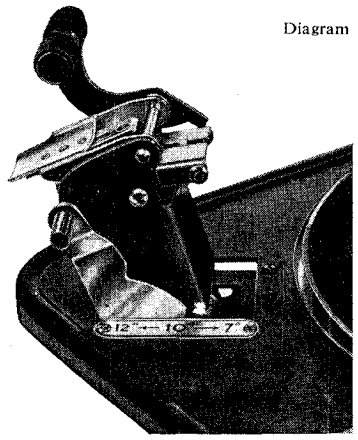


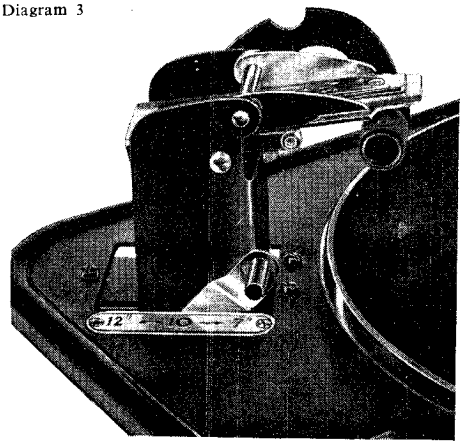
Diagram 1

Diagram 2



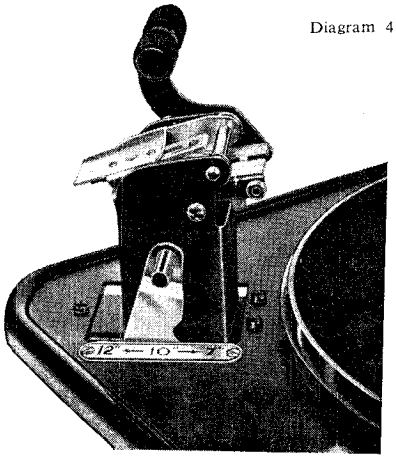
Record Platform Set for 12" Records

Diagram 3



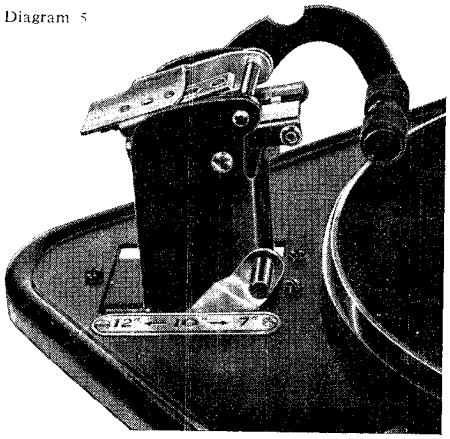
Record Platform Set for 7" Records

Diagram 4



Record Platform Set for 10" Records

Diagram 5



Record Platform set for 7"—45 r.p.m. Records using the large Record Spindle

MAINTENANCE.

The motor and intermediate wheel bearings, being of the oil retaining type, rarely need lubricating. When the need for oil is apparent, remove both the belts and while holding the intermediate wheel out of the way, lubricate the pulley and motor bearings with a medium grade of machine oil. Carefully remove every trace of surplus oil before replacing the belts.

The rubber rim on the intermediate wheel and the two belts must be kept free from oil.

VOLTAGE AND FREQUENCY.

The "GARRARD" Model R.C. 80/AC. Record Changer is suitable for use on 100/130 and 200/250 volts, at either 40, 50 or 60 cycles according to the motor pulley supplied, and the links on the terminal block should be set to the correct position to correspond with the voltage of the power supply as shown in diagrams 6 and 7.

A motor driving pulley can be supplied for 40, 50 or 60 cycle mains as required. The model R.C. 80/D.C. Record Changer is suitable for use on 100/130 and 200/250 volts direct current only and the links on the terminal block should be set to the correct position to correspond to the voltage of the power supply as shown in diagrams 8 and 9. The speed of the D.C. motor is governor controlled and information for adjusting the speed will be found under "Service Instructions."

The motor should be earthed by connecting a lead from the earthing tag, (located under one of the motor end cover screws) to a good earth connection.

When adapting an AC./DC. (Universal) Radio Receiver, Amplifier, or one using an AC./DC. Power Pack for the reproduction of gramophone records, a pick-up transformer, or condensers in series with the pick-up leads should be fitted, otherwise the pick-up circuit becomes alive. Also the leads from the radio set or amplifier to the pick-up should be screened and as short as possible.

LINK CONNECTIONS R.C.80/A.C.

This type is for A.C. only and has a brown cover on the terminal block.

CONNECT LINK THUS FOR 200/250 VOLTS.

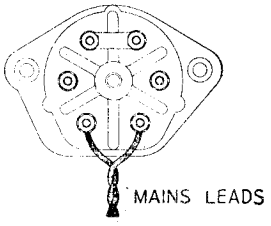


Diagram 6

CONNECT LINK THUS FOR 100/130 VOLTS.

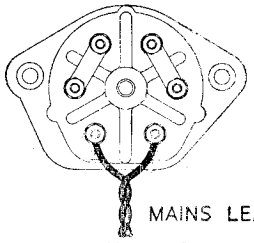


Diagram 7

LINK CONNECTIONS R.C.80/D.C.

This type is for D.C. only and has a blue Cover on the terminal block.

CONNECT LINKS THUS FOR 200/250 VOLTS.

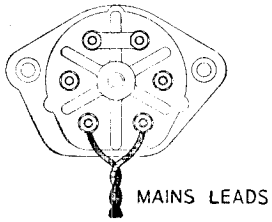


Diagram 8

CONNECT LINKS THUS FOR 100/130 VOLTS.

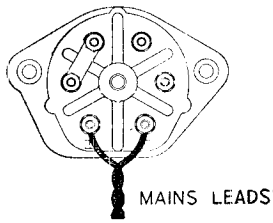
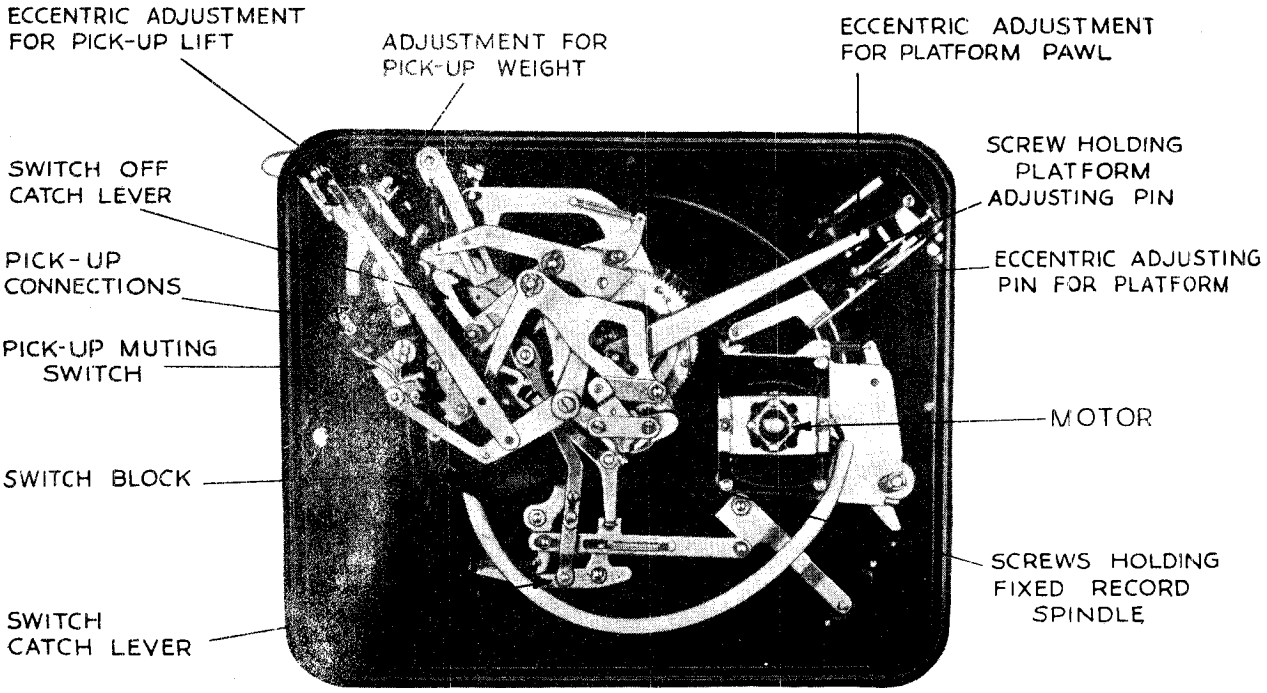


Diagram 9

Low voltage models have a green terminal block cover.



Underneath View

Diagram 10

SERVICE ADJUSTMENTS

SPEED.

The Model R.C. 80/AC. Motor is arranged to give the desired turntable speed within close tolerances. Should the turntable run excessively fast or slow then the motor pulley should be examined to see if it is the correct one to suit the frequency of the mains supply.

The various motor pulleys are colour finished as follows to distinguish the three types:—

Nickel	-	50 cycles.
Brass	-	60 cycles.
Copper	-	40 cycles.

For use on 25 cycles supply, a special motor and pulleys are required.

The speed of the R.C. 80/DC. and low voltage Models, is governor controlled, the governor being located at the lower end of the motor and is screwed on to the armature shaft and held in position by a screw through the governor collar. To adjust the speed, loosen the screw in the governor, and turn the governor a very small amount clockwise to increase the speed, or anti-clockwise to reduce it. Tighten the screw before running the motor to check the speed.

SPEED VARIATION.

It is essential that the driving surfaces of the three brass pulleys, the rubber tyred interwheel, and the belts, should be kept absolutely free from all oil or grease. This is the first point which must be checked if the turntable speed varies and the pulleys, belts and inter-

wheels should be cleaned with a dry cloth if contamination with oil is suspected. Another point to check is that the two belts run centrally on their pulleys; should they tend to run off the pulley, try removing the belt and turning it over. If this does not cure the trouble, a new belt should be fitted. Also see that the main spindle has a small amount of end play. To check this, remove the turntable and grip the main spindle firmly lifting it up and down. If no movement is felt, loosen the two screws (diagram 10) which holds the fixed portion of the main spindle, raise the main spindle a very small amount and re-tighten the screws.

NOISE.

Should the drive become noisy, first see that the screw holding the pulley to the motor shaft is not touching the intermediate wheel as it revolves. If it is, raise the pulley by loosening the screw holding it to the shaft. If the motor pulley is correct, then lubricate the pulleys as described under "Maintenance."

MOTORS.

If the motor fails to start when the control knob is turned to "Start," first check the power supply and ascertain if current is reaching the motor terminals. If correct, switch off the mains supply and examine the terminal block and see that the leads and screws are tight, also examine the switch contacts accessible underneath. Clean and adjust if necessary. On the R.C. 80/DC. and low voltage models, examine the motor brushes and make sure that they are clean and making good contact with the commutator. Also ensure that they are not sticking in the brush tubes.

The "Switch Catch Lever" (diagram 10) should also be checked to see that it is engaging when the knob is moved to "Start." If it fails to engage, adjustment is provided on the link which operates it to allow it to drop into engagement with the switch lever and hold it in position.

If a thick oil has been used to lubricate the motor bearings, the motor will appear weak or will not start. It will then be necessary to dismantle the motor and clean away all traces of the thick oil. It is, therefore, essential to lubricate the motor bearings with a good quality thin oil.

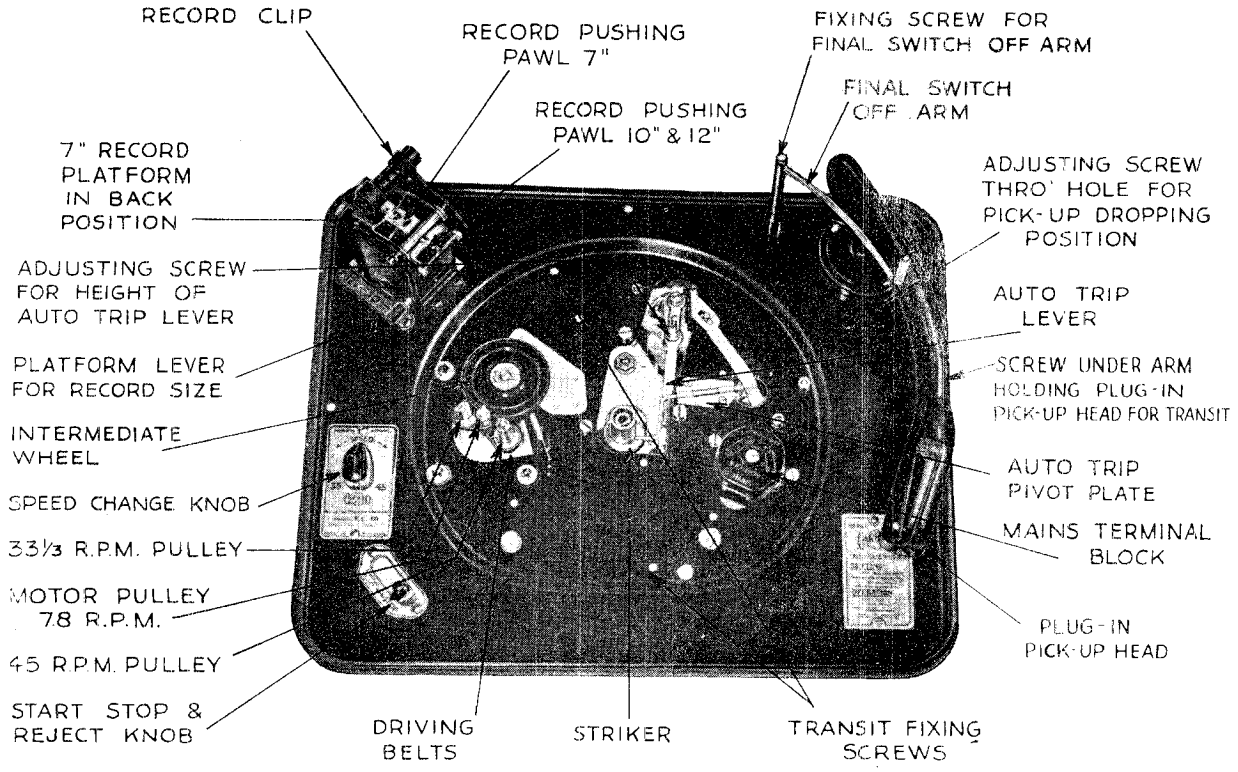
Should the motor get too hot, see that the voltage changeover links are set correctly to correspond with the voltage of the power supply. If correct, check the motor windings by inserting an AC. milli-ammeter in either motor lead.

The maximum current consumption of the R.C. 80/AC. should not exceed 0.26 amps. on 100/130 volts. 50/60 cycles, or 0.13 amps. on 200/250 volts 50/60 cycles. On the R.C. 80/D.C. the current should not exceed .26 amps. on 100/130 volts or .23 amps. on 200/250 volts. On the low voltage 12 volt model, the current should not exceed 1.2 amps. or the 6 volt model 2 amps.

If readings in excess of the above figures are obtained, the motor unit should be returned for examination.

To remove the motor, first make sure the electricity supply is disconnected, then remove the insulated plate on the underside of the terminal block and the two terminal block fixing screws will now be accessible, after removal the terminal block will be released and will be attached only to the motor leads. The speed indicator knob should also be removed.

Next, while supporting the motor underneath, unscrew the nuts on the three suspension screws which secure the motor to the unit plate. Before finally



View with Turntable Removed

Diagram 11

removing the motor and its mounting plate away from the unit plate, make a careful note of the sequence of steel and rubber washers on each suspension screw in order to re-assemble correctly when re-fitting the motor.

PICK-UP.

Two types of needle are necessary for playing the different types of record and a needle having a point radius of .0025" is required for the standard 78 r.p.m. records, and one with a point radius of .001" is required for the fine groove 33.1/3 and 45 r.p.m. records. To obviate needle changing either two plug-in pick-up heads or a turnover type of pick-up having two styli can be used. Care should be taken that the correct radius needle is used for the type of record to be played.

Should another type of pick-up be used other than that supplied with the unit, some adjustment for the difference in pick-up weight may be required.

The pick-up weight adjusting screw is located under the unit plate at the rear of the pick-up arm as indicated on Diagram 10 and to adjust the pick-up weight, the screw should be pulled to bring the nut clear of its bracket and the nut turned to give either an increase or decrease in spring tension. The maximum recommended weight for long playing records is 10 grammes.

Should trouble be experienced with the reproduction from the pick-ups, the head should be returned for examination to the manufacturer whose name or trade mark appears on the cartridge.

Crystal cartridges must not be opened or the manufacturers will disclaim all responsibility.

Note: A continuity test cannot be carried out on Crystal Pick-ups with an ohmmeter.

Should there be a tendency for the pick-up to track incorrectly, especially on the first record, check the pick-up weight and adjust as explained above if found lighter than 8 grammes.

If the pick-up does not run into the record grooves after alighting on the record edge, see that the record changer is level by placing a spirit level on a record on the turntable. Also make sure that the flexible wire leading to the pick-up is not twisted or held in such a manner as to prevent the free movement of the pick-up arm; also see that the associated levers are free.

CAUTION.

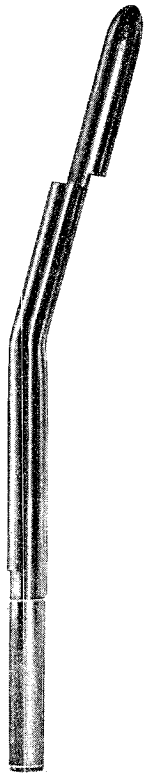
When making any adjustments to the Pick-up Arm it should NEVER on any account be forced into position. If the turntable is turned by hand it should NOT be turned backwards.

PICK-UP DROPPING POSITION.

The pick-up arm dropping position is factory adjusted for optimum accuracy. Should any minor adjustment be required rotate the screw accessible through the top plate as shown in diagram 11. Adjustment must be made only when the pick-up arm is in the rest position.

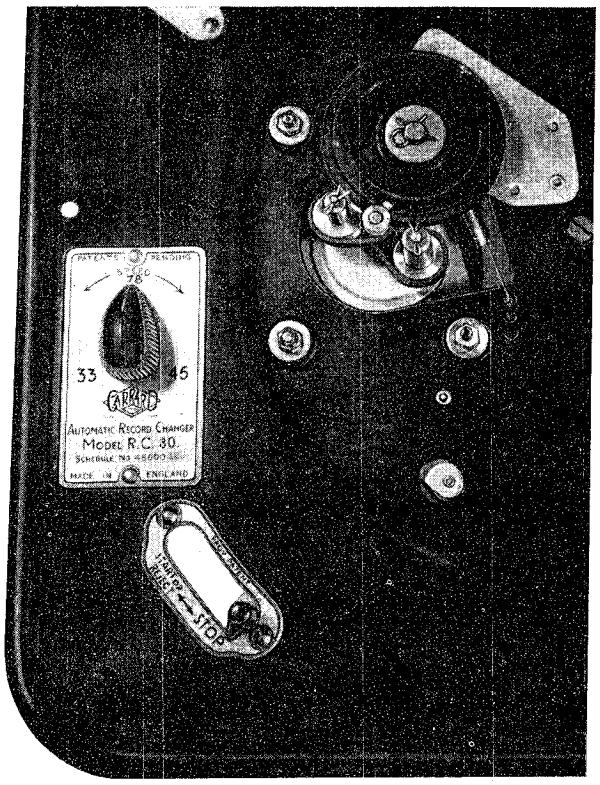
PICK-UP LIFT.

If desired, the amount the pick-up lifts can be adjusted by loosening the nut securing the "Eccentric Adjustment for Pick-up Height" (diagram 10), and adjusting the eccentric pivot with a screw driver in the slot at back. Finally, re-tighten the nut.



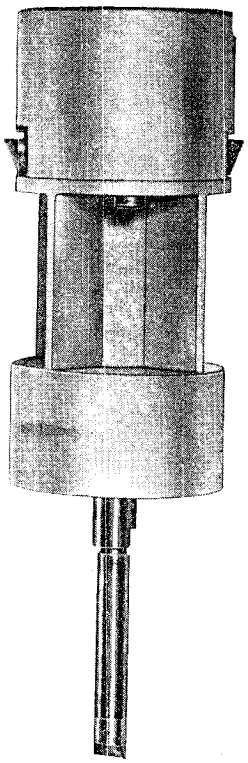
Record Spindle for 78 & 33⅓ r.p.m. Records

Diagram 12



View of Drive with Turntable Removed

Diagram 13



Record Spindle for 45 r.p.m. Records

Diagram 14

PICK-UP MUTING SWITCH.

A pick-up muting switch is connected across the pick-up to short circuit the pick-up except when the changer is in the playing position. It is important to note that no sound will be obtained from the pick-up by flicking the needle when the pick-up is on its rest. The muting switch contacts should be closed except when the changer is in its playing position. Should this switch fail to operate, clean the contact faces, and ensure that they make and break according to the position of the changer mechanism.

AUTO TRIP MECHANISM.

The auto trip mechanism is the velocity type and is of a special design to be very light and sensitive in operation. It is set to commence operation when the needle reaches a 2.7/8″ radius. The trip operates by the auto trip lever being raised by a small cam attached to the main spindle when the pick-up arm runs in on the record run off groove. The auto trip lever, on being lifted, pushes a small cranked rod which engages the clutch.

If the auto trip fails to operate, it may be caused by the auto trip lever being too low and it should be raised by giving the auto trip lever adjusting screw (diagram 11) about half a turn in a clockwise direction).

RECORD PLATFORM ADJUSTMENT.

When despatched from our Works, the record platform is set to accommodate records of average dimensions. Occasionally, however, records may be found outside the normal limits. If necessary, therefore, the platform may be adjusted to take them. To adjust the platform position, loosen the screw in the platform pivot collar (diagram 10) accessible from underneath the changer, rotate the pin by means of the slot in the end, until the platform is in the required position, then re-tighten the screw. The end of this pin is eccentric, and it is this eccentric which adjusts the platform position. Before finally tightening the screw after adjusting this pin, see that a small clearance, about 1/64″ is left between the eccentric shoulder and the side of the platform support.

Separate adjustment is provided for the platform pawl, and, to set the platform pawl, first set the platform lever in the 10″ position and operate the changer until the pawl is in its forward position. It should then be flush with the edge of the record platform. If it is not, the nut locking the eccentric adjustment for platform (diagram 10) should be loosened and the eccentric adjustment turned until the setting is correct, then re-tighten the locking nut. The pawl position should now be correct for all sizes of record.

RECORD DROPPING.

If the changer fails to drop any records other than the 45 r.p.m. type having a large centre hole, first make sure that the records are not badly warped. If they are reasonably flat, the record platform setting should be checked and adjustments made if necessary. Also check the record spindle to see that it is not bent out of position by laying it on the template (diagram 15).

Should records fail to drop correctly when using the large diameter record spindle, replace this spindle with the sloping one and see that it leans towards the record platform and is exactly in line with it. If this spindle is out of position it should be set correctly by loosening the two screws (diagram 10) holding the fixed part of the main spindle in position, turning the record spindle until it leans towards the centre of the record platform and tightening up the screws. After tightening the screws, see that the main spindle has a small amount of end play by first removing the turntable and gripping the main spindle firmly, lift it up and down. If no end play is felt, adjust as described under "Speed variation" on page 7. On fitting the large spindle the records should then drop correctly.

AUTO SWITCH.

When the last record on the record spindle drops on to the turntable, it allows the final switch off arm to move inwards far enough to switch the changer off. When any records are on the spindle, the arm does not move in far enough to allow this to happen. Should the changer fail to stop automatically, check the following points:—

1 That the auto switch arm is in vertical position as shown in the illustrations and that its fixing screw is tight.

2 See that the split lever holding the spindle underneath the mounting plate is also tight—it is at this point that a slight adjustment may be made to the position of the knock-off lever should it for any reason be forced out of position.

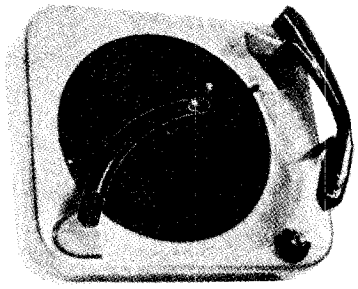
3 The auto switch catch lever (diagram 10) has a friction pivot and if this should become very free it may fail to hold the catch pin when it should engage. If this is so, remove the split pin at the catch lever pivot and stretch the friction spring a small amount, replacing the washer and split pin.

TEMPLATE FOR R.C. 80 RECORD SPINDLE.

Should the sloping record spindle be accidentally bent out of position through being dropped or other reasons, the record dropping will be affected. If trouble is experienced with erratic record dropping, lay the record spindle on the template and check that it conforms to the shape thereof.

Template for Record Spindle

Diagram 15



CONTENTS

SPECIFICATIONS

This single-pickup-arm, single-spindle record changer is designed for three-speed operation (33⅓, 45 or 78 revolutions per minute) from a power source of 110 volts at 60 cycles. It will play a single record manually, or a series of twelve 7-inch, twelve 10-inch, ten 12-inch, or ten 10-inch and 12-inch records intermixed.

Indexing of the tone arm for different sizes of records is automatically controlled by two feeler levers, making unnecessary the usual manipulation of the record shelf by the operator.

The pickup arm is designed to use a two-position knob-controlled dual stylus pickup. A special spring coupling system makes it impossible for the changer mechanism to be jammed or damaged by accidentally moving the pickup arm during the change cycle.

45 RPM records are adapted to the single spindle of this changer by inserting a bushing in the large center hole of each record.

Advantages of the spindle-type record shelf include: simplicity of changer mechanism, ease of operation, freedom from chipped records, and ability to change slightly warped records.

The changer shuts itself off after the last record is played.

OPERATING INSTRUCTIONS

LEVELING RECORD CHANGER

It is important to have the record changer absolutely level. Use a torpedo or similar type level on the record changer base plate. Use adequate shims under the radio combination cabinet to achieve perfect level.

LOADING RECORDS ON CHANGER

Pull straight up on the record balance arm until the arm clears the spindle. Swing the arm to the left until the pin in its shaft drops into the locating groove.

Gently lower records over the spindle until they rest on the off-set shelf. While holding the records level, lower the balance arm over the spindle to hold the records in place.

NOTE: Records requiring different speeds cannot be intermixed. When using 45 RPM records, each record must have a record adapter shim pressed into the large hole to permit their use on the small standard-sized spindle.

BEFORE PLAYING RECORDS make certain that the speed control knob is set at the proper speed for the records to be played, and that the small stylus selector knob on the pickup arm points to the same number as indicated on the speed control knob.

REJECTING: To reject a record at any time while the changer is operating, turn the changer control knob to "REJ" and release.

STOPPING: To turn the changer off before automatic shut-off, turn the changer control knob to "OFF." Lift the pickup arm and place on its rest.

UNLOADING: Lift the record balance arm and swing it to the left until the small pin on the shaft drops into the locating groove. Lift the stack of records straight up and off the spindle.

MANUAL OPERATION: To play single records or home recordings, allow the changer to go through its complete shut-off cycle. Lift the record balance arm and move it to the left to its locating groove. Place the record on the spindle and lower it to the spindle shelf. Tilt the record down toward the back end of the pickup arm while gently pulling it toward the record balance arm shaft, releasing the record support and allowing the record to be lowered to the turntable. Turn the changer control knob to the "ON" position *only*. Raise the pickup arm and place the stylus in the 1st groove of the record. To stop, place the pickup arm on its rest and turn the changer control knob to "OFF."

TO REPEAT RECORDS: Swing the record balance arm clear of the spindle, place a record on the turntable and start the changer. The record will be repeated until the control knob is turned off. If a 12-inch record is to be repeated, provide some means such as a rubber band to hold the 12-inch feeler lever against the pickup arm support post, otherwise the pickup will index as for a 10-inch record.

OPERATING PRECAUTIONS

1. Do not, under any circumstances, connect the motor to a source of direct current or to alternating current other than 110 volts at 60 cycles.

2. Do not allow oil or grease to come in contact with the rubber drive wheels (or belts) of the motor assembly.

3. Do not intermix records of different speed requirements.

4. Do not attempt to play records with other than the proper stylus or turntable speed.

5. Do not allow records to remain unplayed on the changer spindle since they will be warped and ruined. Store records flat, in a cool place. Dust on records spoils tone, and leads to short record and stylus life.

6. Take extra care with micro-groove records—a single scratch can cause the stylus to skip across a large portion of the record: a little dust under the stylus can cause groove jumping and poor tone.

7. Keep a small eyebrow brush handy to remove dust from the stylus after every stack of records for best volume and tone.

8. When not in use, leave the speed control knob between the "78" and "45" positions to relieve pressure on the motor wheel.

9. When playing records manually, do not allow the stylus to be dragged across the record, or "ride" against the top or edge of the turntable. The stylus jeweled point may be broken.

10. Do not play fine records with a broken or badly worn stylus. If tone is poor even after the dust has been removed from the stylus, the stylus may be defective. Further use may ruin records.

PICKUP CARTRIDGE

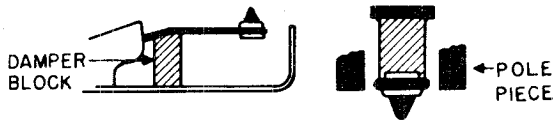
The Model P16 record changer is equipped with a dual stylus variable reluctance cartridge (G.E. Cat. No. RPX-050). A small knob control permits instant selection of either a .003" or .001" stylus for use on standard or micro-groove records. To change styli, first depress the control knob, and then rotate half a turn in either direction, until the pointer points to the number on the pickup arm corresponding to the speed of the records to be played. When the knob is released, the stylus assembly should spring back into its operating position.

MODEL P16

TO CHECK STYLUS

Dust on and around the stylus may cause easily corrected complaints. A soft bristled brush, such as G.E. Cat. No. RQB-001, should be used to clean these parts. A few of these brushes in the home service kit make friendly gifts, may save a service call, and enhance the customer's record enjoyment.

The small rubber-like damper block may become loose at one end, causing distortion. A tiny drop of thin nail polish may be used to re-cement the damper block. Do not allow the whole block to become coated with the cement.



Stylus should ride equidistant between the pole pieces, with only the stylus tip protruding down below the poles. Low pickup output is sometimes traced to a stylus lever bent down below the field of the poles. Normally, a slight extra pressure on the pickup arm causes the stylus to be forced up between the poles, which then support most of the pressure, protecting the stylus.

The tiny micro-groove stylus may be easily broken, causing distortion, groove-jumping, and ***rapid record wear.*** Such a defect is almost impossible to see with the naked eye, especially since the sharp outline of a break would be worn round by the time the serviceman was called. A jeweler's eyeglass, known as a loupe, is very useful when inspecting stylii and damper blocks.

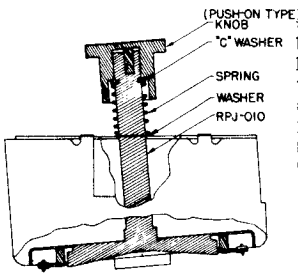
Early stylus wear, though distinguishable by the ear, is almost impossible to determine by sight, unless a high-powered microscope is used. For this reason the listening test for stylus wear is recommended: if a new stylus sounds better, the old one must be defective. Use almost new records with critical high frequency passages for listening tests.

It is suggested that whenever the changer is not in use the larger standard stylus be left in the playing position since the tiny micro-groove stylus is much more easily damaged in case of accidental shock.

TO REPLACE STYLI

To remove the styli assembly for replacement, first pull off the control knob; remove the two cartridge mounting screws; slip off the two wire connectors, and remove the cartridge from the pickup arm. Depress the small spring on the stylus control shaft to remove the "C" washer, followed by the spring and flat washer.

When reassembling, the two wires may be connected to either terminal of the pickup. Note that the knob is keyed to fit on the shaft only one way.



RKP-009 SERVICE KIT—Contains knob, "C" washer, spring, and flat washer

RPJ-010 REPLACEABLE STYLI ASSEMBLY—With .003 and .001 inch sapphire styli

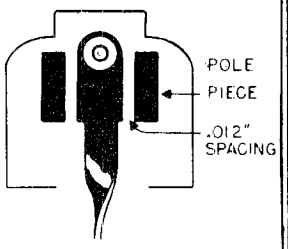
RPJ-011 REPLACEABLE STYLI ASSEMBLY—With .001 and .0025-inch diamond styli

SCRATCH, SURFACE NOISE

Scratch can be reduced by connecting a 15,000 ohm resistor across the pickup leads, either at the amplifier, or under the changer. Lower values of resistors will increase the effect. This procedure reduces the high frequency response of the phonograph, and may be noticed by a lack of "brilliance" in classical music if the resistor value is not carefully chosen to suit the customer.

TO CHECK PICKUP

The pickup coil should measure about 340 ohms. Output measured with a vacuum-tube voltmeter and a Columbia 10003M Standard Test Record should be about .01 volts at 1000 cycles. Distortion originating at the pickup other than by worn or broken styli is usually due to improper spacing of the pole pieces, or bits of dust, especially iron filings, accumulating between the stylus and the pole pieces. Pole pieces should be parallel to each other, and .012 inches from the stylus. Increasing this clearance lowers the voltage output, but tends to lessen distortion and scratch pickup. Though decreasing the clearance increases the output, the stylus becomes more easily clogged with dust, and there is danger that the stylus may actually touch the pole pieces causing unpardonable distortion.

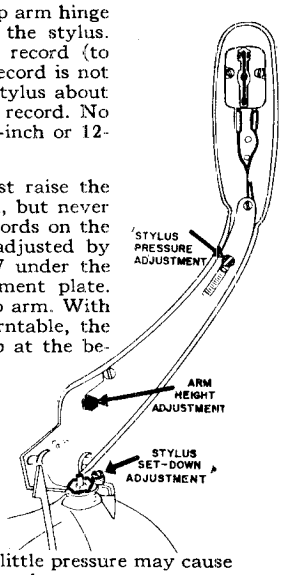


SERVICE ADJUSTMENTS

STYLUS SET-DOWN

A small screw on the top of the pickup arm hinge post adjusts the set-down position of the stylus. Make adjustment with a new 10-inch record (to make sure that the center hole in the record is not enlarged). The ideal setting drops the stylus about in the center of the lead-in area of the record. No other adjustment is necessary for the 7-inch or 12-inch records.

PICKUP ARM HEIGHT: The pickup arm must raise the pickup enough to clear the 12th record, but never so high that it strikes the unplayed records on the record spindle. The pickup height is adjusted by turning the hex-headed LIFT SCREW under the pickup arm at the end of the adjustment plate. Screwing it up and in lowers the pickup arm. With a 1⅛ inch stack of records on the turntable, the pickup should raise ¼ inch straight up at the beginning of the change cycle.



STYLUS PRESSURE

The stylus pressure should be between 6 and 8 grams. Adjustment may be made by loosening the small round-headed screw which moves in a slot on the adjustment plate under the pickup arm. Moving the screw toward the pickup reduces the stylus pressure. Too little pressure may cause groove-jumping or failure to trip; too much pressure causes excessive record and stylus wear.

NOTE: Before increasing stylus pressure to remedy groove-jumping check:

For dirt under stylus

For worn or broken stylus

Damaged micro-groove records

That mounting bolts have been removed allowing the changer to float on its mounting springs. This prevents room vibrations from jarring the stylus out of the record groove.

That the radio and changer are approximately level. Check with a spirit level.

TROUBLESHOOTING

Rather than attempt to itemize the numerous bent levers and stuck bearings and the resulting symptoms that may possibly occur during the life of a record changer this manual intends to explain the operating principles and purpose of the special parts in the belief that a serviceman who understands *how* it is supposed to work can more easily figure out *why* it does not operate.

The following is a brief review of complaints common to many record changers, with suggested causes and remedies.

Many intermittent complaints are caused by irregular records. Another cause is over-oiling: small levers requiring very light pressures become stiff with oil, and the dust accumulated by the oil, and should never be oiled. Gasoline or kerosene should never be used for cleaning changer parts because of possible damage to rubber parts. Use carbon tetrachloride in a ***well-ventilated room.***

SYMPTOM	CAUSE	REMEDY
Too slow, stalls	Dirt or oil on motor pulleys and turntable rim	Clean with carbon tetrachloride
	Speed pulley unsnapped from retaining ring	Snap back in place
	Large idler wheel mounting bent, idler tire not making firm contact with pulley	Straighten mounting
	Voltage too low	Check line voltage, should be at least 105
	Changer too cold	Test changer at room temperature, 70 deg.
	New oil or grease too heavy	Use only light oil and grease. MANY POINTS MUST HAVE NO OIL. See page 2 for lubrication instructions
Noises: Wow	Oil on pulleys causing slippage	Clean with carbon tetrachloride
	Warped records	Use flat records for testing
Click	Trip lever friction assembly too stiff	Clean, adjust spring by bending for minimum friction required to move pawl lever
Rumble, roar	Changer not floating on mounting springs	Loosen mounting bolts under turntable
Thumping	Dent in rubber tire on idler wheel, caused by storing changer in 33-45 RPM position or allowing motor to run when changer is stalled.	May disappear after running the changer a few minutes; otherwise replace the idler wheel. To prevent reoccurrence, leave speed control knob between "78" and "45" when not in use
Dead motor or pickup	Open circuit	Both circuits are simple series type and can be easily checked with an ohmmeter. Pickup—340 ohms; Motor—15 ohms (approx.)
Poor tone, Jumps grooves	Broken or dirty stylus Stylus pressure too light	See page 2 for stylus and pickup information
	Pickup arm bearings stiff	Remove all grease, burrs
	Substandard records	Check for scratches, shallow grooves
	Changer not level or not floating on springs	Level changer; loosen mounting bolts
Doesn't drop records	Spindle mechanism bent or dirty Record holes too small	Repair or replace spindle (see page 8) Check records
Drops two records	Record holes too big Record guide in spindle may be stuck	Use other records Record guide must drop freely by gravity
Fails to cycle, or cycles too soon	Check trip link, trip lever, pawl lever and trip pawl for easy operation. Check spring friction coupling between trip lever and pawl lever	Straighten bent trip link; wash off main gear levers; **DO NOT OIL.**
Pickup arm indexes O.K. for one size record only	Reset lever or 7 inch feeler lever dirty, or their springs interchanged when reassembled; 12 inch lever bent, or spring missing.	Spring under reset lever is lightest of all; 7 inch feeler spring is same tension as auto. shutoff lever assm. See page 5.

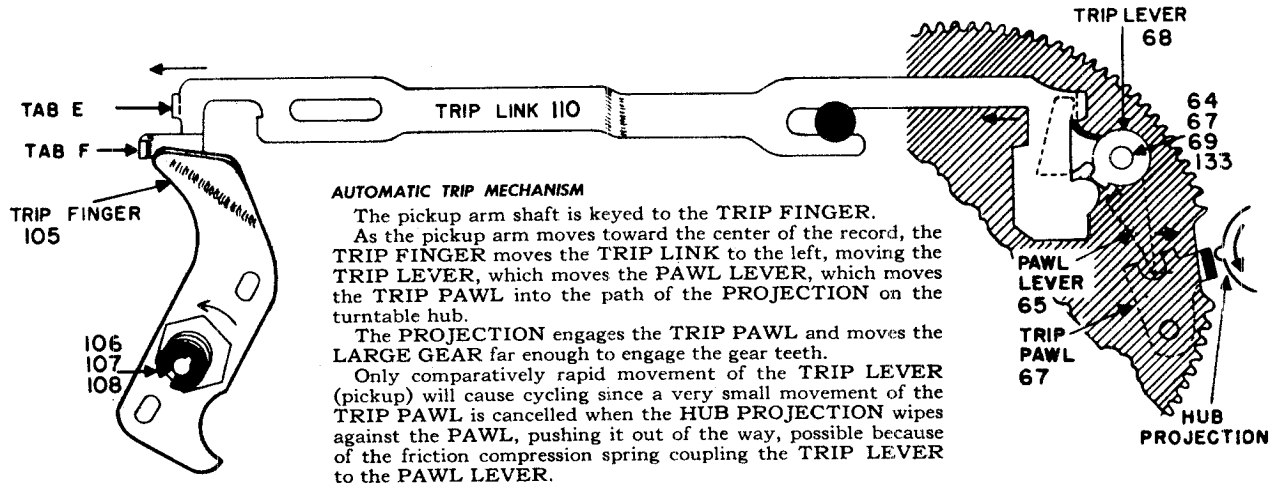
MODEL P16

THEORY OF OPERATION

STARTING CHANGER:

When the control knob is turned to the REJ position, the manual shut-off rod moves the switch operating lever, which engages TAB E of the TRIP LINK.

The TRIP LINK moves the TRIP LEVER, which moves the PAWL LEVER, which moves the TRIP PAWL into the path of the PROJECTION on the turntable hub. The PROJECTION engages the TRIP PAWL and moves the LARGE GEAR far enough to engage the gear teeth with the turntable hub gear.



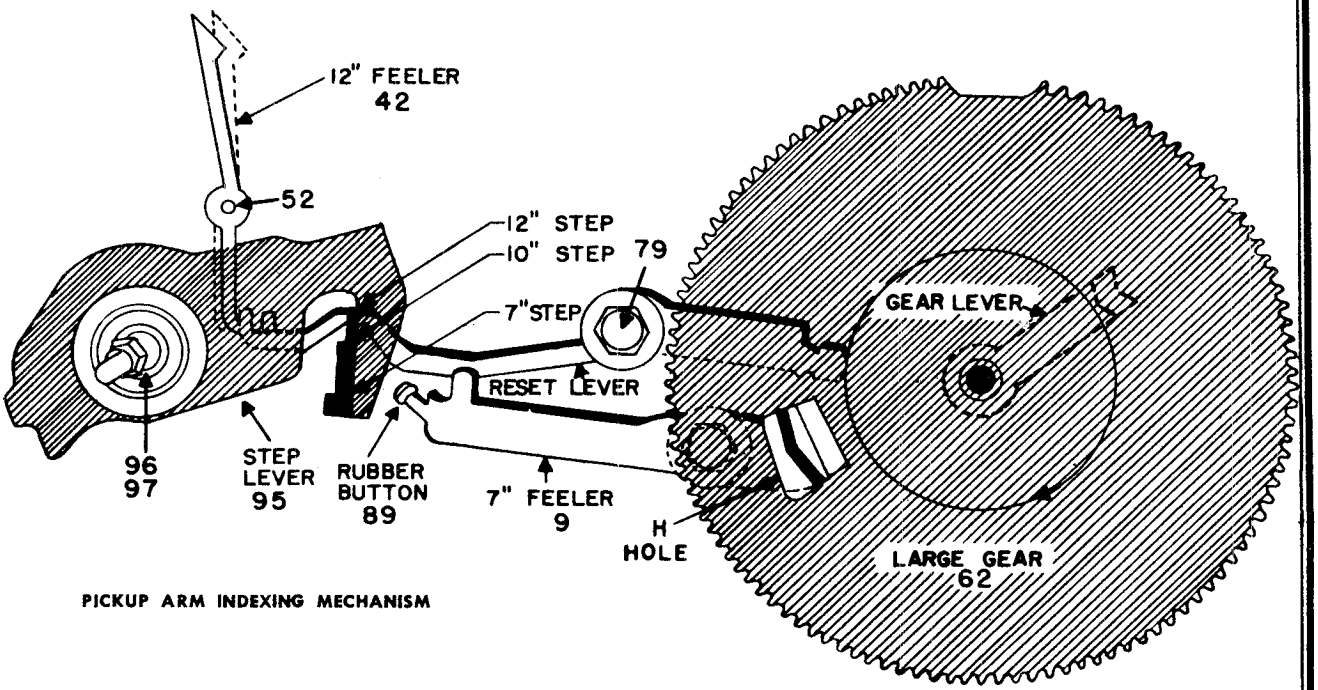
AUTOMATIC TRIP MECHANISM

The pickup arm shaft is keyed to the TRIP FINGER.

As the pickup arm moves toward the center of the record, the TRIP FINGER moves the TRIP LINK to the left, moving the TRIP LEVER, which moves the PAWL LEVER, which moves the TRIP PAWL into the path of the PROJECTION on the turntable hub.

The PROJECTION engages the TRIP PAWL and moves the LARGE GEAR far enough to engage the gear teeth.

Only comparatively rapid movement of the TRIP LEVER (pickup) will cause cycling since a very small movement of the TRIP PAWL is cancelled when the HUB PROJECTION wipes against the PAWL, pushing it out of the way, possible because of the friction compression spring coupling the TRIP LEVER to the PAWL LEVER.



PICKUP ARM INDEXING MECHANISM

PICKUP ARM INDEXING SEQUENCE

The RESET LEVER is a limit stop for the STEP LEVER, the position of which determines where the pickup arm sets down after a change cycle.

The GEAR LEVER depresses the RESET LEVER, cancelling all previous indexing information. (This is done mid-cycle, as soon as the pickup arm reaches the extreme right-hand position.)

As each 12-inch record falls it displaces the 12-inch FEELER, which unlatches the RESET LEVER, allowing a spring to move the RESET LEVER to its 12-inch position. The position of the RESET LEVER determines which step the STEP LEVER will stop against.

As LARGE GEAR continues to rotate, the 7-inch FEELER is allowed to drop into HOLE H, forcing the RUBBER BUTTON upward toward a record; if it touches a 10-inch or 12-inch record its movement is limited—and nothing happens. If a 7-inch record is on the turntable, RUBBER BUTTON cannot stop the 7-inch FEELER from depressing the RESET LEVER enough to engage the STEP LEVER at the 7-inch step.

Since neither the 12-inch FEELER nor the 7-inch FEELER operate when a 10-inch record falls to the turntable, the RESET LEVER remains in the neutral 10-inch step position.

PICKUP ARM MOVEMENT

As the forked lever begins to move, the inclined surface on the end near the switch pushes the lift pin upward, raising the pickup arm clear of the record. As soon as the pickup arm is fully raised, the tab on the side of the forked lever contacts the trip finger, swinging the pickup arm clear of the turntable. The tab also contacts the step lever moving it clear of the reset lever.

As the lift pin is pushed upward, the conical spring is compressed, overcoming the pressure of the spring washer separating the step lever and the trip finger, and forcing them together. The detents in the trip finger drop into the matching holes in the step lever locking the two together so that the step lever can control the pickup arm until the stylus is properly placed on the next record.

As soon as the stylus is placed in the lead-in groove of the record, the rapidly decreasing conical spring tension is overcome by the spring washer, which unlocks the trip finger from the step lever, thereby allowing the pickup arm to be guided by the stylus in the record groove.

CHANGING RECORDS

As the LARGE GEAR rotates, the ROLLER moves the FORKED LEVER toward the ON-OFF switch.

Near the end of its travel, the FORKED LEVER engages the EJECTOR LINK, which forces the PUSH ROD up inside of the record support spindle.

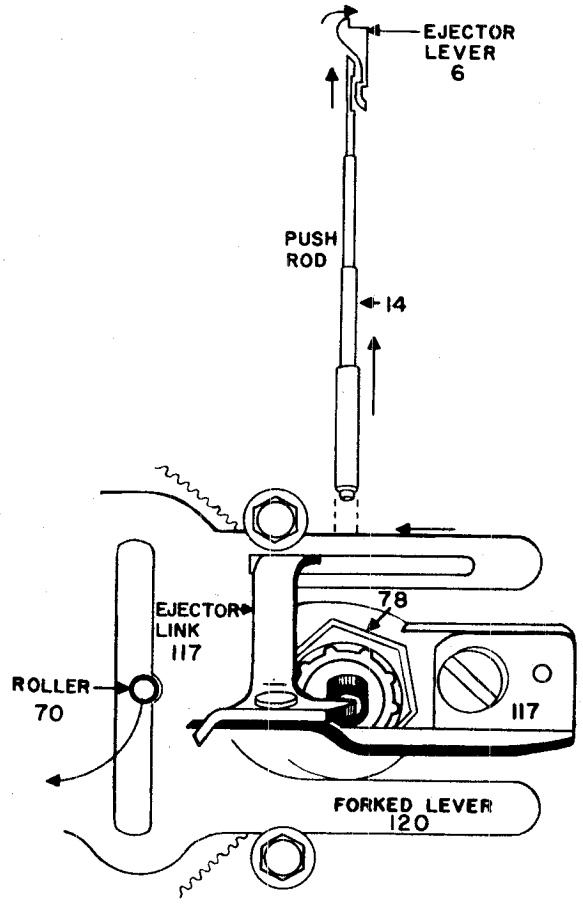
The PUSH ROD forces the record EJECTOR LEVER up and over, forcing the record off the record support ledge of the spindle.

AUTOMATIC SHUTOFF SEQUENCE

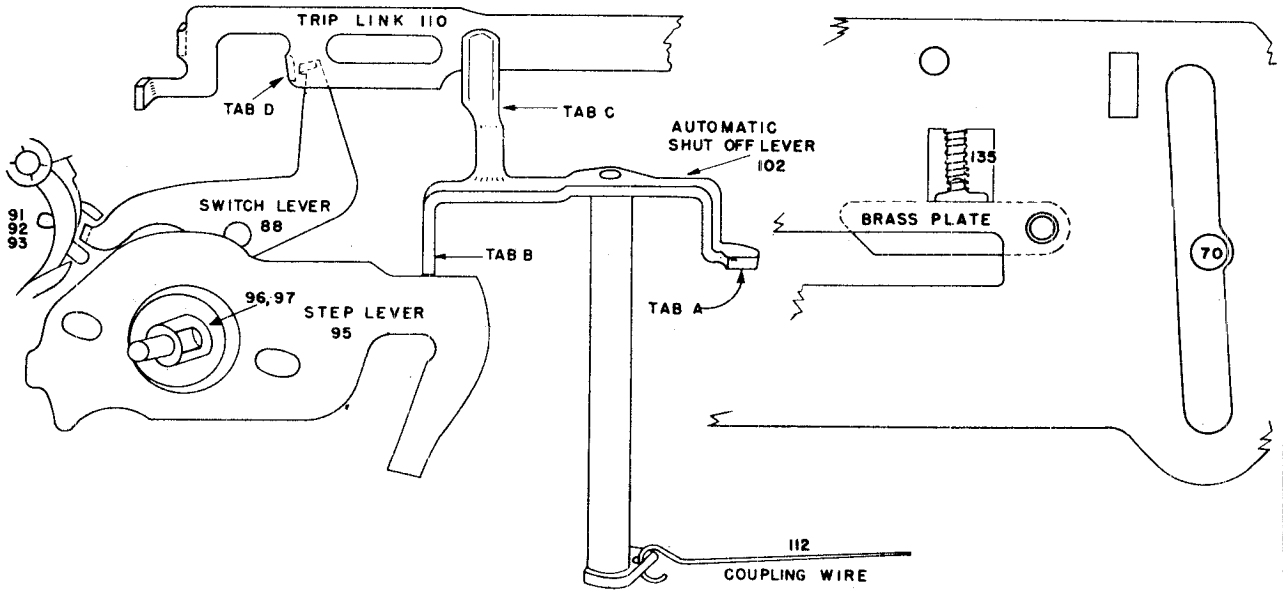
After the last record falls to the turntable, the record balance arm drops, operating a lever which pulls on the COUPLING WIRE which operates the AUTOMATIC SHUTOFF LEVER. At this instant the STEP LEVER and TRIP LINK are in a position to stop the changer . . . but are prevented from doing so by TAB A which strikes the BRASS PLATE, thereby limiting the movement of the AUTOMATIC SHUTOFF LEVER until after the record has been played and the next cycle completed.

On the shutoff cycle TAB B moves up to stop the STEP LEVER, which locates the tone arm in its rest position.

TAB C pushes up on the TRIP LINK allowing TAB D of the TRIP LINK to engage the SWITCH LEVER which operates the ON-OFF switch.



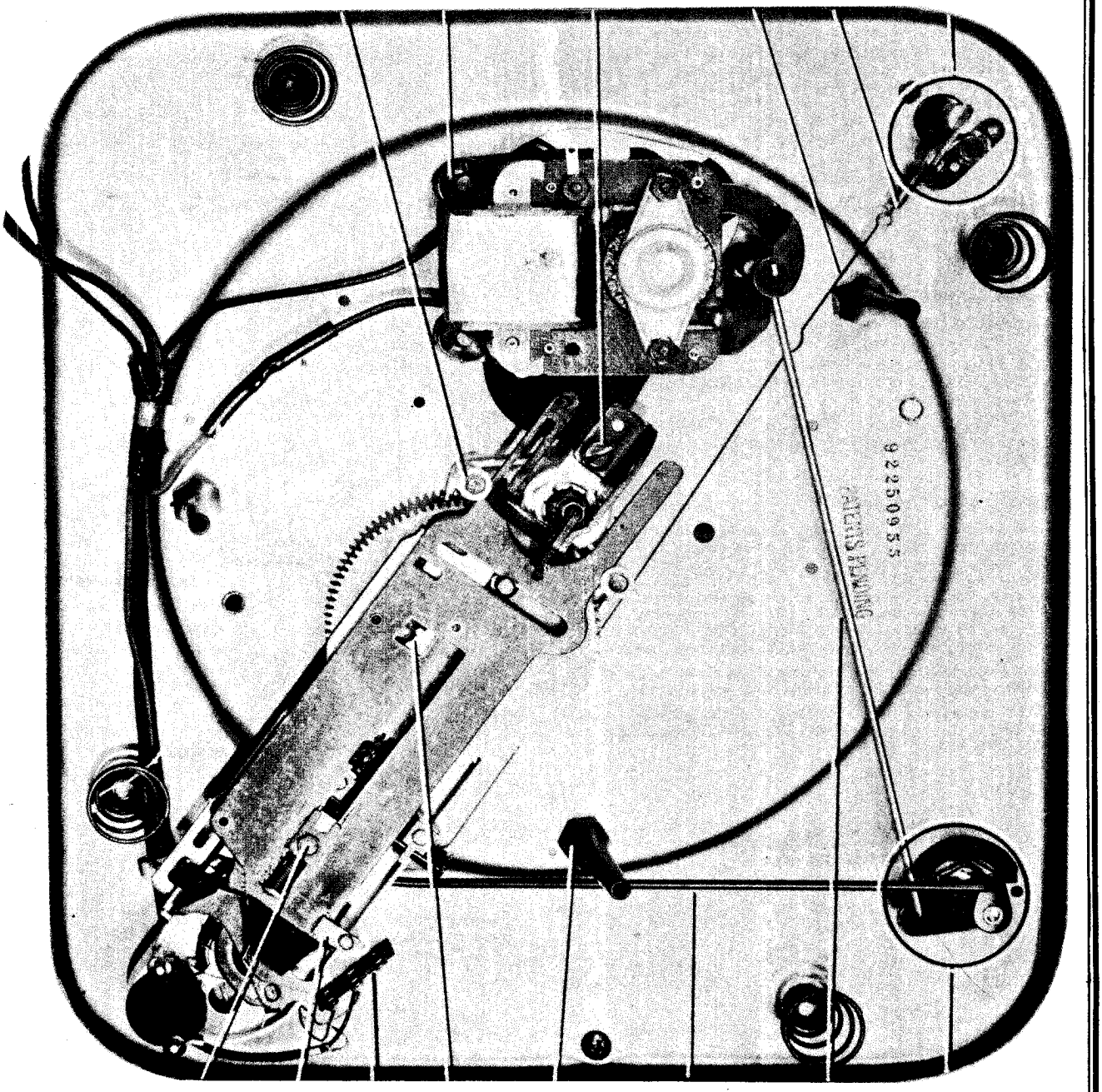
RECORD CHANGING MECHANISM



AUTOMATIC SHUTOFF MECHANISM

MODEL P16.

ASSEMBLY INSTRUCTIONS—PARTS IDENTIFICATION



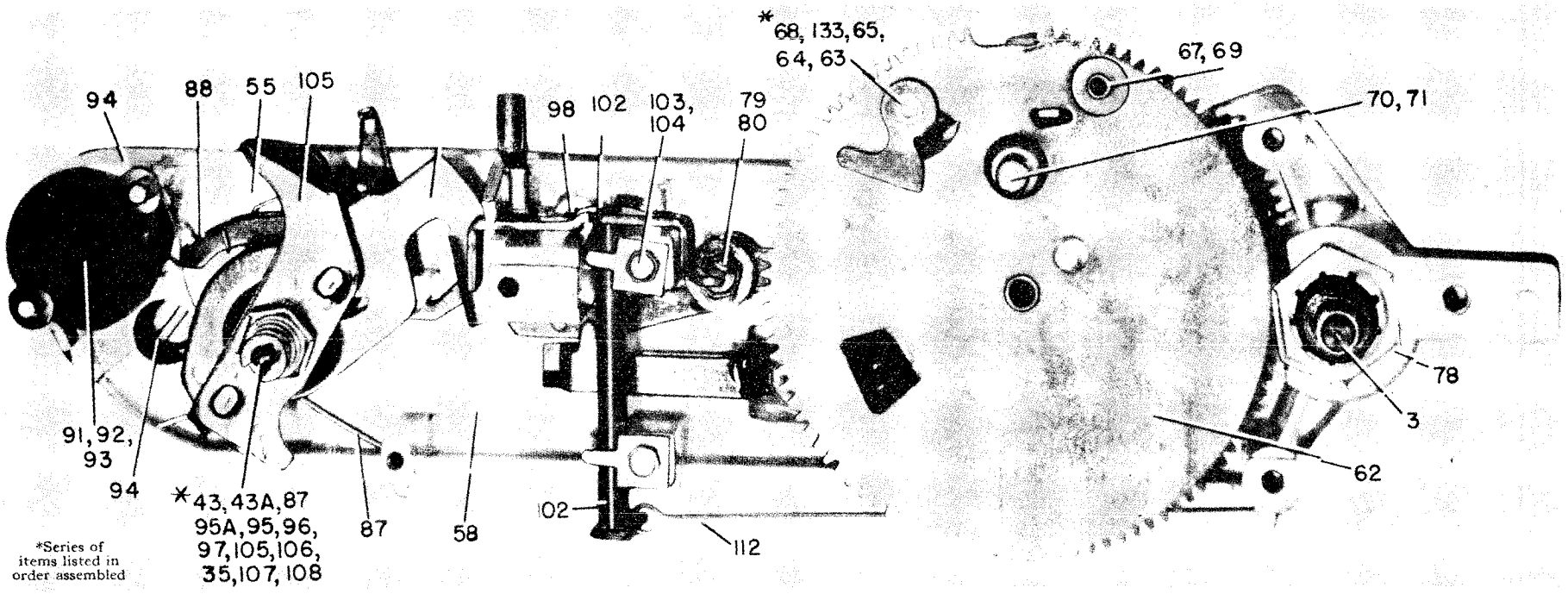
UNDER-CHASSIS VIEW COMPLETE

CONTROL KNOB SHAFT ASSEMBLY SEQUENCE

Control knob shaft bearing, PAL nut

Speed control shaft, rubber grommet, speed control rod, spring washer (dish away from bearing). Mount shaft through bearing, add C washer to hold shaft in place

Connect ON-OFF shaft to manual shut-off rod, mount compression spring on shaft, slip ON-OFF shaft thru speed control shaft, mount speed control knob, C washer and ON-OFF knob.



MAIN LEVER SUB-ASSEMBLY

MAIN LEVER ASSEMBLY SEQUENCE

Main casting.
12″ feeler lever, C washer, wire spring, speed clip.
Switch lever, wire spring, C washer.
Hook ON-OFF control rod into hole in switch lever.
Mount casting on changer chassis.
Reset lever, spring, washer, screw.
7″ feeler lever, spring, washer, screw.
Place fiber washer on pickup arm shaft, insert shaft through bushing, add step lever spring, fiber washer, step lever, retaining ring.
Spring washer (dish away from step lever), trip finger lever, nut.
Pickup arm push rod, conical spring, C washer.
Hook automatic shutoff wire to automatic shutoff lever.
Mount automatic shutoff lever, spring, two bearings, screws.
Mount large gear, thin fiber washer goes under C washer.
Forked lever assembly (slip trip lever under automatic shutoff tab C). 2 rectangular bearings (one holds detent spring), 2 round bearing washers and screws.
Turntable spindle, nut.
Ejector link, lockwasher, screw.
ON-OFF switch, fiber spacer strip, fiber cover disk, speed clips.

MODEL P16

LUBRICATION

Additional lubrication should not be required for the life of the changer, but in cases of unusual use, high temperature or very dusty conditions the changer should be lubricated as follows:

Old grease and dust should be removed with a small brush and plenty of cleaning fluid. Gasoline or kerosene should not be used because of possible damage to rubber parts.

Grease the following points, using Millicott 70K, Andok "B," or other high grade, light-bodied lubricant:

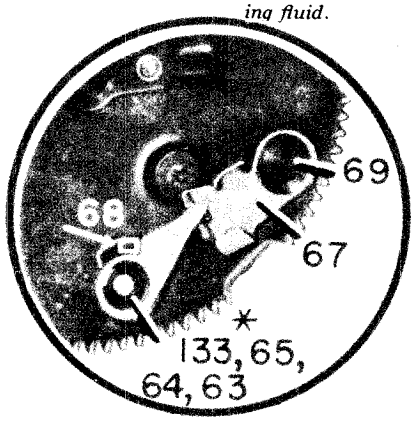
Head of lift screw under tone arm.
Edges of the 3 slots, other 4 support bearing surfaces, step lever cam, and the pickup arm push rod cam of the forked lever.
Lower surface of the step lever.
Base of record spindle push rod, turntable ball bearings, bushing and gear.

Apply a small quantity of light mineral oil to:

Tone arm hinge pivots, spindle, push rod.
Step Lever bearing
Ejector link
Large gear shaft, stud roller

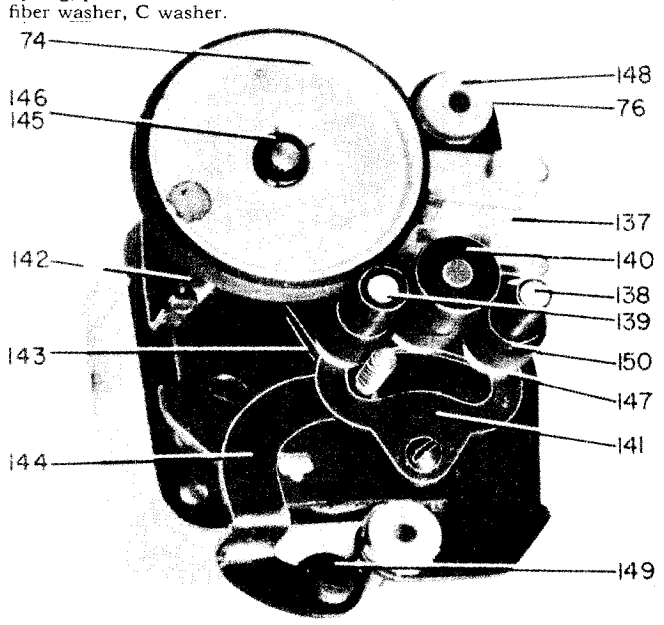
Idler wheel and speed-change pulleys. (Remove pulleys to oil their spindles.) Motor can be partly disassembled to washer bearings; allow cleaning fluid to dry before applying a drop of light oil to each bearing.

NOTE: Never allow any oil or grease to reach the rubber parts of the drive wheels. The rubber wheels should be cleaned with a cloth moistened with cleaning fluid.

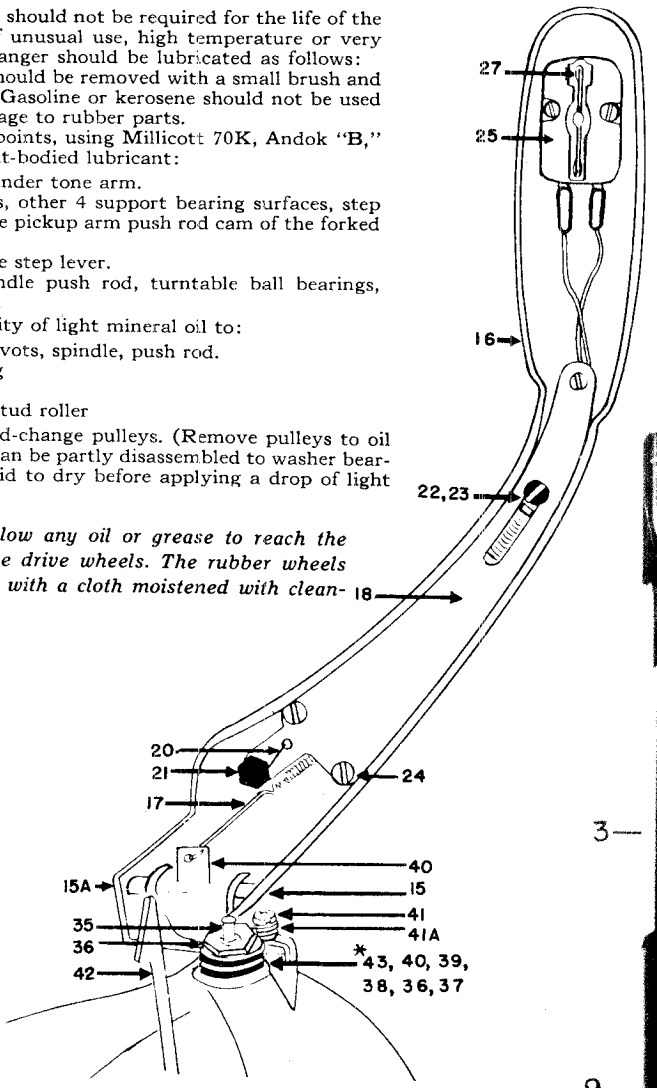


MAIN GEAR LEVERS
PAWL LEVER FRICTION ASSEMBLY SEQUENCE

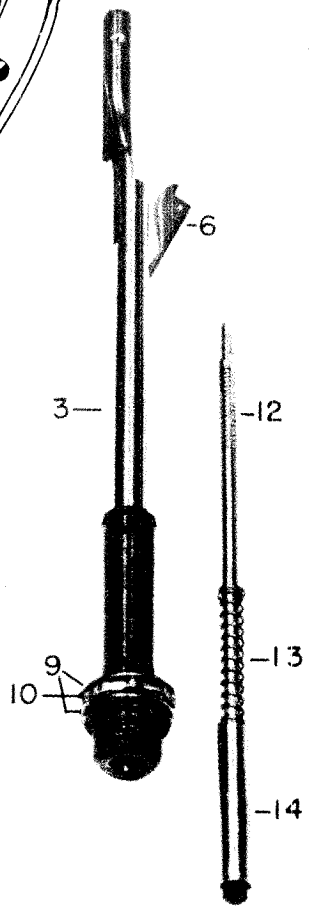
Mount the trip lever on the main gear
Spring, pawl lever
fiber washer, C washer.



MOTOR ASSEMBLY



PICKUP ARM ASSEMBLY



SPINDLE ASSEMBLY

* Series of items listed in order assembled.

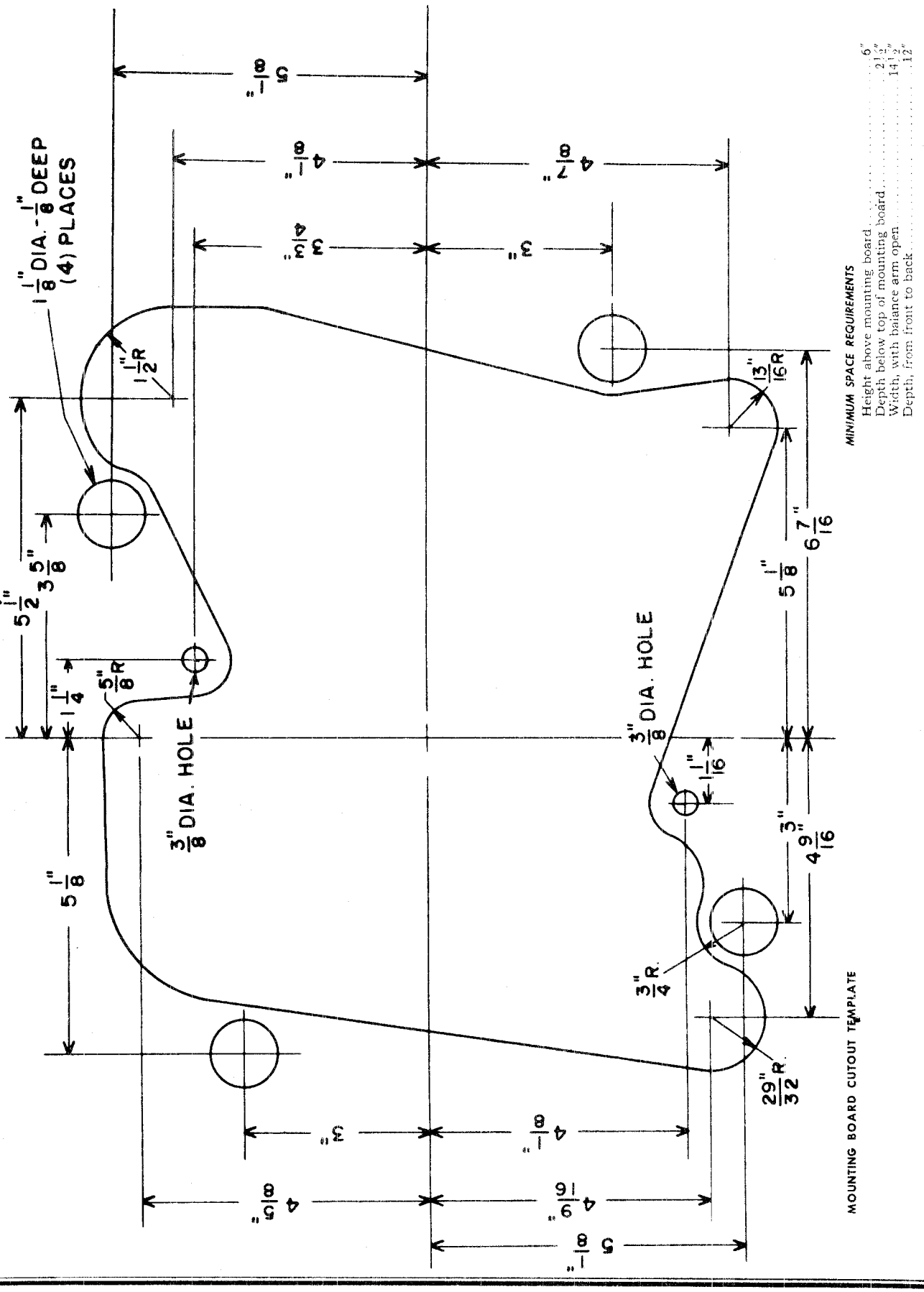
TO DISASSEMBLE SPINDLE PUSH-ROD ASSEMBLY

Holding the spindle vertically, press the base of the push rod against the bench until the ejector lever moves up into the spindle body. Press the lever on through with a thumbnail, and at the same time release the downward pressure on the spindle. When the ejector lever pops out, press downward on the spindle again and press the lever downward and out. The push rod and two springs may now be withdrawn from the base of the spindle.

TO ASSEMBLE SPINDLE PUSH-ROD ASSEMBLY

Place both springs on push rod. Insert push rod into spindle with the flatted side of tip facing ejector lever retaining pin. Press spindle downward forcing the push rod in as far as possible. Place ejector lever in the slot resting the end against the top of the spring. Point the lever upward and release the pressure on the spindle, allowing the reject lever to be caught under its retaining pin. Press the spindle downward again pushing the ejector lever into the spindle, snapping it into place.

MODEL P16

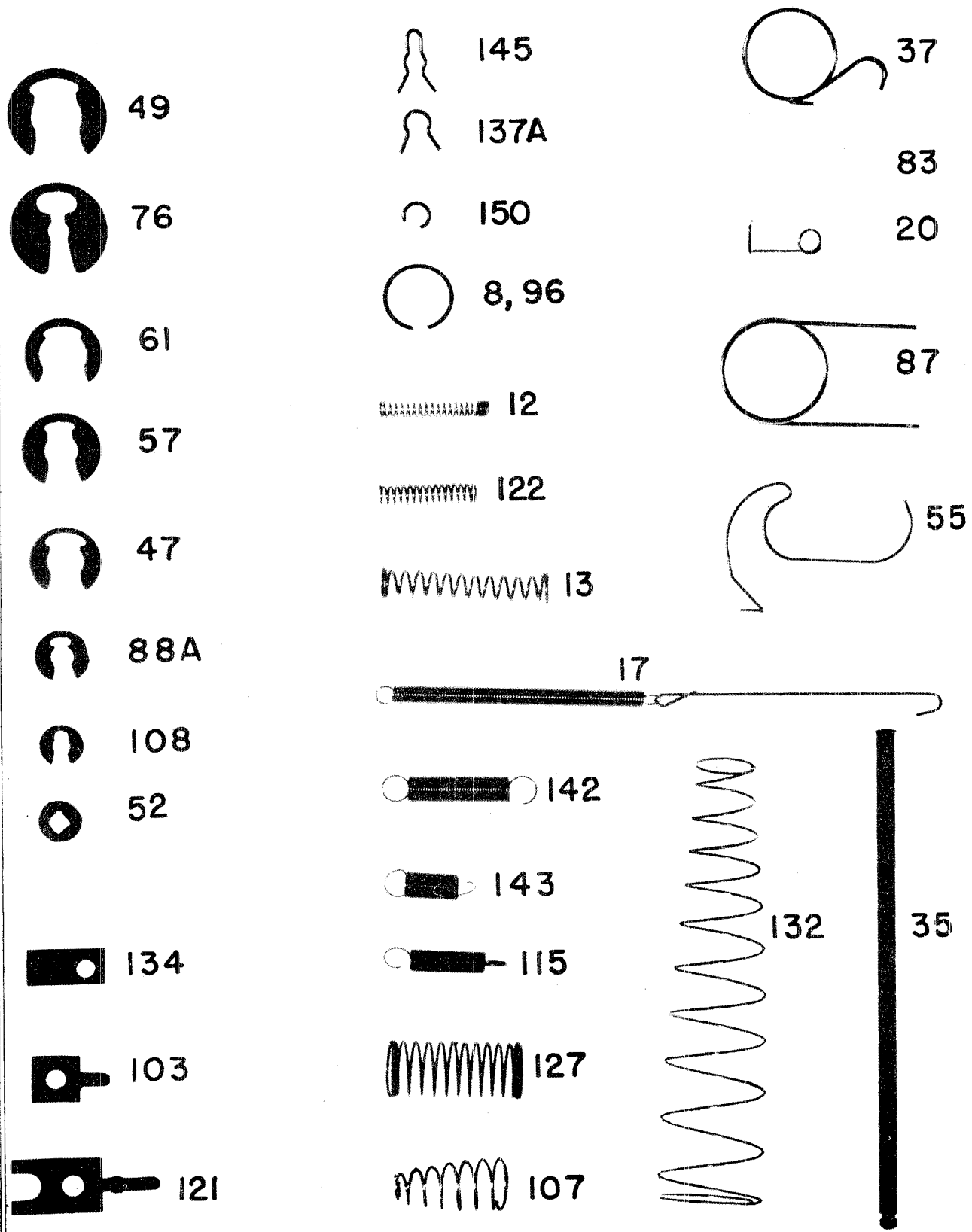


MINIMUM SPACE REQUIREMENTS

Height above mounting board	6"
Depth below top of mounting board	2 1/2"
Width, with balance arm open	14 1/2"
Depth, from front to back	12"

MOUNTING BOARD CUTOUT TEMPLATE

MODEL P16



The following springs are critical, and their proper installation effects the indexing of the pickup arm. Their length, diameter and number of turns are very similar, making identification difficult. Their most distinguishing feature is their tension, a comparison of which is listed below.

Item				
	82	for reset lever	very light tension	RMS-253
	135	escape lever	light tension	RMS-262
	99	7" feeler lever	medium tension	RMS-256

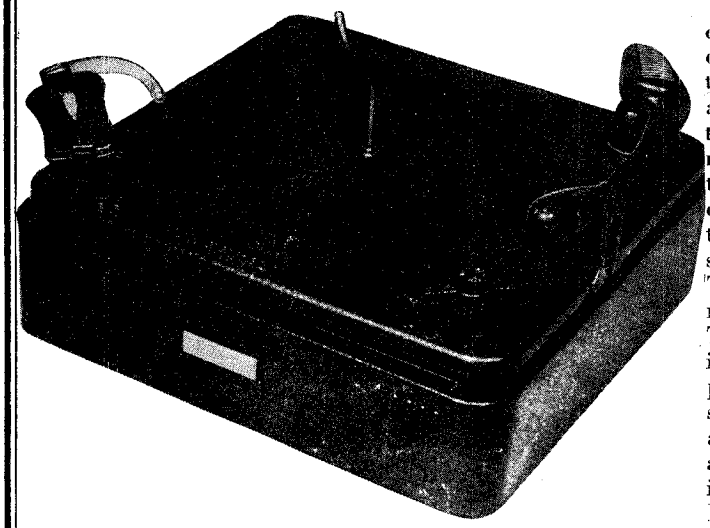
SPRING AND WASHER IDENTIFICATION

MODEL P16 RECORD CHANGER

REPLACEMENT PARTS LIST

Ref. No.	Cat. No.	Description
1	RMX-184	ARM—Record balance arm assembly, includes: plastic button, record balance arm and support rod
2	RMT-019	TURNTABLE
3	RMX-185	SPINDLE—Turntable spindle, less bearings. Includes pusher mechanism inside
6	RML-052	PUSHER—Record push-off lever in spindle
8	RMS-246	RING—Retaining ring for turntable bearing assembly
9	RHW-016	WASHER—Bearing washer, one needed on each side of turntable ball bearing assembly
10	RMB-020	BEARING—Ball bearing race
12	RMS-247	SPRING—Small spring inside spindle
13	RMS-248	SPRING—Large spring inside spindle
14	RMX-186	SHAFT—Pusher shaft inside spindle
15	*RHS-042	SCREW—Pickup arm hinge pivot adjustment screw
15A	RMB-024	BEARING—Pickup arm hinge pivot bearing
16	RPA-014	ARM—Plastic pickup arm only
17	RMS-249	SPRING—Pickup arm counterbalance spring
18	RAP-030	PLATE—Pickup arm adjustment plate (strengthener)
20	RMS-268	SPRING—Lift screw lock spring
21	RHS-090	SCREW—Hex head lift screw for pickup arm
†22		SCREW—6/32″ x ¼″ screw for pickup arm counterbalance adjusting slide
23	RMM-196	SLIDE—Adjusting slide for pickup arm counterbalance
†24		SCREW—#4 x ¼″ self threading screw for mounting adjustment plate
25	RPX-050	PICKUP—G. E. reluctance pickup, includes .001″ and .003″ sapphire styli
26	*RKP-009	KNOB KIT—Pickup knob kit
27	*RPJ-010	STYLI—.001″—.003″ sapphire styli assembly
28	*RPJ-011	STYLI—.001″—.003″ diamond styli assembly
29	*RQB-001	BRUSH—Small brush for cleaning stylus
35	RMU-075	LIFT PIN—Pickup arm lift pin
36	RHN-021	NUT—Holds hinge assembly on pickup arm shaft
37	RMS-250	SPRING—Pickup arm safety coupling spring
†38		WASHER—Lockwasher, ¼″ I.D. x ½″ O.D.
39	RAP-025	SAFETY PLATE—Washer-like member couples spring #37 to pickup arm shaft #43
40	RMX-187	HINGE—Pickup arm hinge and pin
41	RHS-086	SCREW—Eccentric setdown adjusting screw on pickup arm hinge
†41A		NUT—#720 Tinnerman speed nut for mounting eccentric screw
42	RML-053	LEVER—12 inch feeler lever
43	RMU-076	SHAFT—Pickup arm pivot shaft
†43A		WASHER—Fiber washer goes on top of pickup arm pivot sleeve under shaft shoulder ¼″ I.D. x ½″ O.D.
†44		SCREW—10–24 x ¼″ screw with lockwasher for mounting main casting and ejector link
45	RHX-018	POST—Plastic tone arm rest post
46	RDK-255	KNOB—Brown plastic OFF-ON-REJ. control knob
47	*RMC-046	WASHER—"C" washer under OFF-ON-REJ knob
48	RDK-256	KNOB—Brown plastic 33–78–45 speed control knob
49	RHC-050	WASHER—"C" washer under speed control knob
50	RMB-027	BEARING—Control knob shaft bearing
52	*RHC-033	WASHER—"C" washer for 12 inch feeler lever, pickup arm lift pin and trip link
53	RML-054	ROD—Manual shut-off rod
55	RMS-252	SPRING—Switch lever spring
†56		WASHER—Fiber washer, goes under main gear mounting "C" washer, ¼″ I.D. x ½″ O.D.
57	*RHC-027	WASHER—"C" washer holds main gear in frame
58	RAP-026	FRAME—Main lever assembly frame
60	RHF-013	FOOT—Plastic support foot
61	*RHC-028	WASHER—"C" washer holds spring under record balance rod
62	RMX-188	GEAR—Main gear assembly, complete
63	RHC-033	WASHER—"C" washer for trip lever on main gear
†64		WASHER—Fiber washer goes under trip lever "C" washer, ⅛″ I.D. x ⅜″ O.D.
65	RML-055	LEVER—Pawl lever on main gear
67	RMM-186	PAWL—Trip pawl on main gear
68	RML-056	LEVER—Trip lever on main gear
69	RHR-016	RIVET—Trip pawl mounting rivet
70	RMB-025	ROLLER—Main gear detent roller
71	RHR-015	RIVET—Detent roller mounting rivet
74	*RMW-060	WHEEL—Motor idler wheel
75	*RBH-014	MOTOR—General Industries 3-speed turret motor, complete
76	*RHC-029	WASHER—"C" washer for mounting motor
77	RML-057	ROD—Motor speed control rod
78	RHN-022	NUT—Spindle mounting nut
79	RHS-087	SCREW—6/32 x ¼″ self tapping screw to mount reset lever, terminal board and forked lever washer bearings
80		WASHER—Flat steel washer for mounting reset lever, 7″ feeler lever and forked lever, ⅛″ I.D. x ⅜″ O.D.
81	RML-058	LEVER—Index reset lever
82	RMS-253	SPRING—Reset lever spring
83	RMS-254	SPRING—12-inch feeler lever spring
86	*UJB-001	TERMINAL STRIP—3 lug terminal strip
87	RMS-255	SPRING—Step lever return spring
88	RML-059	LEVER—Switch operating lever
88-A	RMC-042	WASHER—"C" washer for mounting switch operating lever
89	RMB-026	RUBBER—Tip of 7-inch feeler lever
90	RML-060	LEVER—7-inch feeler lever
91	RSW-089	SWITCH—ON-OFF switch
92	RII-063	INSULATOR—Fiber strip holds ON-OFF switch in place
93	RII-064	INSULATOR—Fiber disk holds ON-OFF switch in place
†94		NUT—(#720 Tinnerman speed nut) for mounting switch cover
95	RML-061	LEVER—Step lever, determines pickup arm indexing
†95A		WASHER—Fiber washer goes under step lever, ¼″ I.D. x ½″ O.D.
96	RMS-263	RING—Retaining ring for step lever
†97	RMS-269	WASHER—Spring washer between trip finger and step lever
98, 99	RMS-256	SPRING—Shut-off lever or 7-inch feeler lever spring
102	RML-062	LEVER—Automatic shut-off lever assembly
103	*RML-036	BEARING—Rectangular washer holds automatic shut-off lever
†104		SCREW—4-40 hex-head self tapping screw, for forked lever bearing
105	RML-063	LEVER—Trip finger lever
106	RHN-023	NUT—PAL nut holds trip finger lever to pickup arm shaft
107	RMS-264	SPRING—Conical lift pin spring
108, 109	*RHC-033	WASHER—"C" washer for 12-inch feeler lever, pickup arm lift pin and trip link
110	RML-064	LEVER—Trip link lever on forked lever
111	RHR-014	RIVET—Trip link mounting rivet
112	RML-065	WIRE—Automatic shut-off lever control link wire
113	RMX-189	BRACKET—Shut-off bracket
†114		SCREW—6 x 5/16″ self tapping screw for mounting shut-off bracket
115	RMS-257	SPRING—Shut-off spring couples shut-off bracket to control wire
117	RMX-190	LINK—Ejector link operates spindle mechanism
†118		WASHER—Lockwasher, holds pickup arm hinge to spindle ¼″ I.D. x ½″ O.D.
†119		BRACE—Angle iron brace strengthens main frames ½″ x ⅝″ x 8″ long
120	RAP-027	FORKED LEVER—(Slide and cam assembly) large forked sliding plate, less trip link
121	RAP-028	SLIDE BEARING—Rectangular washer with extension to hold detent spring, supports forked lever
122	RMS-258	SPRING—Forked lever detent spring
123	RHN-024	NUT—Knob shaft bearing mounting nut
124	RHW-031	WASHER—Spring washer goes under speed knob control shaft
125	RMX-191	SHAFT—33-78-45 knob shaft
126	*RHG-027	GROMMET—Rubber grommet for speed control rod
127	RMS-259	SPRING—Compression spring between control shafts
128	RMU-077	SHAFT—OFF-ON-REJ. knob shaft
†129		SCREW—6/32″ x ⅛″ screw holds forked lever detent spring "bearing"
†130		NUT—(#720 Tinnerman speed nut) for mounting shut-off lever bearings
132	RMS-260	SPRING—Record balance arm holddown spring
133	RMS-261	SPRING—Trip lever friction spring on main gear
134	RAP-029	BEARING—Rectangular washer supports forked lever
135	RMS-262	SPRING—Escape lever spring on forked lever
136	*RJP-003	PLUG—AC plug for motor
137	*RMA-008	ARM—Motor idler wheel arm
137-A	RHC-009	HAIRPIN CLIP—For idler arm
138	*RMW-061	PULLEY—Low speed pulley, 33 1/3 rpm
139	*RMW-062	PULLEY—Medium speed pulley, 45 rpm
140	*RMW-063	PULLEY—High speed pulley, 78 rpm
141	*RMA-009	ARM—Speed pulley mounting arm
142	*RMS-205	SPRING—Idler wheel tension spring
143	*RMS-211	SPRING—Pulley arm tension spring
144	*RMA-010	ARM—Motor speed control arm
145	*RHC-009	HAIRPIN CLIP—For idler wheel
†146		WASHER—Fiber washer for (¼″ I.D. x ⅛″ O.D.) idler wheel
†147		WASHER—Felt washer for (¼″ I.D. x ⅛″ O.D., 1/16″) thick speed pulleys
148	*RHG-026	GROMMET—Motor mounting grommet
149	*RHG-027	GROMMET—Speed control arm grommet
150	*RMS-218	RING—Retaining ring for speed pulley

*Parts used on previous models. †Common hardware items not stocked by G.E.



TPO-1843

INTRODUCTION

This de luxe record changer is designed to automatically play 78, 45, or 33-1/3 r. p. m. records of 7″, 10″, or 12″ size. The changer will play twelve 7″, twelve 10″, or ten 12″ records at one loading. It operates from a 105-125 volt, 60-cycle a-c supply. If operation is desired on a 50-cycle supply, the 50-60 cycle motor, Part No. 35-1462, must be used, with the springs supplied in the conversion kit, Part No. 40-7848.

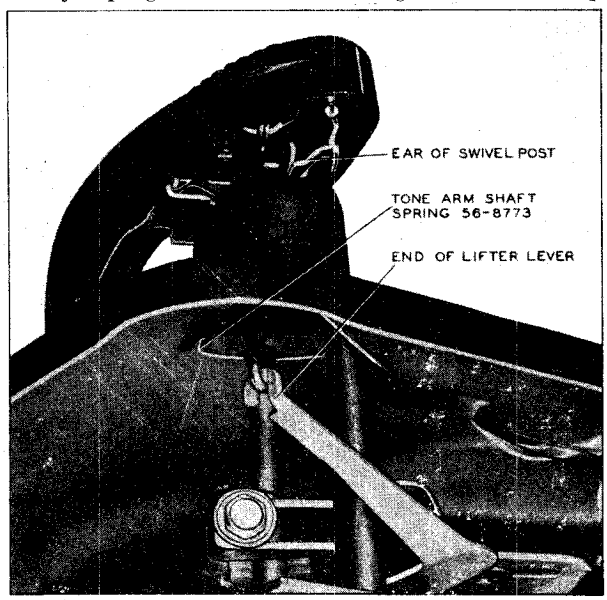
The time interval between the last note of one record and the first note of the next one is shortened by the use of a velocity trip. The possibility of damaging the changer by holding the tone arm during a change cycle is prevented by spring-loading all actuating levers.

The controls are conveniently grouped near the front of the changer. All knobs are concentrically mounted in the front right-hand corner. The tone-arm head is immediately behind the control knobs, and the record shelf is in the front left-hand corner.

The tone arm set-down indexing is simplified by eliminating feelers and establishing the set-down by means of the record-shelf position. The nodding spindle, rather than a complicated system of levers and blades, accomplishes the record dropping. Most of the working parts are mounted on a bridge subassembly, a feature which makes the parts easily accessible for servicing.

DESCRIPTION OF OPERATIONAL CYCLE

At the completion of a record, the changer trips, and allows the dog latch to engage the spur of the turntable hub gear. This rotates the cam gear, allowing the teeth of the cam gear and hub gear to engage. As the cam rotates, it forces the lifter lever down, raising the tone arm from the record. As the tone arm reaches maximum height, the tone-arm actuator, motivated by the cam gear, contacts the trip-arm stud and swings the tone arm against the rest post. After the tone arm reaches the rest post, the push-off lever rotates, nodding the spindle and dropping the next record onto the turntable. After the record has dropped, the return lever contacts the stud of the trip arm, and starts the tone arm inward. The tone arm is now controlled by the actuator and return levers, in contact with the stud of the trip arm. The return lever continues swinging the tone arm inward until it is stopped by the set-down lever, whose position is dependent upon the setting of the record shelf. This stoppage of the inward travel of the tone arm by the established position of the return lever accomplishes the set-down indexing. The tone arm is thus held above the set-down point. The lifter lever now moves upward, slowly dropping the tone arm to the record surface. As the cam gear continues to rotate, the actuator lever is moved outward and away from the trip-arm stud. The tone-arm return lever then moves away from the trip-arm stud, but the spring portion of the actuator momentarily remains in contact with the stud, eliminating a sudden release of control of the tone arm, and preventing the needle from jumping into the modulated grooves. The trip-plate supporting finger now engages the dog latch, and the index lever locks the cam gear in a neutral position. The tone arm is now free to play the record.



TPO-1831

Figure 1. Tone-Arm Height and Lift Adjustments and Vertical Timing Adjustment

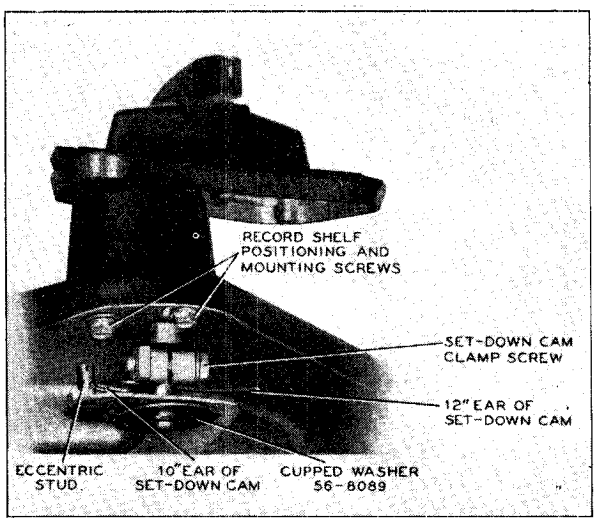
As the tone-arm advances toward the spindle, the friction-clutch trip finger engages the end of the trip plate. Through the applied pressure of the friction finger (approximately 2 grams) against the trip plate, the trip-plate finger supporting the dog latch begins to move, lessening the engagement of the trip-plate finger and dog latch, preparatory to releasing the latch. This engagement is slowly lessened while the needle is in the playing grooves, giving the reset cam an opportunity (once each revolution of the turn-

table) to reset the trip plate into full engagement and slip the friction finger in the friction clutch. As the needle rides in the lead-out or eccentric groove of the record, the velocity of the friction finger is increased. The speed of the disengagement of the trip-plate supporting finger and the dog latch is also increased sufficiently to allow complete disengagement of the dog latch before it has been restored by the reset cam.

ADJUSTMENTS

SPINDLE ADJUSTMENT

The spindle should be checked for perpendicularity (use square on turntable surface) when the changer is out of cycle. To adjust, bend the ear on the push-off-lever assembly; bending the lever toward the spindle spring throws the top of the spindle away from the record shelf. This is shown in figures 3 and 6.



TPO-1839

Figure 2. Record-Shelf Adjustment and 10", 12", and Fine Set-down

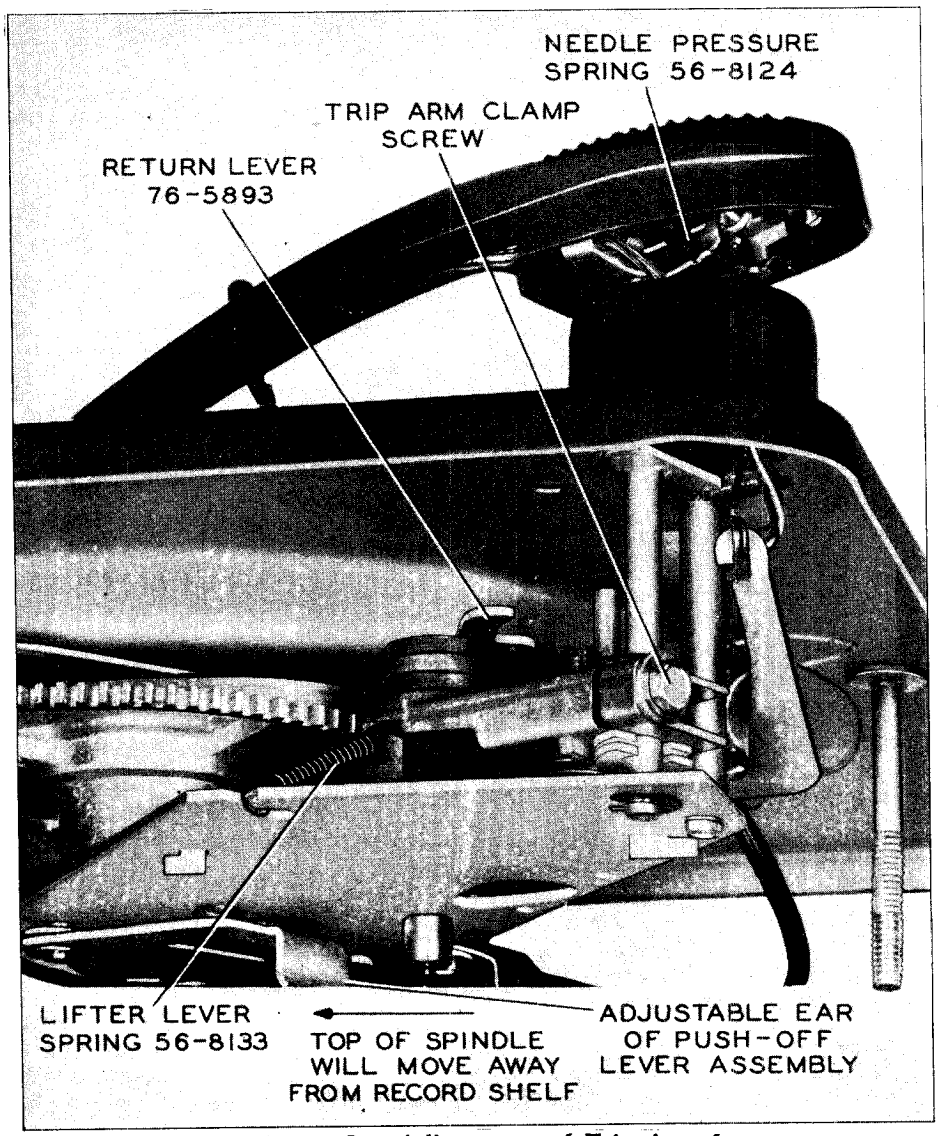


Figure 3. Adjustment of Trip Arm for 7" Set-down

TPO-1845

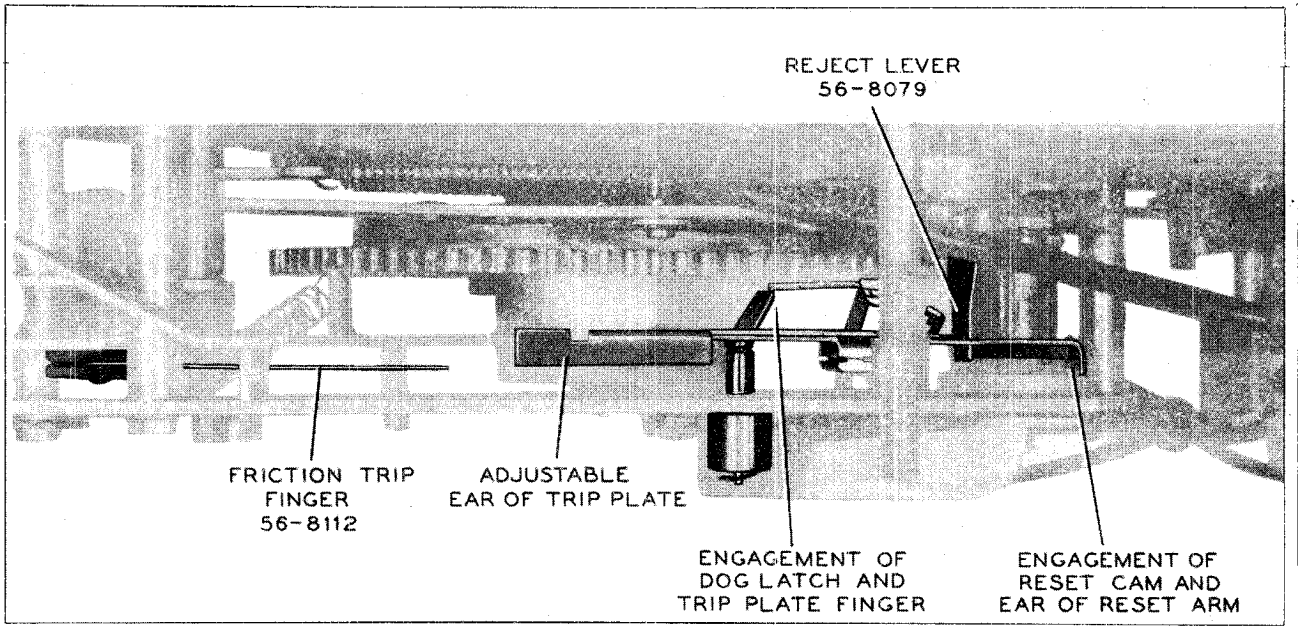


Figure 4. Trip Adjustment

RECORD SHELF

CAUTION: This adjustment must be made immediately after a change cycle is completed.

With the changer set for manual operation, place a record-shelf gauge, Part No. 45-6647, on the record shelf. The edge of the gauge should fit snugly against the edge of the raised portion of the shelf, without flexing the spindle.

If the gauge does not fit properly, loosen the two saddle mounting screws holding the record shelf to the base plate (figure 2), and adjust the position of the record shelf. Then tighten the screws.

TONE-ARM HEIGHT AND LIFT

With the changer out of cycle, and the tone arm over the base plate, the needle point should be 1/8″ ± 1/16″ above the base plate. To adjust the clearance, bend the protruding ear of the swivel post, at the rear of the tone-arm heel. See figure 1. Bending the ear upward decreases the clearance, downward increases the clearance. Raise the tone arm to its maximum height, and place it against the rest post. There should be approximately 3/32″ clearance between the lower edge of the tone arm and the top of the rest-post hook. Bend the ear of the swivel to obtain the most satisfactory adjustment of both the rest-post clearance and the base-plate clearance.

VERTICAL TIMING

Adjust the vertical timing by bending the end of the lifter lever (shown in figure 1), which attaches to the pull-cord, so that there is 1/32″ to 1/16″ slack in the pull-cord for all tone-arm positions between the tone-arm rest post and the spindle when the changer is out of cycle. Check by cycling the changer and noting if the lifter lever and pull-cord will raise the tone arm to its maximum height.

SET-DOWN

Set the record shelf to the 12″ position. Set the eccentric stud to its center position toward the corner of the base plate. This stud is accessible through a hole in the base plate near the tone-arm stanchion (see figure 5). Place a 7″ record on the turntable, set the record shelf to the 7″ position, and cycle the changer by hand until the tone arm is just above the record. Loosen the hex-head clamp screw on the trip arm (see figure 3), and swing the tone arm until the needle is 1/8″ in from the edge of the record. Tighten the clamp screw, and check the adjustment by putting the changer through another cycle. If the set-down point is slightly incorrect, it may be corrected by means of the eccentric stud mentioned above. Recheck the needle set-down. The trip arm should be positioned vertically so that the friction finger is midway between the base plate and the lifter lever. Remove the 7″ record. Set the record shelf to the 10″ position, and place a 10″ record on the turntable. Rotate the turntable until the needle is just above the record. If the needle is not 1/8″ in from the edge of the record, an adjustment may be made by bending the ear of the set-down cam which is in contact with the eccentric stud. See figure 2. Bending the ear outward moves the set-down point away from the spindle; bending the ear in toward the shelf shaft moves the set-down point toward the spindle. Recheck the needle set-down. Using a 12″ record, with the shelf set to the 12″ position, repeat the adjustment, bending the corresponding ear of the set-down cam (figure 2).

The eccentric stud mentioned above (shown in figures 2 and 5) provides a fine adjustment of the set-down position. This adjustment varies the set-down position of ALL size records over a total range of 3/16″. Do not use this adjustment unless it is desired to change all three set-down positions by an equal amount.

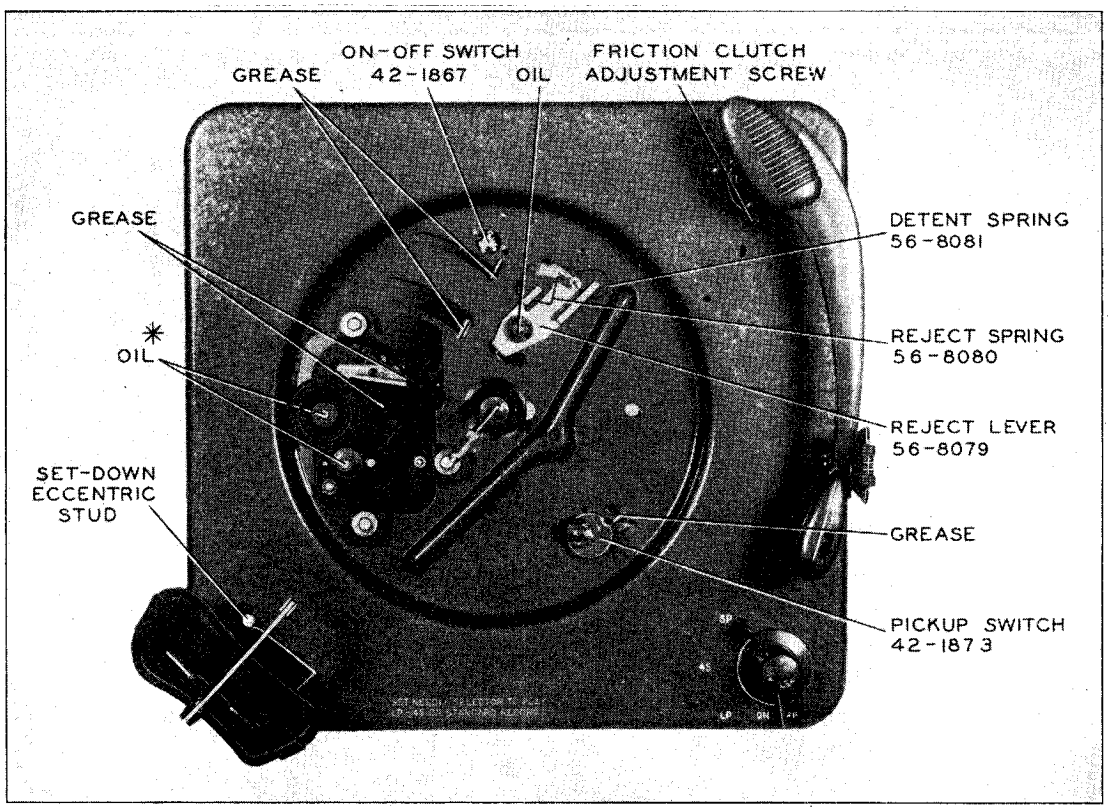


Figure 5. Top View, Showing Lubrication Points

TRIP

CAUTION: Do not adjust the friction clutch until the trip-plate engagement is properly set, as explained below.

The proper trip action is greatly dependent upon the proper engagement of the dog latch and the finger of the trip plate supporting it. The correct engagement is 5/64" (or approximately one-half the width of the supporting finger of the trip plate) when the ear of the reset arm is contacting the peak point of the reset cam. This is shown in figure 4. The extent of this engagement is adjustable by bending the ear of the trip plate, shown in figure 6. Bending the ear inward decreases the amount of engagement, and bending the ear outward increases the amount of engagement. This adjustable ear is accessible through the large hole in the bridge, and should be bent by using long-nose pliers.

NOTE: Too much engagement will prevent tripping, while too little engagement will cause pre-tripping. If the changer is Run 2, and if it still does not trip after the trip is properly adjusted, remove the tone-arm-shaft spring.

After the trip-latch engagement is set, check the changer for proper trip action. If the trip action is faulty, i.e., if the changer pre-trips or does not trip at all, recheck the trip-latch adjustment. If the changer still does not operate properly, check for tight tone-arm lead dress or excessive friction in the tone-arm-shaft bearing. If this does not clear the trouble, the friction clutch can be adjusted, although this should *not* normally be necessary. This is a screw adjustment and is accessible, when the tone arm is on the rest post, through a hole in the base plate near the tone-arm stanchion (see figure 5)

Turn the screw counterclockwise until the clutch is just snug (do not tighten), then loosen one turn. Check the adjustment by playing several records. If the changer pre-trips, loosen the screw (turn clockwise) a bit more. This trip arm and clutch assembly is shown in figure 16.

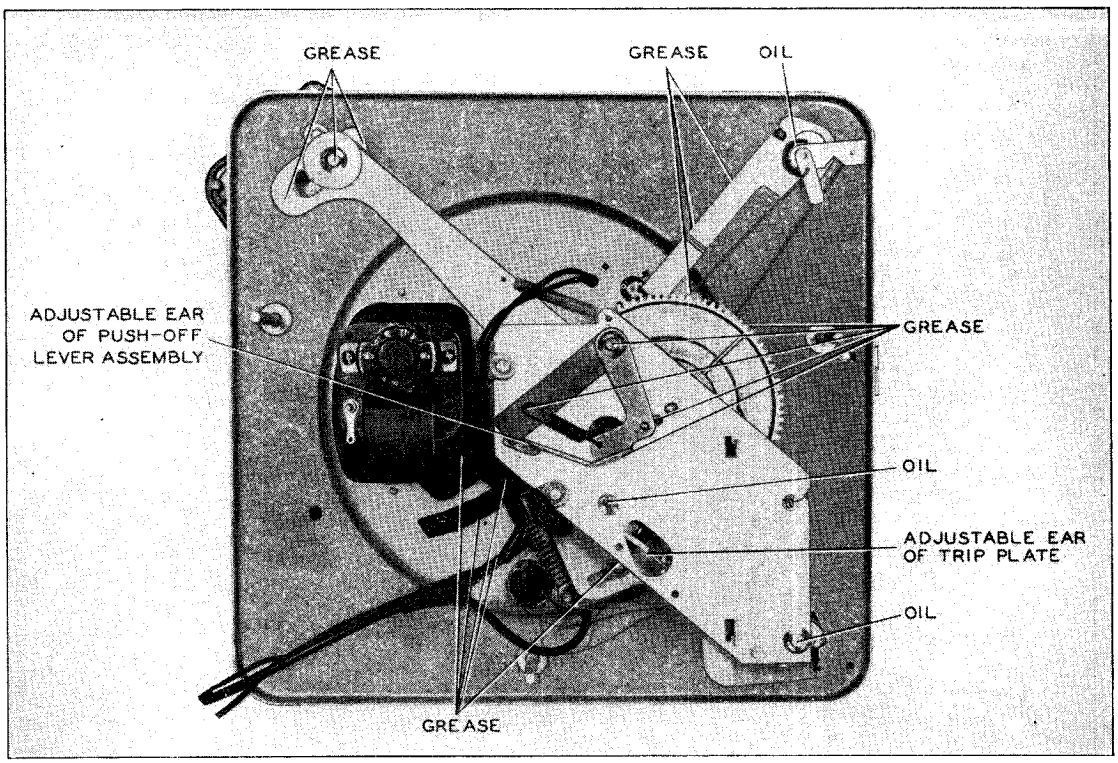
LUBRICATION

LUBRICANTS

Oil: S.A.E. 20.
Grease: Motor cup grease.
Contact lubricant: Dow Corning "DC-4."

PARTS NOT TO BE LUBRICATED

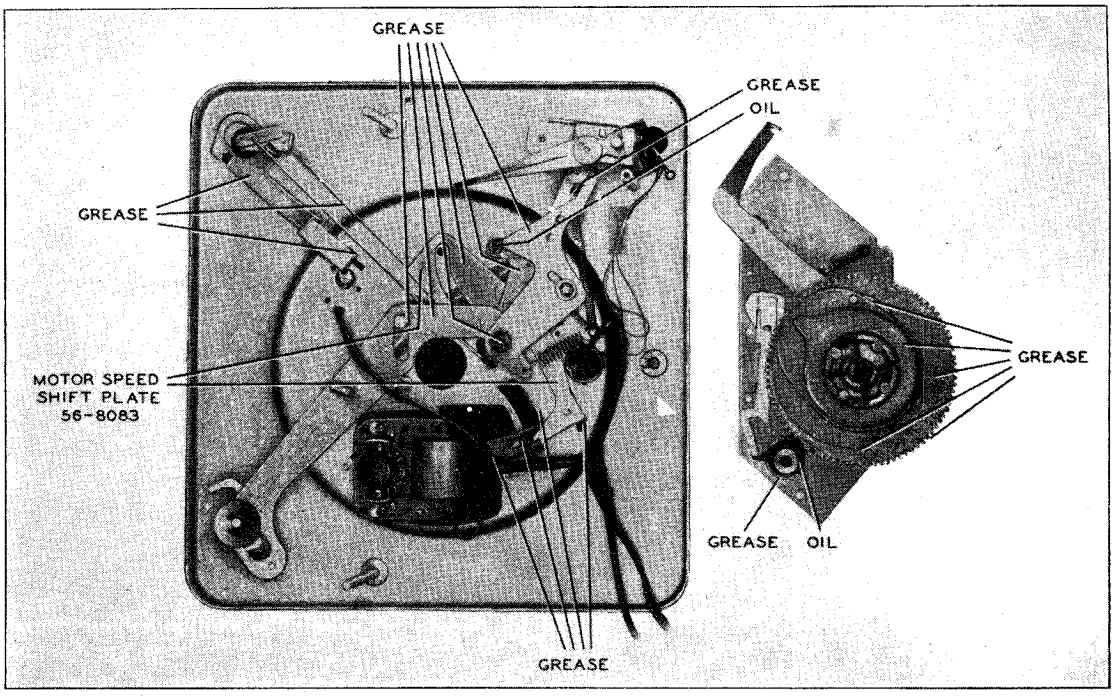
Motor drive shaft.
Motor pulley.
Drive belt.
Idler tire.
Dog latch (on cam gear).



TPO-1836

Figure 6. Bottom View, Showing Lubrication Points

Lifting lever (where dog rides).
Trip-plate assembly.
Friction finger.
Friction washer.
Spindle latch (may be lubricated with powdered graphite or talcum powder).



TPO-1837

Figure 7. Bottom View, Bridge Removed, Showing Lubrication Points

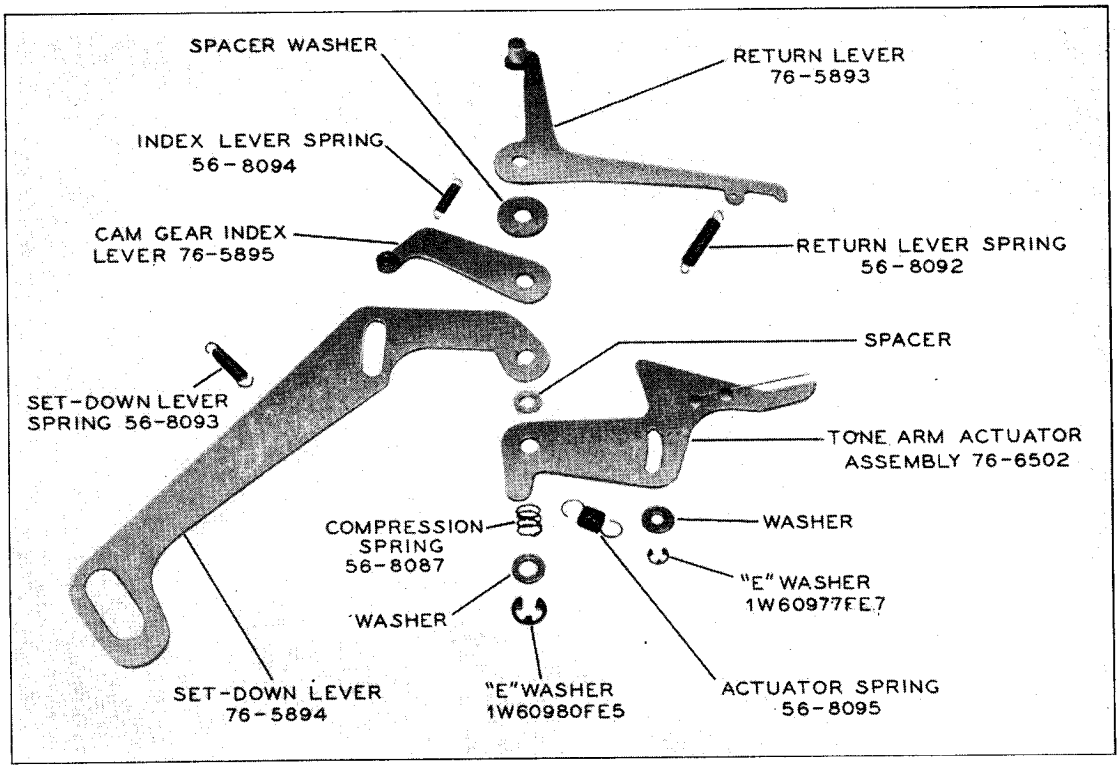


Figure 8. Actuator Assembly

PARTS TO BE GREASED

Actuators

1. Lifting lever, where lever contacts cam gear.
2. Tone-arm-actuator lever where it contacts stud of friction-clutch assembly.

Base Plate

1. Switch lever where it slides on base plate, and slot where ear rides.
2. Motor-speed-shift plate, where it rides in guide slots, and slot that rides on cam-gear spindle; control links where they ride on base plate.

Bridge Assembly

Push-off lever where end slides on bridge, where stud rides in slot of bridge, and at pivot pin.

Cam Gear

All cam surfaces and gear teeth except dog latch.

Friction-Clutch Assembly

Stud of friction-clutch assembly where return lever and tone-arm actuator ride.

Motor

NOTE: When lubricating the motor, use grease or oil very sparingly. Excessive lubrication will cause erratic operation.

1. Cam surfaces of idler-wheel lifter.
2. Detent surfaces.
3. Guide slots of shifter plate.
4. Extension of idler shaft in contact with lower shifter plate.
5. Retaining ear of speed-shift lever.

Record Shelf

1. Record-shelf-shaft bearing.
2. Detents for record shelf.
3. Hold-down pin and detents.
4. Hold-down shaft.
5. Set-down cam, where eccentric stud rides.

PARTS TO BE OILED

1. Cam-gear spindle.
2. Control-knob shafts.
3. Index-lever roller.
4. Motor.
   a. Idler-assembly pivot shaft.
   b. Idler-wheel shaft.
   c. Slider bar, four points.
   d. Two shift roller pins.
   e. Pulley shaft (wipe dry and apply only one drop).
   f. Under pivot bushing of shifter plate.
5. Reject-lever pivot.
6. Tone-arm shaft where it rotates in bridge.
7. Tone-arm-pivot pin where it goes through holes in base plate.
8. Trip-plate-assembly pivot in bushing only.
9. Turntable bearings, top and bottom.
10. Actuator spindle.
11. Bearing surfaces between actuator lever, washer, set-down lever, index lever, washer, and return lever (grease end of return lever where it contacts stud of friction-clutch assembly).

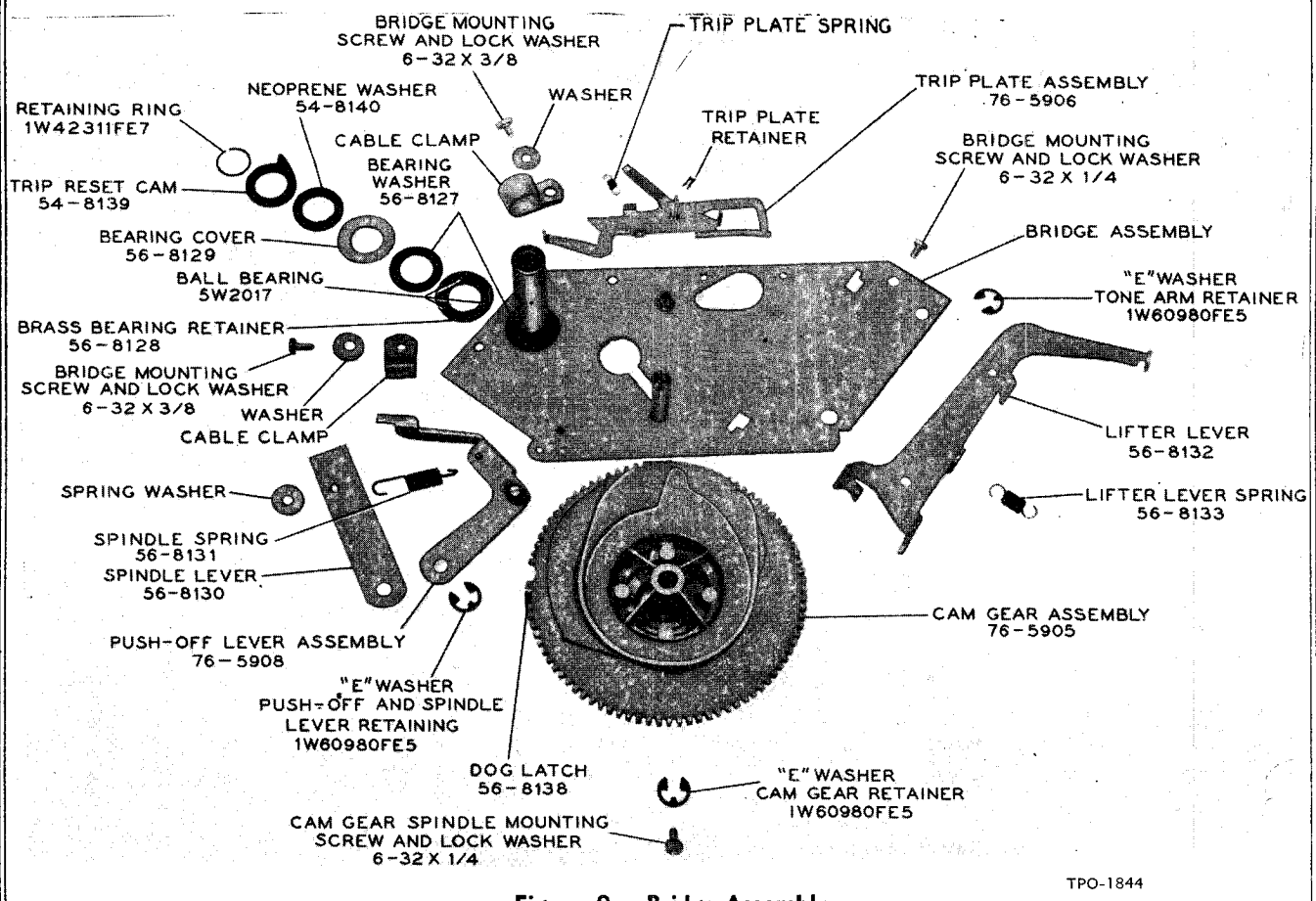


Figure 9. Bridge Assembly

CAUTION: When lubricating the motor, remove the rubber belt and idler wheel. When lubrication is completed, be sure the motor shaft and pulley are free from oil and grease. Failure to observe this precaution may result in slippage.

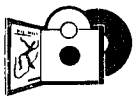
CONTACT LUBRICATION

Apply Dow Corning "DC-4" to the contacts of the cartridge contact plate, and to the dimple of the cartridge retaining spring.

UNEVEN TURNTABLE SPEED (WOWS)

Uneven turntable speed may be caused by any of the following conditions:

1. Dirt under and around the idler-wheel assembly.
2. Idler-wheel spring loose or missing.
3. Flat spot on idler-wheel tire or turntable.
4. Loose, worn, or distorted pulley belt.
5. Oil or grease on idler-wheel tire, pulley, pulley belt, or drive shaft.
6. Speed-control knob not in proper position.



REPLACEMENT OF PARTS AND ASSEMBLIES

The following procedures are recommended for the correct removal of parts and assemblies. The parts should be replaced by reversing the order of removal.

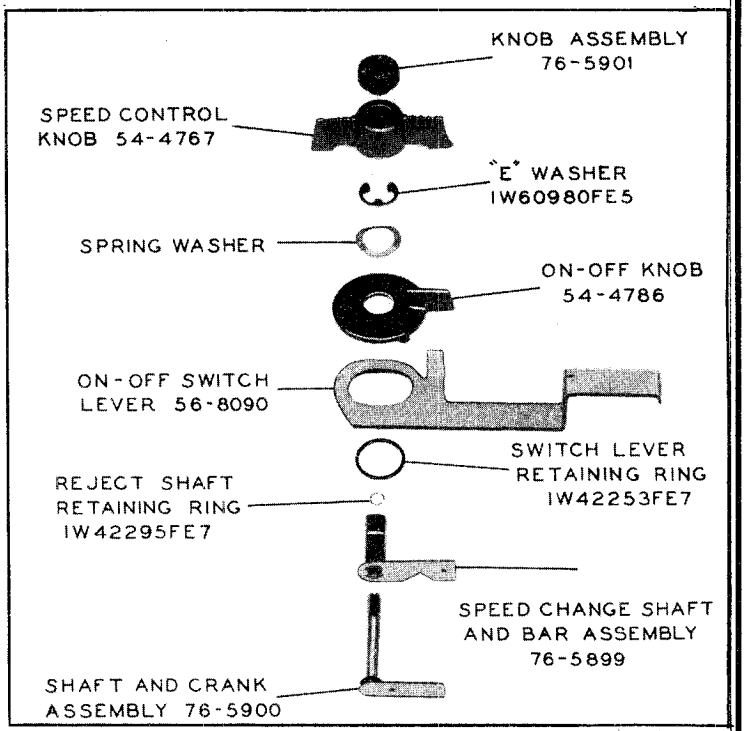


Figure 10. Control Assembly

MODEL M-22

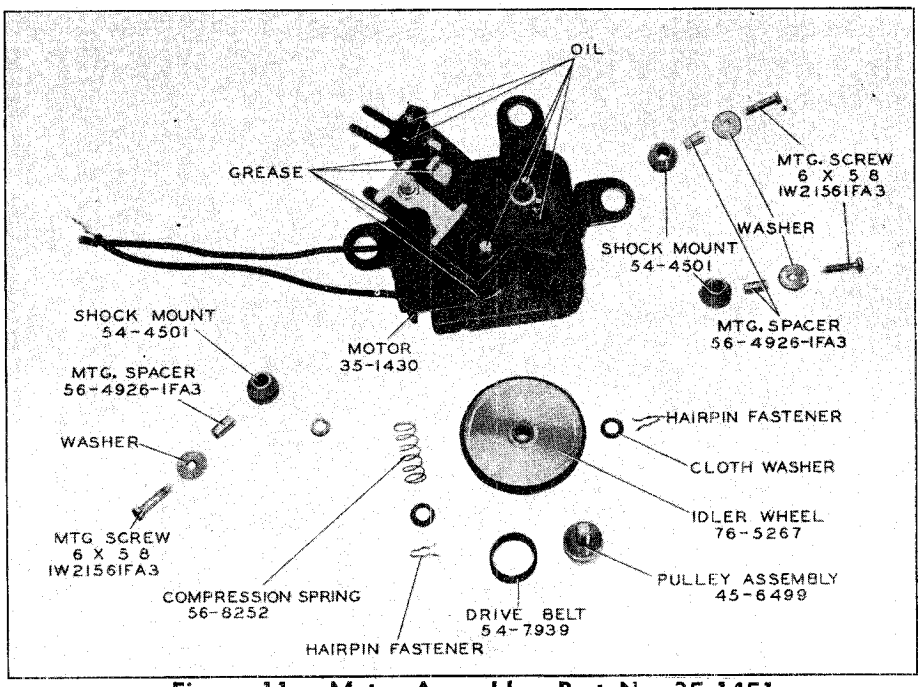


Figure 11. Motor Assembly—Part No. 35-1451 TP9-204

Adjustments should be made according to the directions given in the ADJUSTMENTS section of the manual.

1. Crystal Cartridge

Grasp crystal cartridge with fingernails. With the other hand, hold tone arm and apply slight pressure on switch lever. Pull cartridge down and to the outside. Replace cartridge by holding contacts toward spindle, and pushing upward until firmly seated.

2. Needle

Remove crystal cartridge (see paragraph 1). Lift needle out gently with prying motion, using fingernail or knife point. When replacing needle, align key of needle shaft with keyway in chuck of cartridge, then push needle into cartridge.

3. Turntable

Remove spring retainer and washer from top of spindle bushing. Lift turntable off.

NOTE: When replacing turntable, position speed-control knob midway between LP and 45 or 45 and SP. This holds the idler wheel in a retracted position. Then replace turntable. This method will prevent damage to the idler-wheel tire.

4. Spindle

Disengage spindle spring. Remove spindle. Do not lose spring washer under spindle lever.

5. Bridge (See figure 9)

a. Remove set-down-lever spring.
b. Remove lifter-lever spring.
c. Remove the three hex-head drive screws and the two plastic cable retainers.
d. Remove "E" washer from tone-arm spindle.
e. Remove hex-head drive screw from cam-gear spindle. This screw is located on the top.
f. Remove pull-cord and disconnect tone-arm wires.
g. Carefully lift off bridge, cam gear, spindle bushing, trip-plate assembly, lifter lever, spindle lever, and push-off lever.

6. Cam Gear

a. Remove bridge (see paragraph 5).
b. Remove "E" washer from cam-gear spindle.
c. Lift off cam gear.

7. Push-off-Lever Assembly and Spindle Lever

a. Remove cam gear (see paragraph 6).
b. Remove "E" washer from push-off fulcrum stud.
c. Rotate push-off lever so that stud is in large hole, and lift off both push-off lever and spindle lever.

8. Trip-Plate Assembly

a. Remove cam gear (see paragraph 6).
b. Remove clip from trip stud, and lift assembly from bushing.

9. Trip Reset Cam, Neoprene Washer, and Ball Bearing

a. Remove cam gear (see paragraph 6).
b. Remove spring retaining ring.
c. The trip reset cam, neoprene washer, ball cover, balls, and race may be removed in that order.

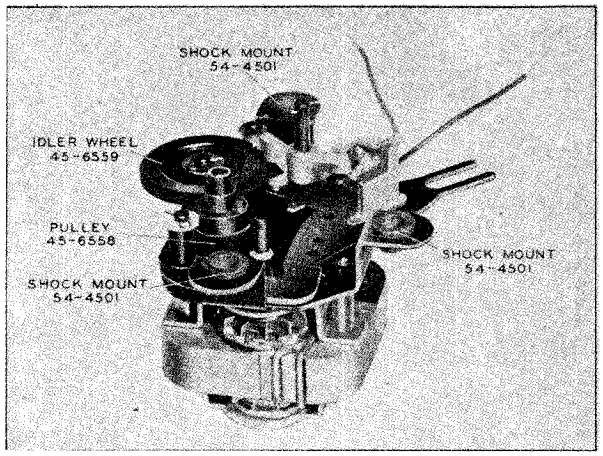
10. Trip-Arm Assembly

a. Remove "E" washer from end of tone-arm shaft.
b. Disengage pull-cord.
c. Loosen trip-arm-clamp screw.
d. Raise tone arm sufficiently to clear trip arm.
e. Remove trip-arm assembly.
Figure 16 shows trip-arm assembly.

11. Tone Arm

a. Place control in MAN. position.
b. Unsolder the four tone-arm leads.
c. Remove pull-cord from lifter lever.

d. Remove "E" washer from end of tone-arm stud.
e. Loosen trip-arm-clamp screw.
f. Remove tone-arm-shaft spring, if present.
g. Lift out tone arm.
Figure 15 shows tone-arm assembly.



TP9-456

Figure 12. Motor Assembly—Part No. 35-1452

12. Motor Assembly

a. Remove turntable (see paragraph 3).
b. Unsolder motor lead from switch on base plate, and free other lead from tape and spaghetti.
c. Remove the three hex-head drive screws, washers, and spacers from motor frame.
d. Slide jaws of speed-shift lever free of rubber grommet and ear of motor-speed-shift plate.
e. Lift motor out.
Figures 11, 12, and 13 show motor assembly.

13. Control Shafts and Links

a. Pull off MAN.—AUT.—REJ. button.
b. Lift off speed-control knob.
c. Remove "E" washer and spring washer.
d. Lift off ON-OFF knob.
e. Remove retaining ring from reject shaft.
f. From underside, pull out speed-change shaft and bar assembly and MAN.—AUT.—REJ. shaft and crank assembly.
g. Disengage each of the above from its respective links.
h. Remove speed-change link.
i. Remove heavy spring ring from control bushing.
j. Remove ON-OFF switch lever by lifting over bushing, pulling toward corner of base plate, and lifting ear out of slot.
Figure 10 shows control assembly.

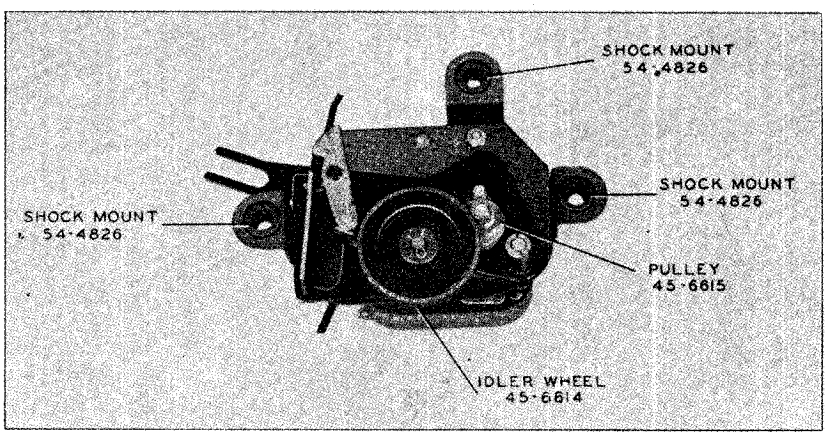
14. Record Shelf

a. Remove "E" washer from bottom of record-shelf shaft.
b. Remove cupped washer.
c. Loosen set-down clamp screw.
d. Remove set-down cam, record-shelf spring, and spacer (if used; Run 4 on). When reassembling, add spacer and new spring.
e. Lift record shelf from saddle.
Figure 14 shows record-shelf assembly.

15. Actuator Levers

a. Remove bridge (see paragraph 5).
b. Remove spring from tone-arm return lever.
c. Remove "E" washer, washer, and compression spring from actuator stud.
d. Remove "E" washer and washer from return-lever support stud.
e. Remove tone-arm-actuator lever.
f. Remove spacer washer.
g. Remove set-down lever.
h. Remove cam-gear index lever.
i. Remove motor-speed-shift plate by pulling speed-shift lever toward center of changer, freeing grommet from jaws of lever, and returning lever to an outward position. Lift and turn free end of speed-shift plate toward tone arm; this will free ear in large slot. With free end, carefully twist plate down between return-lever support stud and spring-anchor stud. Ear in small slot will come free.
j. Remove large washer.
k. From top of base plate, remove reject and detent springs, "E" washer, and spring washer. Free reject lever of stud, and remove reject link from lever.
l. Remove tone-arm-return lever.
Figure 8 shows actuator assembly.

NOTE: When replacing the index-lever spring, the tone-arm-actuator spring, and the return-lever spring, re-cement the ends to the spring mounting stud, using glyptol, as in production. This will prevent the springs from coming loose due to shock.



TPO-1832

Figure 13. Motor Assembly—Part No. 35-1455

MODEL M-22

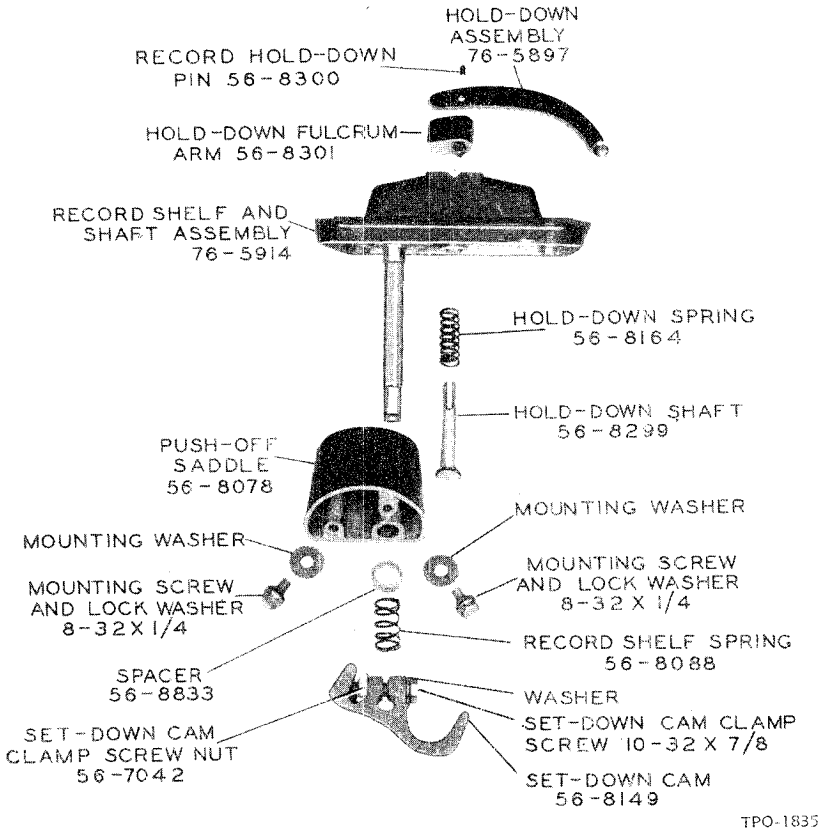


Figure 14. Record-Shelf Assembly

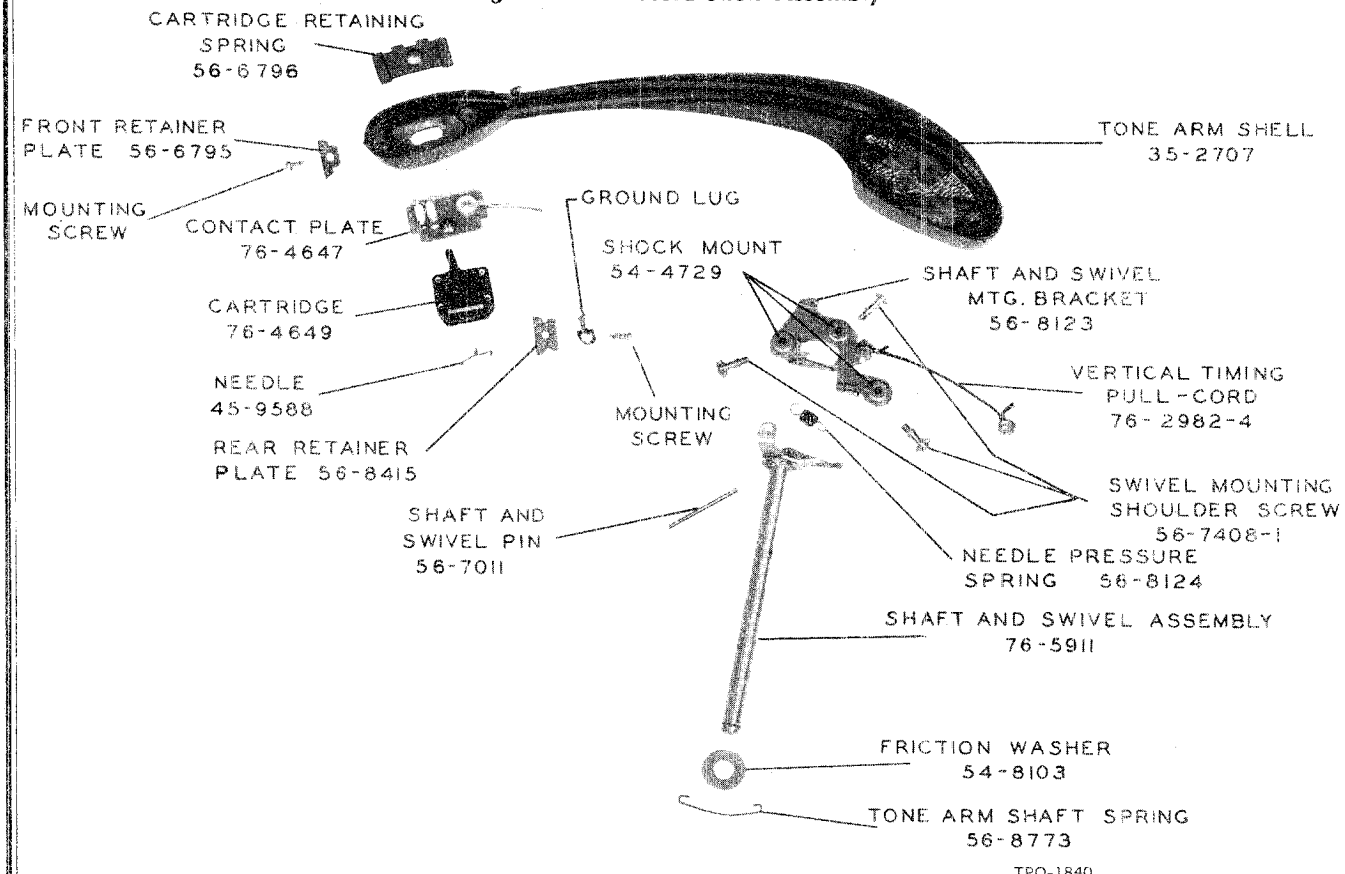
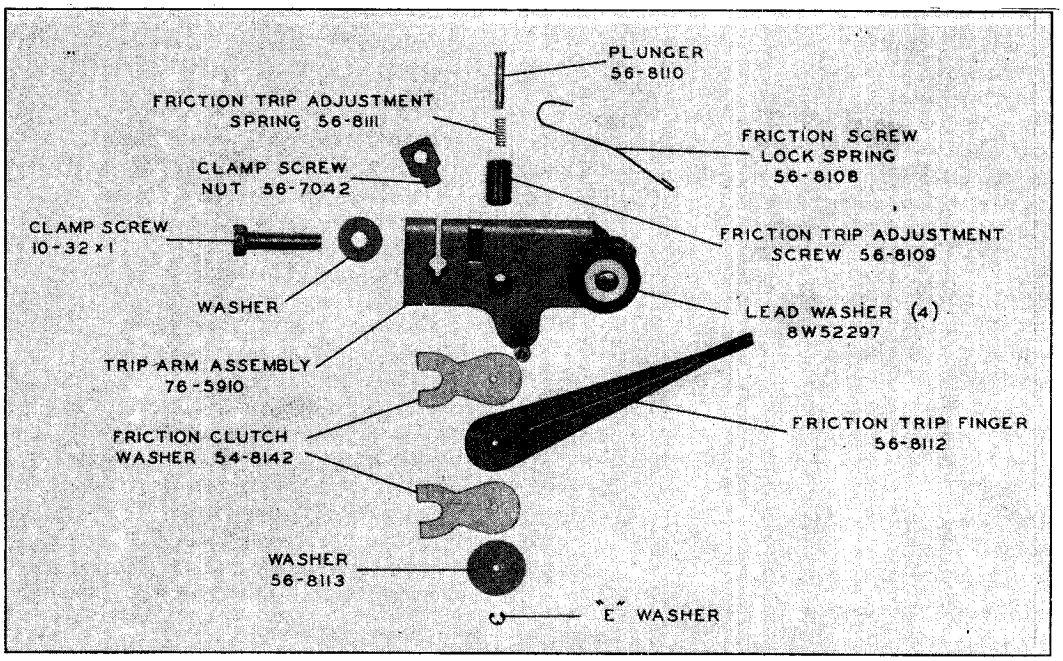


Figure 15. Tone-Arm Assembly



TPO-1842

Figure 16. Trip-Arm Assembly

PRODUCTION CHANGES

RUN 2

Tone-arm-shaft spring, Part No. 56-8773, was added, to stabilize tone-arm skip.

RUN 3

Tone-arm-shaft spring was removed, to eliminate mistracking. The inside of the tone-arm head was given an aquadage coating, to eliminate hum pick-up.

RUN 4

An extrusion was added to the tone-arm-shaft bearing of the tone-arm stanchion. Tone-arm-shaft spring, Part No. 56-8773, was added, to stabilize horizontal friction.

RUN 5

Record-shelf spacer, Part No. 56-8833, was added, to prevent jamming of shelf due to mishandling.

RUN 5Z

Changers built prior to Run 5, and converted to include all revisions up to and including Run 5, are identified as Run 5Z.

REPLACEMENT PARTS LIST

Description	Service Part No.
Actuator Assembly (figure 8)	
Cam-gear index lever	76-5895
Spring, index lever	56-8094
Compression spring	56-8087
Return lever	76-5893
Spring, return lever	56-8092
Set-down lever	76-5894
Spring, set-down lever	56-8093
Tone-arm-actuator assembly	76-6502
Spring, actuator	56-8095
Bridge Assembly	
Ball bearing, 1/8" dia. (3)	5W2017
Bearing cover	56-8129
Bearing retainer, brass	56-8128
Bearing washer (2)	56-8127
Cam-gear assembly	76-5905
Dog latch	56-8138
Pin, dog-latch mounting	56-8139
Lifter lever	56-8132
Spring, lifter lever	56-8133
Neoprene washer	54-8140
Push-off-lever assembly	76-5908
Retaining ring, reset cam and bearing	1W42311FE7
Spindle lever	56-8130
Spring, spindle	56-8131
Trip-plate assembly	76-5906
Trip-reset cam	54-8139
Changer base plate, tone-arm rest, and tone-arm stanchion	76-5892
Bumper, tone-arm rest, rubber	54-8136
Switch, motor power	42-1867
Switch, pickup	42-1873
Changer Mounting Hardware	
Sleeve, rubber (3)	54-7798
Spring, heavy, top (3)	56-7059FA9
Spring, light, bottom (3)	56-7059-1FCP
Speed nut (3)	W-2554FCP
Control Assembly	
Knob assembly, MAN.—AUT.—REJ.	76-5901
Knob, ON-OFF	54-4786

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Knob, speed control 54-4767
Lever, ON-OFF switch 56-8090
Link, reject 56-8084
Link, speed change 56-8091
Retaining ring, reject shaft 1W42295FE7
Retaining ring, switch lever 1W42253FE7
Shaft-and-bar assembly, speed change 76-5899
Shaft-and-crank assembly, reject 76-5900

Motor, 117 volts, 60 cycles 35-1451
Drive belt 54-7939
Grommet, rubber, speed-selector lever 27-4707
Idler wheel 76-5267
Plate, motor speed shift 56-8083
Pulley assembly 45-6499
Screw, motor mounting (3) 1W21561FA3
Shock mount (3) 54-4501
Spacer, mounting (3) 56-4926-1FA3
Spring, idler retractor 56-8252

***Motor, 117 volts, 60 cycles** 35-1452
Idler wheel 45-6559
Pulley assembly 45-6558

***Motor, 117 volts, 60 cycles** 35-1455
Idler wheel 45-6614
Pulley assembly 45-6615
Shock mount (3) 54-4826
Motor, 117 volts, 50-60 cycles 35-1462
Conversion kit, for 50-cycle operation 40-7848

Record-Shelf Assembly
Hold-down assembly 76-5897
Hold-down fulcrum arm 56-8301
Hold-down pin 56-8300
Hold-down shaft 56-8299
Hold-down spring 56-8164
Push-off saddle 56-8078
Record-shelf and shaft assembly 76-5914
Set-down cam 56-8149
Nut, cam locking 56-7042
Spacer 56-8833
Spring, record shelf 56-8088
Washer, cupped 56-8089

Reject lever 56-8079
Spring, detent 56-8081
Spring, reject 56-8080

Spindle 76-5909

Tone-arm assembly (complete) 35-2710
Bracket, mounting for shaft and swivel 56-8123
Cartridge (includes needle) 76-4649
Contact plate 76-4647
Needle 45-9588
Needle, sapphire tips 45-9589
Pin, shaft and swivel 56-7011
Pull-cord, vertical timing 76-2982-4
Retainer plate, front 56-6795
Retainer plate, rear 56-8415
Screw, shoulder, bracket mounting (3) 56-7408-1
Shaft-and-swivel assembly 76-5911
Shock-mount, bracket mounting (3) 54-4729
Spring, cartridge retaining 56-6796
Spring, needle pressure 56-8124
Spring, tone-arm shaft 56-8773
Tone-arm shell 35-2707
Washer, horizontal friction (plastic) 54-8103

Trip-arm assembly 76-5910
Finger, friction trip 56-8112
Nut, clamp screw 56-7042
Plunger 56-8110
Screw, friction-trip adjustment 56-8109
Spring, friction screw lock 56-8108
Spring, friction-trip adjustment 56-8111
Washer 56-8113
Washer, friction clutch (plastic) (2) 54-8142
Washer, lead (4) 8W52297

Turntable 35-2711
Retainer, turntable 56-8097
Washer, turntable 56-8096

* This motor not carried in stock. Order motor Part No. 35-1451. If motor Part No. 35-1455 is replaced by motor Part No. 35-1451, order three shock mounts, Part No. 54-4501.

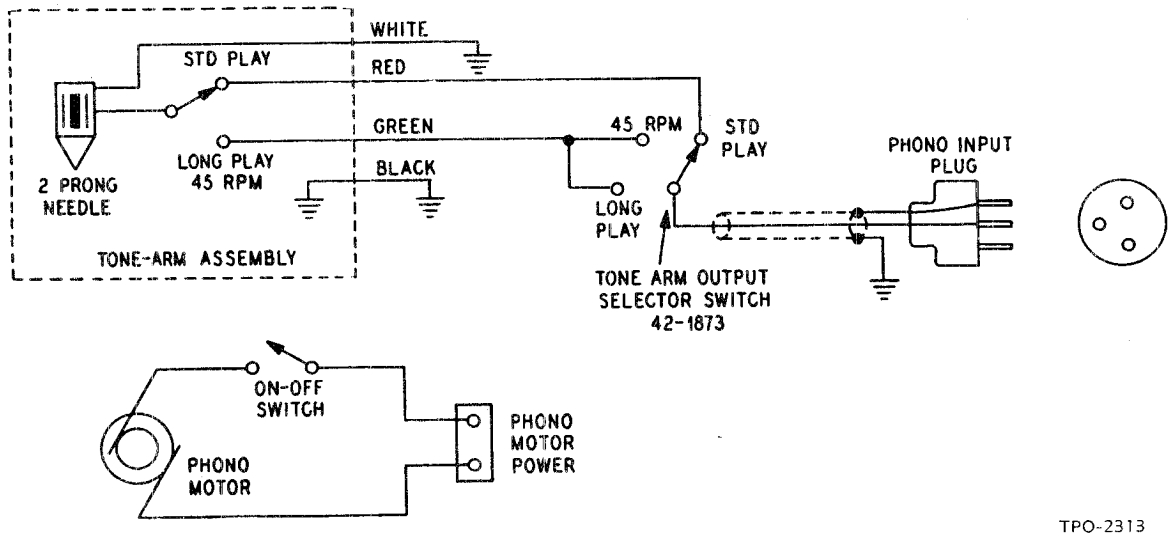
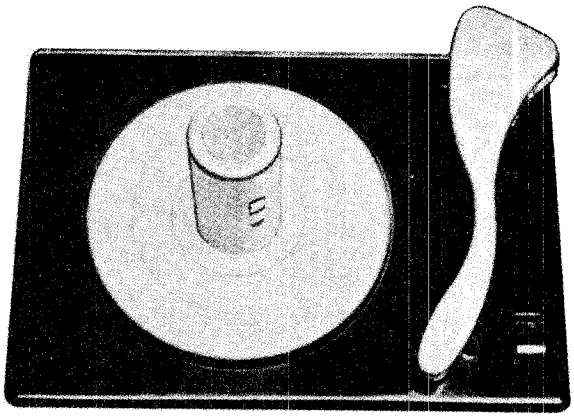


Figure 17. Wiring Diagram of Model M-22

MODEL RP-193-1



PH489

The RP193-1 record changer is designed to play and change automatically twelve of the new RCA type seven inch fine groove 45 r.p.m. phonograph records.

SPECIFICATIONS

Turntable speed ..... **45 r.p.m.**
Records used ..... **RCA type seven-inch fine groove**
Record capacity ..... **12 records**
Pickup force ..... **Approx. 5 grams**
Stylus tip radius ..... **.001 inch**
Power supply ..... **105-125 volts, 60 cycle, a.c.**

LUBRICATION

A light machine oil (Singer Sewing Machine Oil) or equivalent, should be used to oil the bearings of the drive motor and the following:

Idler Carriage.
Pickup Arm Pivot Bearing.
Top & Bottom Turntable Shaft Bearings.

Houghton STA-PUT No. 512 or equivalent grease should be used on the following:

Ball bearing on bottom end of turntable shaft.
Cycling cam shaft.
Points of contact on reject slide assembly.
Cam tracks where the following parts contact.
Elevating rod, pickup arm lever and inclined edge where pinion gear rides.
All gear teeth.
Surfaces where pinion gear drive keys contact shelf and blade assemblies.

Houghton STA-PUT No. 320 can be used on the pinion gear shaft. (However, if available a graphite grease is highly recommended.)

(Do not oil or grease record separator shelves.)

It is important that the drive motor spindle and the rubber tire on the idler wheel be kept clean and free from oil and grease, dirt, or any foreign material at all times. Carbon tetrachloride or naphtha is satisfactory for cleaning those parts.

STA-PUT can be purchased from E. F. Houghton & Company, 303 W. Lehigh Avenue, Philadelphia, Pa.

CAUTION

1. Avoid handling the pickup arm when the mechanism is in cycle.
2. Do not use force to release a jam.
3. Do not try to remove the records on the turntable if the turntable is stopped in cycle with separator blades exposed.

AUTOMATIC OPERATION

1. Place a stack of records over the center post, with the desired selections upward, the last record to be played on top.
2. Push the "start-reject" knob toward the back of the cabinet and let go. The mechanism will automatically play in sequence one side of each record stacked on the separator shelves.
3. To reject a record being played, push the "start-reject" knob toward the back of the cabinet.
4. At conclusion of playing and as the last record is being repeated, lift the pickup arm and place on its rest. Turn off the power to the drive motor by pulling forward on control knob.
5. Remove the stack of records by lifting them straight up.

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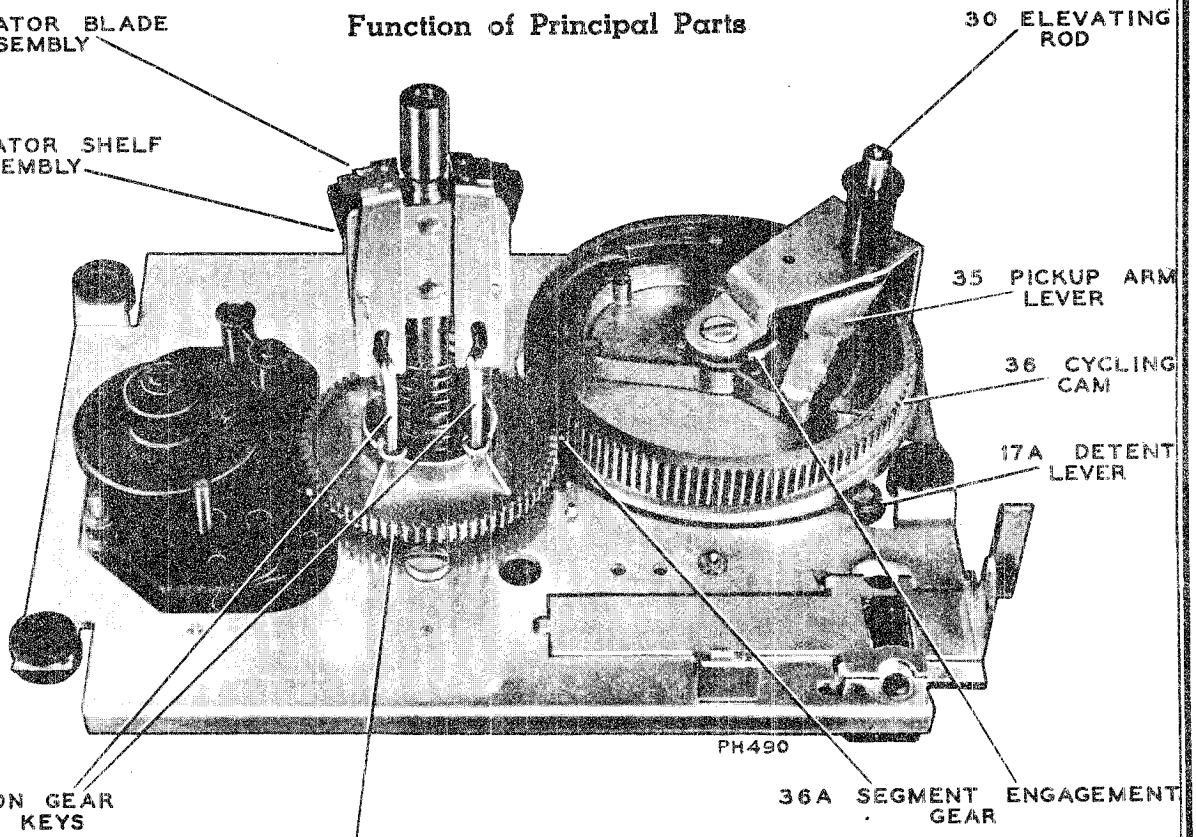
Function of Principal Parts



Pickup Arm Lever (35)

The function of the pickup arm lever is to direct the horizontal movement of the pickup arm during change cycle. This is accomplished as the end of the pickup arm lever rides in the channel molded in the cycling cam. Later, as the mechanism is playing, the pickup arm lever follows the movement of the pickup arm until the pickup arm lever contacts and moves the segment engagement gear, thus tripping the mechanism.

Pinion Gear (13)

The function of the pinion gear is to mount the pinion gear drive keys and transfer the rotating motion of the turntable to the cycling cam during change cycle.

Pinion Gear Drive Keys (13A)

The function of the drive keys mounted on the pinion gear is to actuate the separator mechanism inside the centerpost as they raise and lower with the pinion gear.

Segment Engagement Gear and Lever Assembly (36A)

The segment engagement gear is mounted on the underside of the cycling cam. During the playing time the segment engagement gear is receded. As the mechanism is tripped the segment gear is extended, thereby making a momentary contact with the rotating pinion gear. This contact provides the movement to start the cycling cam rotating and carry the mechanism through change cycle.

Cycling Cam (36)

The function of the cycling cam and its molded channels is to direct the movement of the pickup arm and the separator mechanism during change cycle.

Detent Lever (17A)

The function of the detent lever is to engage the depression in the side of the cycling cam, and stabilize the cycling cam in the out of cycle position.

ADJUSTMENTS

PICKUP ARM HEIGHT

Loosen the screw marked ("A") on back of the pickup arm and adjust so the pickup will clear a stack of twelve records. Raising the screw in the elongated hole raises the pickup arm, lowering the screw lowers the pickup arm.

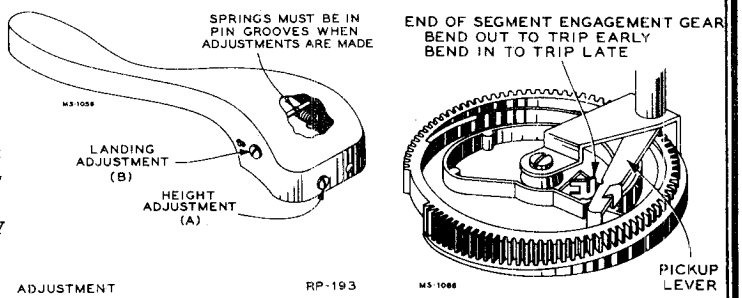
PICKUP LANDING ADJUSTMENT

Loosen screw marked ("B") and slide the mounting bracket forward to move the landing point away from the centerpost, and back to move the landing point inward.

NOTE: Before making the adjustment, make certain the safety springs (26) are in the pin grooves.

TRIPPING ADJUSTMENT

If mechanism fails to trip when the stylus is approximately 1 9/32" from the side of the centerpost, bend the end of the segment engagement lever (indicated in drawing at right) out for early tripping and in for late tripping.

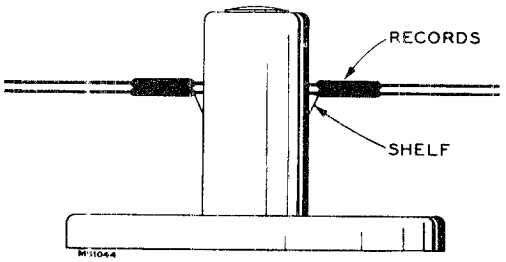


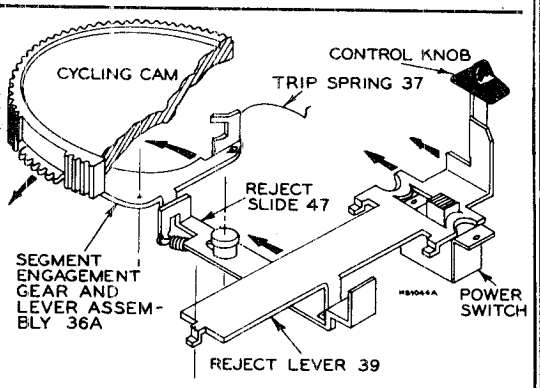
ADJUSTMENT RP-193

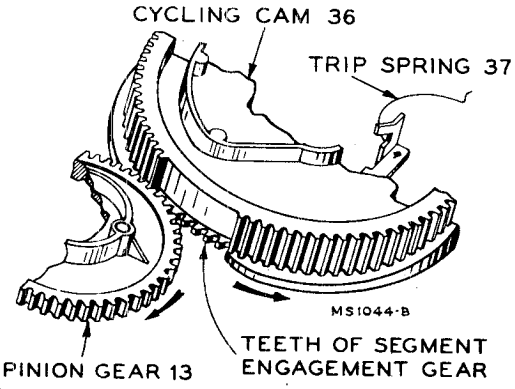
Note:
If spacing between separator blades and separator shelves do not fall between .040 to .048" bend blades accordingly.

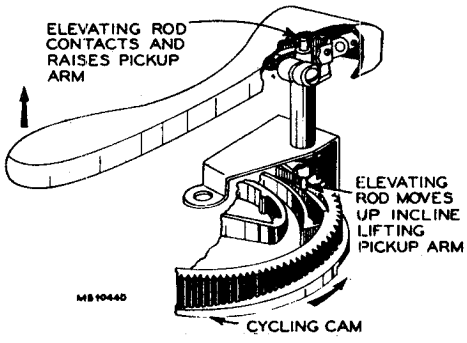
Cycle of Operation

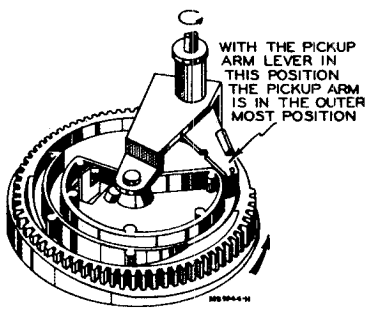
FUNCTION	EXPLANATION
Place a stack of records over the centerpost.	1. Records rest on separator shelves protruding from either side of the centerpost.
Push control knob to reject and release.	1. The control first actuates the power switch applying power to the drive motor. This action starts the turntable rotating. 2. Further movement of the control knob causes the reject lever (39) to move the reject slide (47) sufficiently, for engagement with the end of the segment engagement gear and lever assembly (36A). This movement through the train of levers trips the mechanism.
Cycling starts.	1. As the reject slide moves the segment engagement gear slightly, the segment gear snaps outward due to the action of trip spring (37). 2. After the segment engagement gear has snapped out, the rotating pinion gear (13) engages the teeth of the segment gear and gives a slight rotary motion to the cycling cam (36). This slight rotary motion causes the teeth of the pinion gear and the teeth of the cycling gear to engage, thus starting change cycle.
Pickup raises from the rest and moves out.	1. As the cycling gear starts rotating the pin on the muting switch moves off the boss on the gear permitting the switch to short out the pickup. 2. The elevating rod (30) rides up the incline surface of the track on the cycling cam, causing the pickup to raise from the rest. 3. As the cycling cam continues to rotate the turned down end of the pickup arm lever (35) follows the channel moulded in the cycling cam and swings the pickup arm out clear of the records.

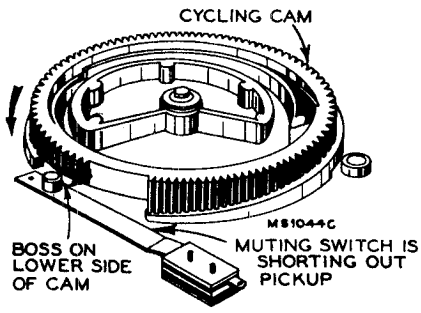












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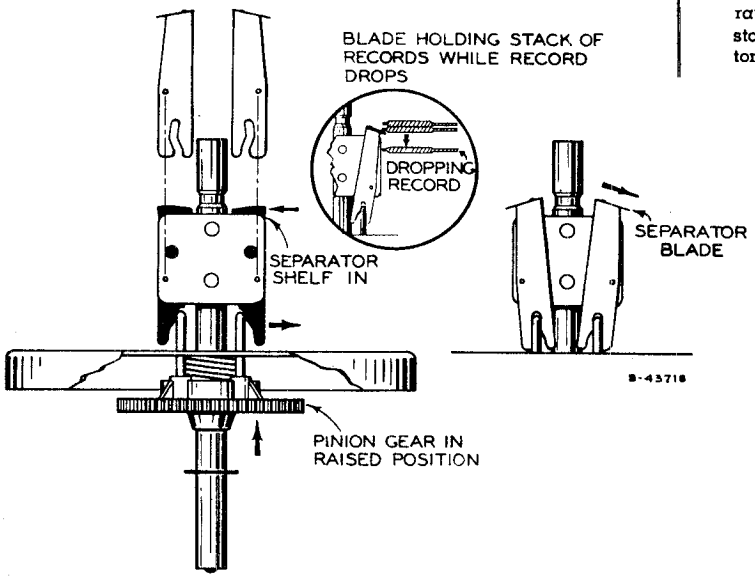
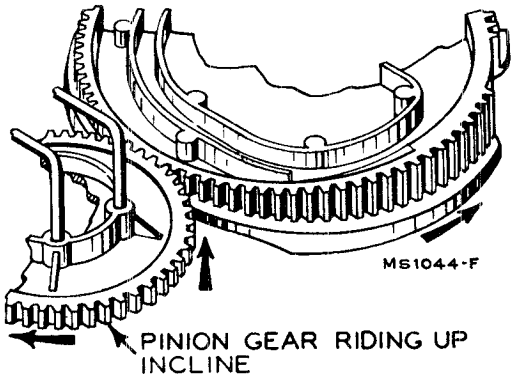
Separator blades separate the lower record from the stack and the lower record drops to the turntable.



1. An instant after the pickup arm has started to raise the rotating pinion gear (13) starts to raise also. This is due to the lower edge of the gear riding up the spiral incline formed on the edge of the cycling cam.

2. The raising of the pinion gear and key assembly actuates the separating mechanism inside the centerpost. This action causes the support shelves to recede and the separator blades to move out to select the lower record of the stack and to support the remaining records while the bottom record drops to the turntable.



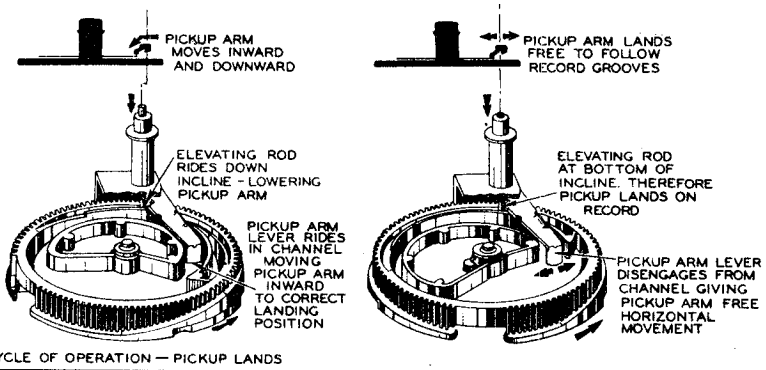
Pickup moves in for landing.

1. As the mechanism nears the end of the change cycle, the end of the segment engagement gear extending from the top of the rotating cycling gear comes against the mounting bracket. This contact resets the segment engagement gear preventing continuous cycling.

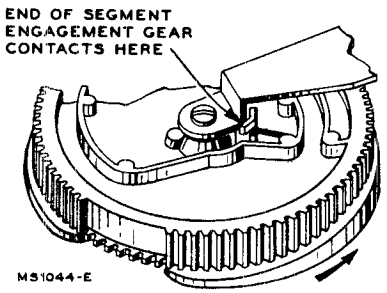
2. The end of the pickup arm lever riding in the channel in the cycling gear, moves the pickup arm in for landing.

3. The pickup lands on the start of the record as the elevating rod rides down the incline on the cycling gear.

4. At this very moment the end of the pickup arm lever moves into the open portion of the cycling cam track. This gives free movement to the pickup arm as it moves across the record.

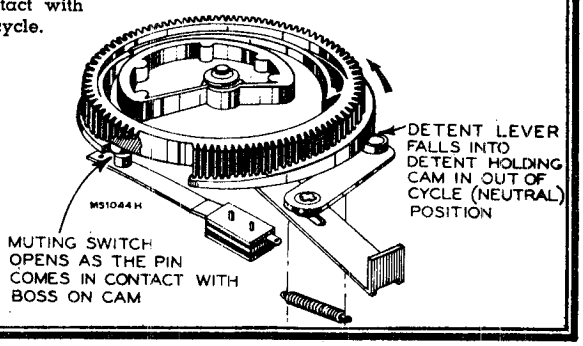


RP193 - CYCLE OF OPERATION — PICKUP LANDS

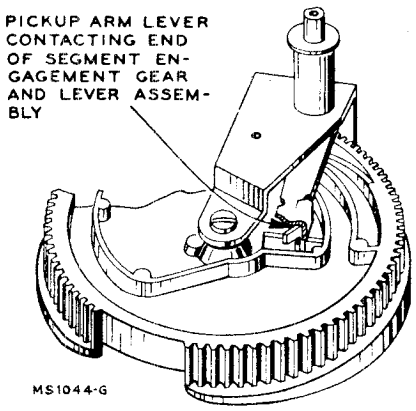


Cycling completed and the record plays.

1. The detent lever (17A) snaps the cycling cam into a neutral position as the muting switch pin comes in contact with the boss on the cam. This completes the change cycle.

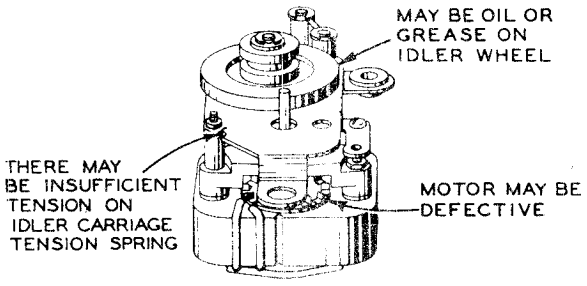


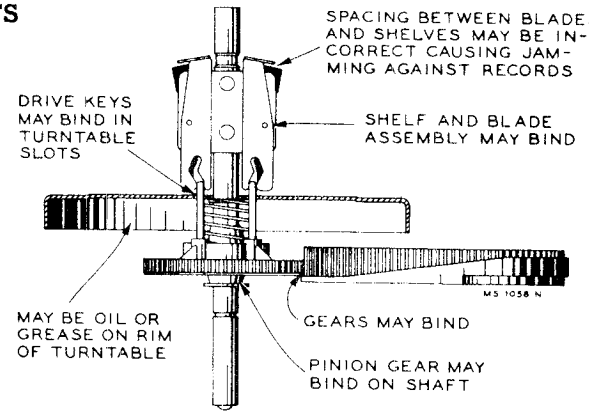
2. As the record plays, the pickup moves inward.
3. When the stylus reaches the end of the selection, the side of the pickup arm lever (35) contacts and trips the segment engagement gear and a new change cycle is started.
4. The mechanism repeats the preceding sequence of operations until the last record of the stack has dropped to the turntable and has been played.
5. The last record will be repeated until the pickup is lifted and placed on the rest.



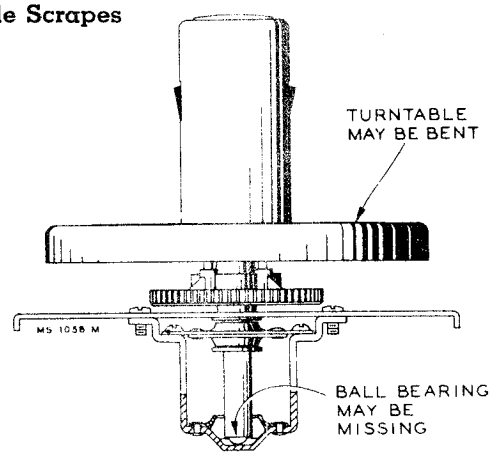
SERVICE HINTS

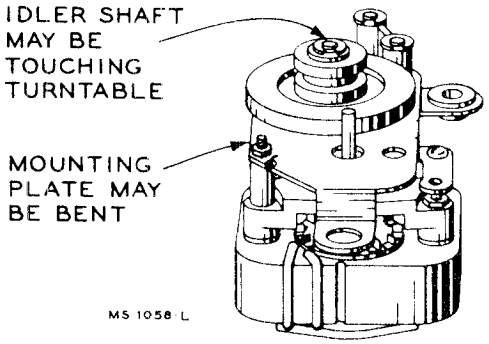
Stalling During Change Cycle



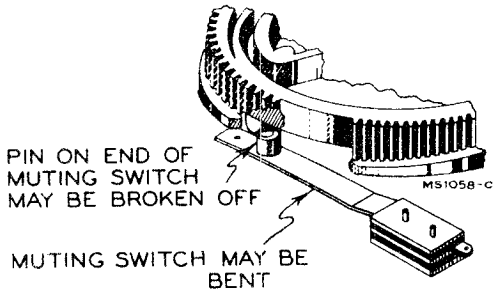


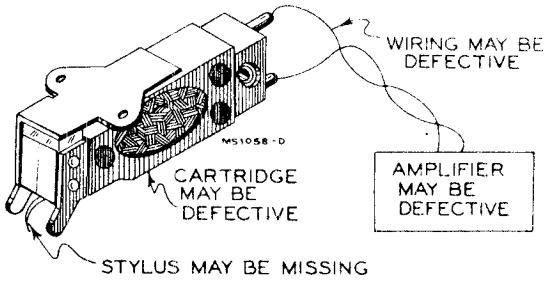
Turntable Scrapes





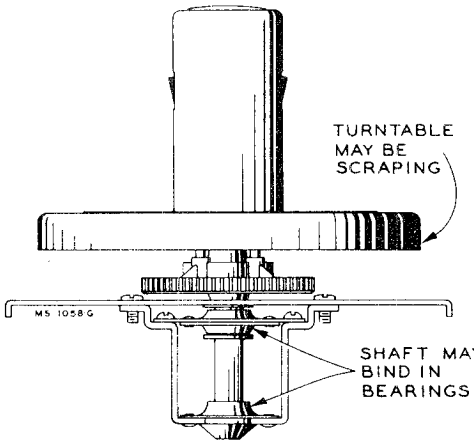
No Output From Instrument

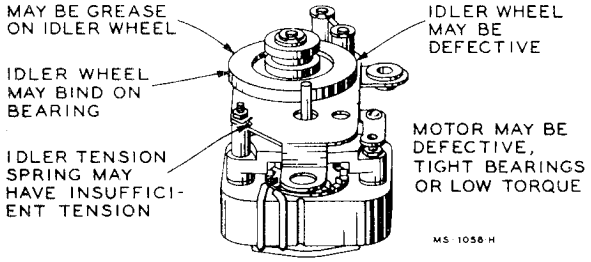




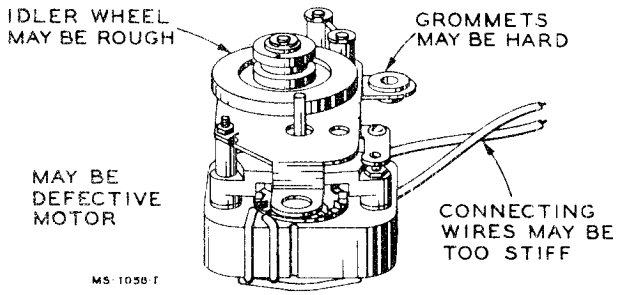
MODEL RP-193-1

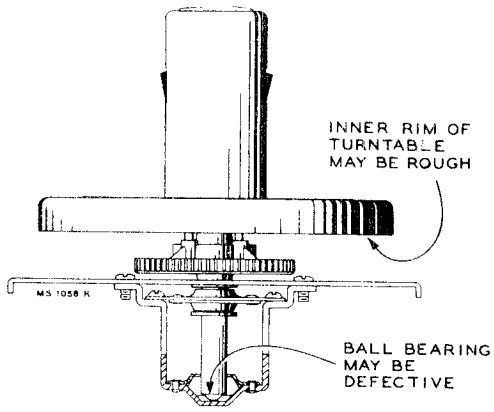
"WOW" OR SPEED VARIATION



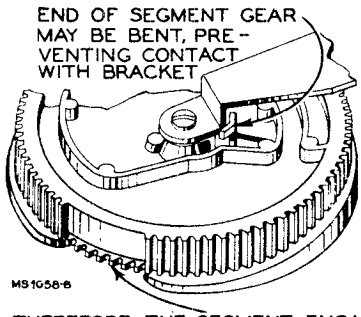


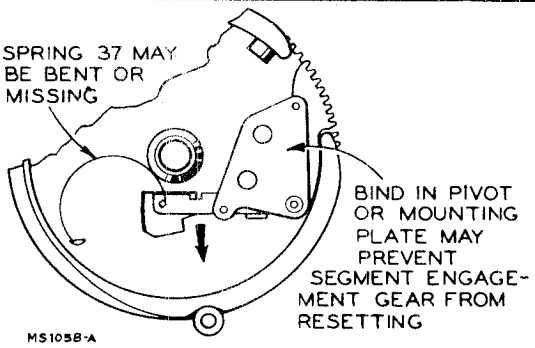
RUMBLE

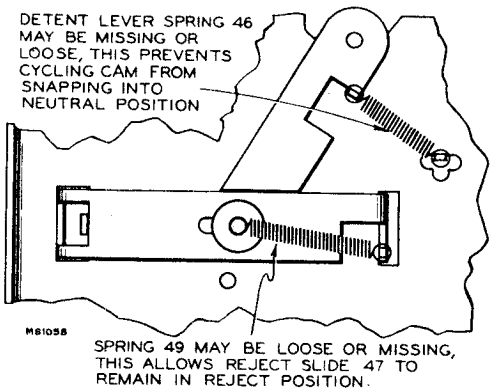




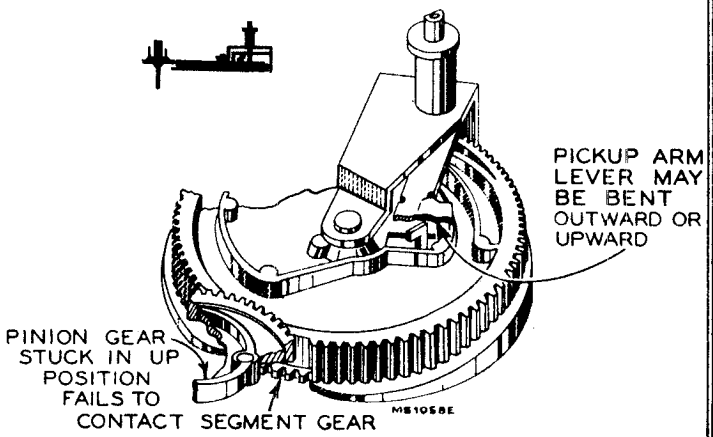
CONTINUOUS TRIPPING



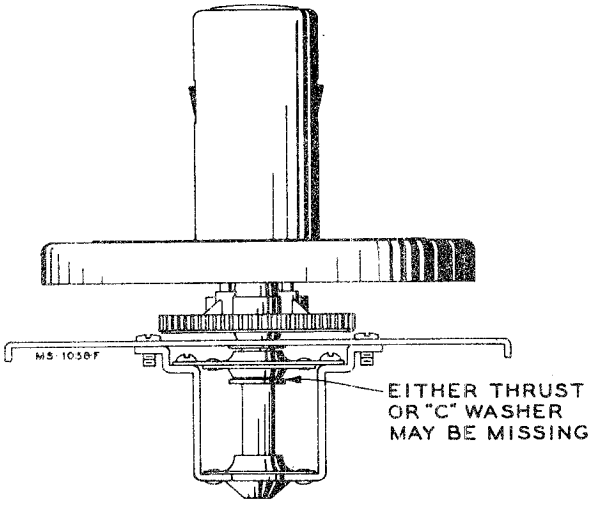




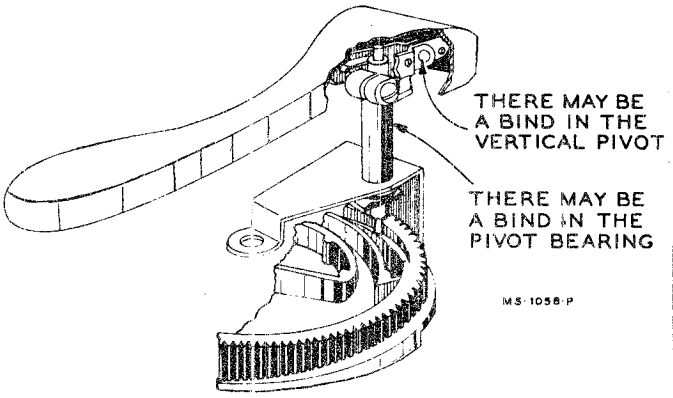
MECHANISM FAILS TO TRIP



TURNTABLE RAISES DURING CHANGE CYCLE

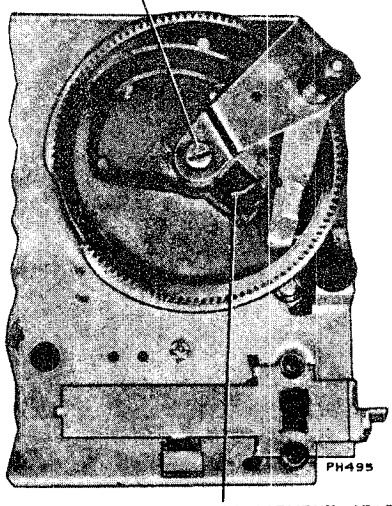


PICKUP SKIPS GROOVES



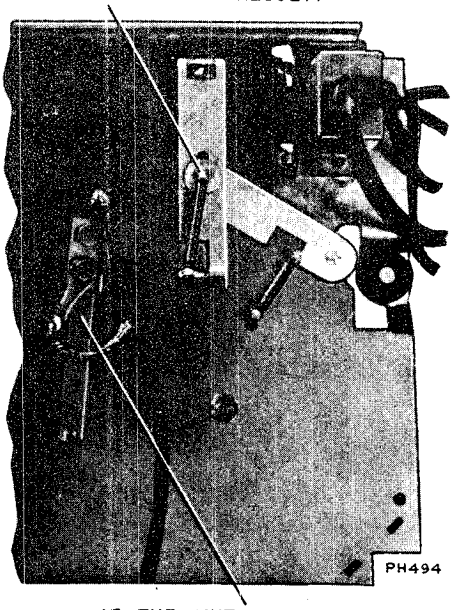
DO YOU KNOW?

IF MOUNTING BRACKET IS NOT SEATED PROPERLY OVER SHOULDER OF SHAFT, MECHANISM MAY FAIL TO TRIP. ALSO MUTING SWITCH MAY NOT FUNCTION PROPERLY.



IF THE END OF THE SEGMENT ENGAGEMENT GEAR IS BENT IMPROPERLY, RESETTING THE GEAR WILL NOT BE ACCOMPLISHED AND CONTINUOUS TRIPPING WILL RESULT.

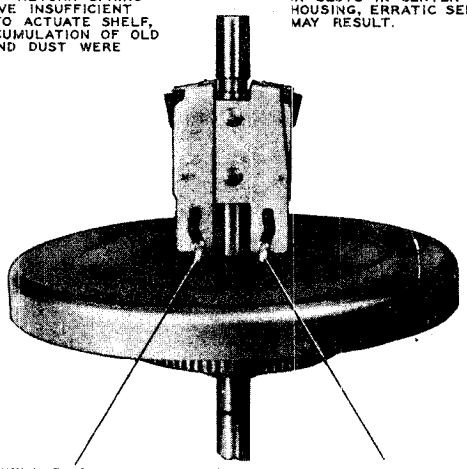
IF REJECT SLIDE BINDS, CONTINUOUS TRIPPING MAY RESULT.



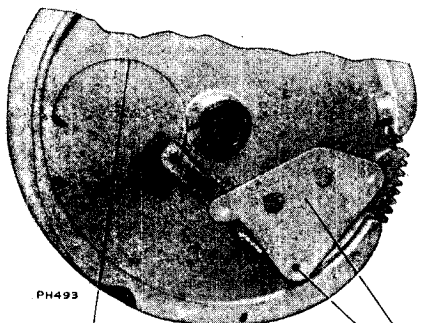
IF THE MUTING SWITCH IS BENT, MECHANICAL NOISES MAY BE AMPLIFIED DURING CHANGE CYCLE.

BLADE AND SHELF ASSEMBLY SHOULD NOT BE GREASED. THE SHELF RETURN SPRING WOULD HAVE INSUFFICIENT TENSION TO ACTUATE SHELF, IF AN ACCUMULATION OF OLD GREASE AND DUST WERE PRESENT.

IF BLADE AND SHELF ASSEMBLY IS NOT CENTERED PROPERLY IN SLOTS IN CENTER POST HOUSING, ERRATIC SEPARATION MAY RESULT.



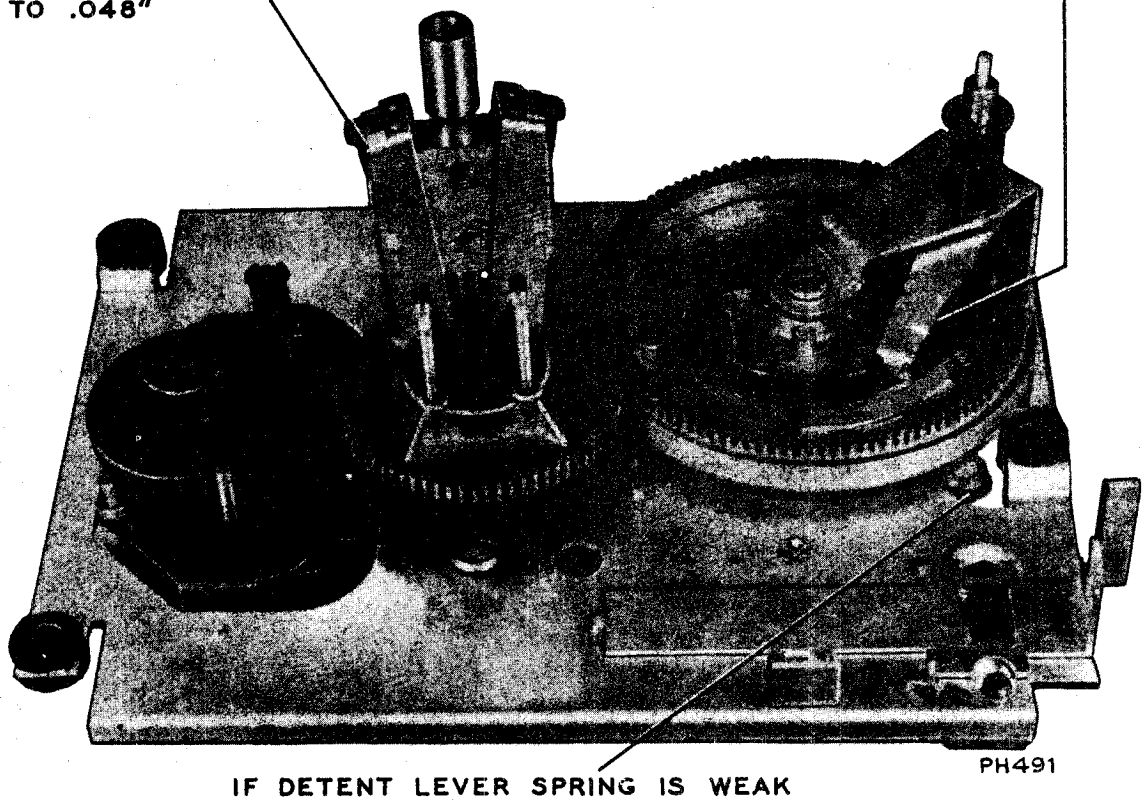
IF KEYS BIND IN SLOTS IN TURNTABLE, MECHANISM WILL NOT SEPARATE RECORDS. ALSO MECHANISM WILL NOT GO INTO CHANGE CYCLE IF THE PINION GEAR REMAINS IN THE UP POSITION.



IF THE SPRING IS IMPROPERLY BENT, OR THE END OF THE SEGMENT GEAR BINDS IN THE HOUSING OR BEARING, TRIPPING WILL BE ERRATIC

MODEL RP-193-1

DO YOU KNOW? (Continued)



DISMANTLING MECHANISM

(Refer to exploded view on opposite page)

REMOVAL OF PICKUP ARM

1. Disconnect pickup wires.
2. Loosen clamp screw 28.
3. Lift pickup arm straight up.

REMOVAL OF PICKUP ARM SWIVEL (BRACKET)

1. Remove landing adjustment screw 22.
2. Push pivot pin 25 away from the slotted side of the pickup arm shell, bend shell slightly to remove pin and entire swivel assembly will slide out.

REMOVAL OF TURNTABLE ASSEMBLY

1. The entire turntable and pinion gear assembly (Nos. 1 to 40 inclusive) can be lifted out by removing the "C" washer 40 located below the upper turntable bearing.

DISMANTLING THE TURNTABLE ASSEMBLY

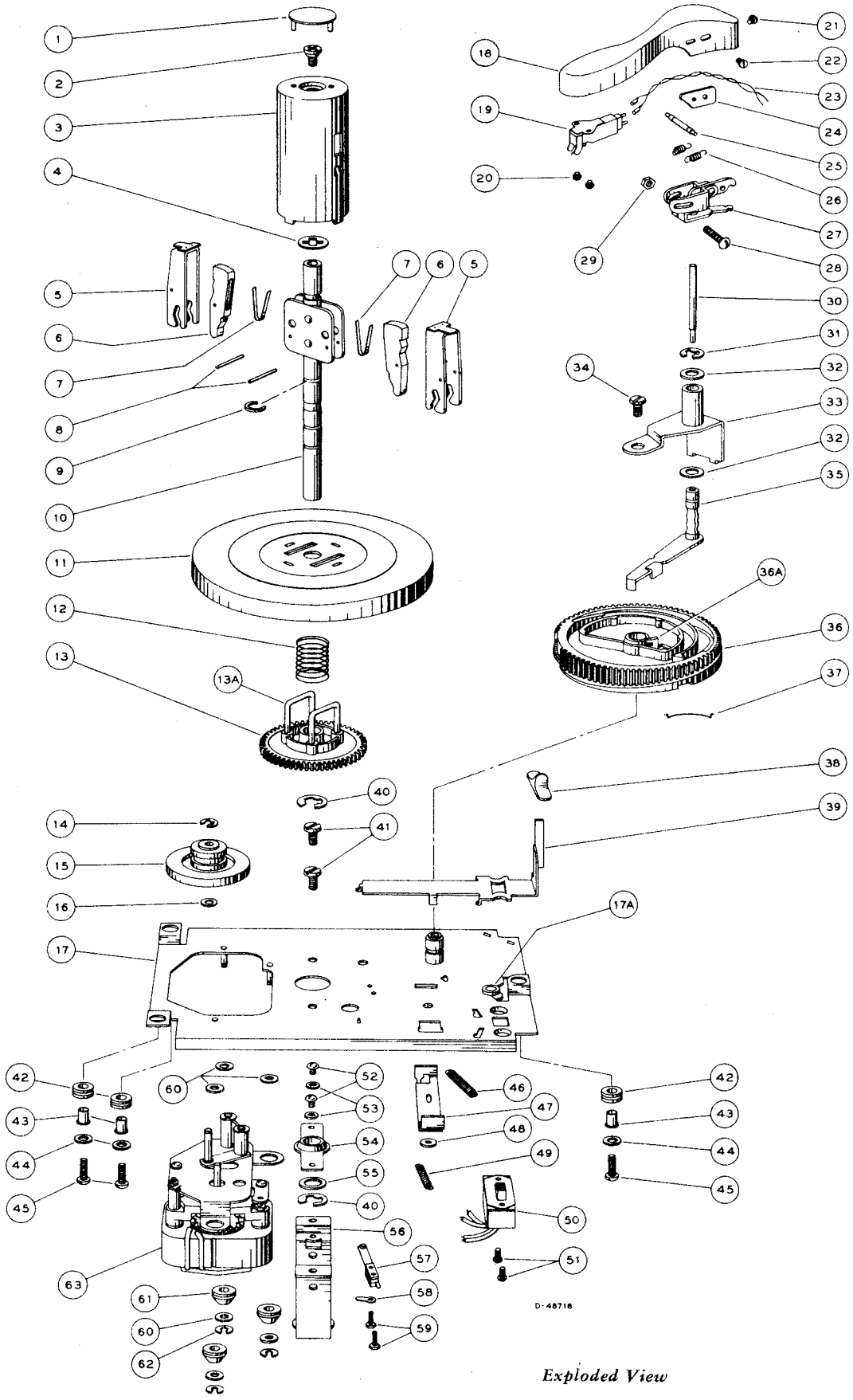
1. Remove "C" washer 40 located directly below the pinion gear.
2. Slide the pinion gear 13 and spring 12 off the spindle shaft 10.
3. Remove cap 1.
4. Remove screw 2.
5. Separate spindle cover 3 from the turntable.
6. Push pin 8 out to remove spring 7, shelf 6 and blade assembly 5.

REMOVAL OF TURNTABLE SPINDLE SHAFT

1. Remove "C" washer 9 and lift out spindle shaft 10.

REMOVAL OF CYCLING CAM

1. Remove screw 34.
2. Lift bracket assembly consisting parts Nos. 31 to 35 inclusive.
3. Remove cycling cam.



Exploded View

MODEL RP-193-1

REPLACEMENT PARTS

ILL. NO.	STOCK NO.	DESCRIPTION
1	76246	Cap—Turntable centerpost housing cap—red
2	76242	Screw—#8-32 x 3/8" cross-recessed shoulder screw
3	76241	Housing—Centerpost housing
4	76247	Washer—Spring washer for turntable centerpost and shoulder screw
5	76237	Separator—Record separator and knife
6	76238	Shelf—Record shelf
7	76239	Spring—Record shelf spring (formed)
8	76240	Pin—Record shelf and separator pin
9	76245	Washer—"C" washer for turntable centerpost
10	76236	Shaft—Turntable shaft
11	76248	Turntable—Turntable and mat
12	76244	Spring—Pinion gear return spring (23/32" O.D. 1 1/8"—8 turns)
13	76243	Gear—Turntable pinion gear complete with two (2) drive keys
13A	——	Key—Drive key for turntable pinion gear—included in Ill. #13
14	76229	Washer—"C" washer to fasten idler wheel on Motor #9220-1.
15	76286	Wheel—Idler wheel for Motor 9220-1
16	76287	Washer—Dampening washer for idler wheel for Motor 9220-1
17	76231	Base—Sub-base complete with all staked and riveted parts including detent lever
17A	——	Lever—Detent lever—included in Ill. #17
18	76215	Arm—Pickup arm complete with counterweight less crystal and cable
19	76257	Crystal—Crystal cartridge complete with stylus
20	76216	Screw—#2-56 x 1/8" cross recessed fillister head machine screw to mount crystal
21	76210	Screw—#4-40 x 1/8" binder head machine screw for height adjustment
22	76210	Screw—#4-40 x 1/8" binder head machine screw for landing adjustment
23	——	Cable—Twisted pair cable and connectors
24	76211	Bracket—Landing adjustment bracket
25	76212	Pin—Pivot pin
26	76213	Spring—Pickup arm safety spring (3/16" O.D. x 35/64"—9 turns)
27	76214	Bracket—Pickup arm mounting bracket
28	75726	Screw—#8-32 x 5/8" round head screw for mounting bracket
29	75725	Nut—#8-32 hex nut to fasten mounting bracket
30	76235	Rod—Elevating rod
31	76220	Washer—"C" washer to fasten pickup arm lever
32	57209	Washer—Spring washer for pickup arm lever and bearing bracket
33	76219	Bracket—Pickup arm bearing bracket
34	72409	Screw—#8-32 x 1/4" binder head screw to fasten pickup arm bearing bracket
35	76222	Lever—Pickup arm shaft and lever
36	76217	Cam—Cycling cam and gear complete with segment engaging gear and trip spring
36A	——	Gear—Segment engaging gear—part of Ill. #36
37	76218	Spring—Trip spring
38	76251	Knob—Reject knob
39	76223	Lever—Reject lever
40	76221	Washer—"C" washer to fasten spindle and centerpost
41	76227	Screw—#10-32 x 1/4" binder head machine screw to mount bearing assembly
42	76228	Grommet—Rubber grommet to mounting sub-base
43	76249	Spacer—Metal spacer to mount mechanism in plastic cabinet used in (45J3)
44	76250	Washer—Flat metal washer to mount mechanism in plastic cabinet used in (45J3)
45	——	Screw—#8-32 x 3/4" binder head machine screw to mount mechanism in plastic cabinet used in (45J3)
46	76233	Spring—Detent lever return spring (9/64" O.D. x 3/4"—34 turns)
47	76232	Link—Reject link
48	——	Washer—Flat washer for mounting reject slide
49	76230	Spring—Reject slide return spring (9/64" O.D. x 7/8"—42 turns)
50	32875	Switch—ON-OFF switch complete with cover
51	——	Screw—#4 x 3/16" cross recessed round head self tapping screw to mount ON-OFF switch
52, 53, 54,		
56	76234	Bearing—Turntable bearing assembly
55	76226	Washer—Bakelite washer for bearing assembly
57	76224	Switch—Muting switch
58	——	Lug—Solder lug
59	76225	Screw—#5-40 x 5/16" hex head tapping screw for mounting muting switch (2 req'd)
60	70490	Washer—Fibre washer for mounting motor
61	76288	Grommet—Rubber grommet for motor mounting plate for Motor 9220-1
62	76229	Washer—"C" washer to mount motor
63	76291	Motor—115 volt, 60 cycle motor less mounting plate and idler wheel (stamped 9220-1)
—	76289	Plate—Motor mounting plate for Motor 9220-1
—	76290	Spring—Idler wheel spring (3/16" O.D. x 5/16") for Motor 9220-1

MODEL 950

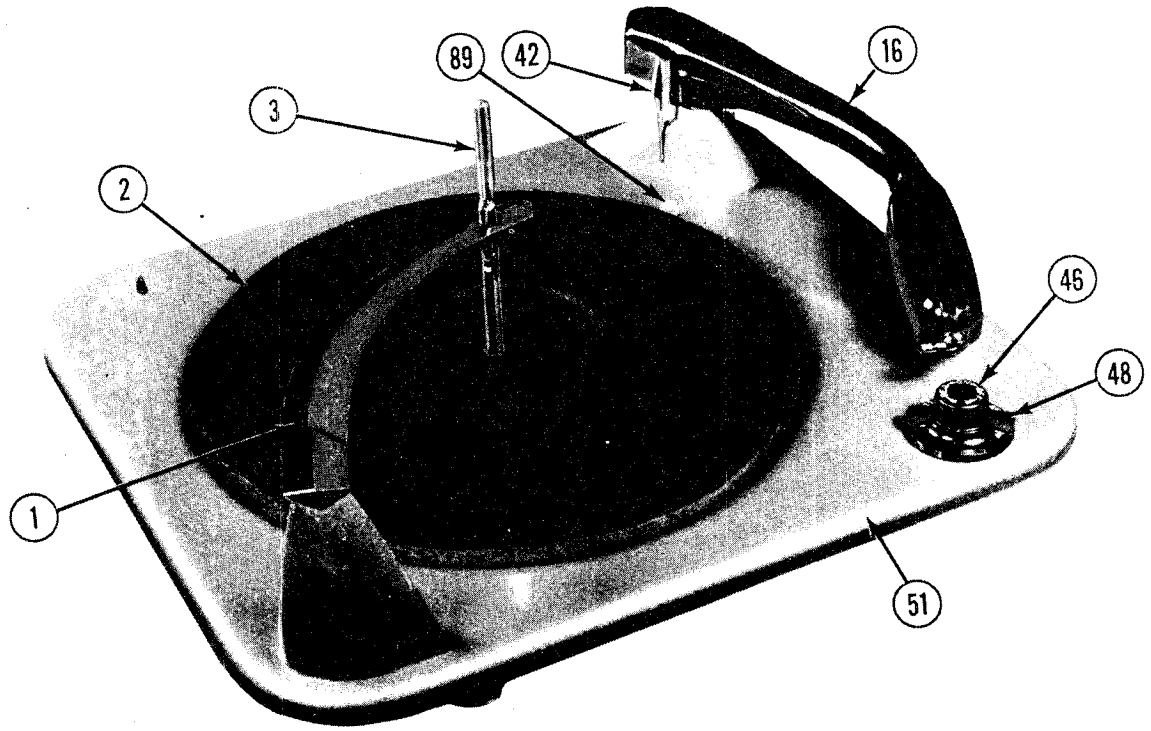


Figure 2

SPECIFICATIONS

The V-M 950 Tri-o-matic Record Changer Intermix Model is designed to play standard 78 RPM, fine-groove 45 RPM, or long-play 33-1/3 RPM records of standard commercial dimensions. Records up to 12 inches in diameter can be played manually.

Features of this changer include playing and automatically changing as many as ten - 12", twelve - 10", or any assortment of 10" and 12" of the same type (78 RPM or 33-1/3 RPM).

A full stack of twelve - 7", 33-1/3 RPM records or a full stack of twelve - 7", 45 RPM records (with the adapter inserted in the record) will also play on this changer.

The changer shuts off after the last record has been played.

Connect this changer only to an outlet supplying 117 volts, 60-cycle ac unless otherwise specified. Power consumption 25 watts.

PREPARING FOR OPERATION

SHIPPING BOLTS: Before placing in operation, the machine must be floated freely on the mounting springs. During shipment, the mechanism is secured by means of two shipping bolts. To float the changer, remove the turntable by lifting it straight up the spindle. Turn the two shipping bolts in a clockwise direction as far as they will go and replace the turntable. Before the turntable can be fully seated, the idler wheel must be gently pushed back out of the way to prevent damage to the rubber tire.

OPERATION

Loading -

1. Pull straight up on record support knob until record support clears spindle. Swing record support to the left until pin in shaft drops into locating groove.

2. Changer will automatically play ten - 12" either standard or long-play records, twelve - 10" either standard or long-play records, any assortment of ten - 12" and 10" records intermixed, or twelve - 7" long-play or fine-groove records.

NOTE: Standard, fine-groove, and long-play records cannot be intermixed. Motor speed control knob must be reset for each type of recording.

3. Place records on spindle and lower to offset shelf. Hold records level and replace record support over spindle.

To Play Standard Recordings -

1. Motor speed control knob must be in the "78" position.

2. To start, turn changer control knob to "Rej." and release. Changer will operate automatically until the last record has been played. Pickup arm returns to rest and the changer control knob to the "Off" position. Changer automatically stops.

LEVELING RECORD CHANGER: It is essential to have the record changer absolutely level. Use a torpedo or similar type level on the record changer baseplate. Use adequate shims to level the record changer pan or radio combination cabinet to achieve perfect level.

MODEL 950

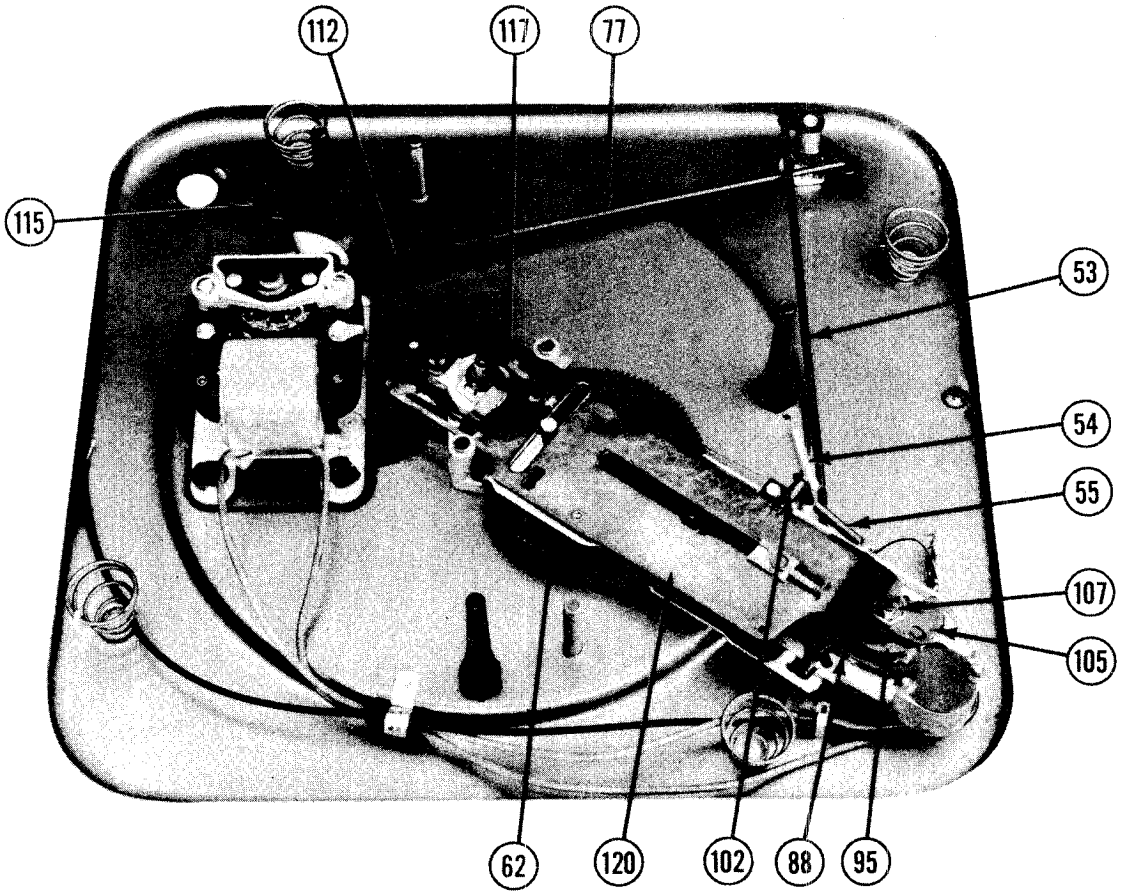


Figure 3

To Play Long-Play (33-1/3 RPM) Records -

1. Motor speed control knob must be in the "33" position.

To Play Fine-Groove (45 RPM) Records -

1. Motor speed control knob must be in the "45" position.

2. These records are manufactured with a 1-1/2" spindle hole. It is essential that a record adapter be inserted into each 45 RPM record to be played. This is necessary to reduce the spindle hole to conventional size.

REJECTING: To reject a record at any time while changer is operating, turn changer control knob to "Rej." and release.

STOPPING: To turn off changer before automatic shut-off, turn changer control knob to "Off." Lift pickup arm and place on rest.

UNLOADING: Lift the record support and swing to the left until pin on shaft drops into locating groove. Lift stack of records straight up and off spindle.

MANUAL OPERATION: To play single records or home recordings, allow the changer to go through its complete shut-off cycle. Lift the record support arm and move it to the left clear of the turntable. Place record on spindle and lower to spindle shelf. Tilt record down toward the rear of pickup arm and lower record to turntable. Turn changer control knob to "On" position only. Raise pickup arm and place in lead-in groove of record.

REPEATING OF 7", 10", OR 12" RECORDS: To repeat records, swing record support clear of spindle, place record on the turntable, and start changer. Record repeats until control is turned "Off." If a 12" record is repeated, wait for the changer to finish cycling and reposition the pickup arm manually to the 12" position.

SUGGESTIONS: When loading and unloading the changer, use care to prevent bending of the spindle. Records should not be left on the spindle except during operation of changer. Records will warp. When machine is not in use, it is suggested that the speed control knob be left in the "78" position. For best reproduction, keep needle and records clean. Store records flat, in folders or in albums. Do not lay record on record.

CHANGE CYCLE

This changer is provided with what is known as a velocity trip mechanism. The change cycle is started by the faster inward motion of the pickup arm when the needle enters the trip grooves at the end of the record. Only records having fast-finishing grooves before the eccentric cycling groove will operate this velocity trip.

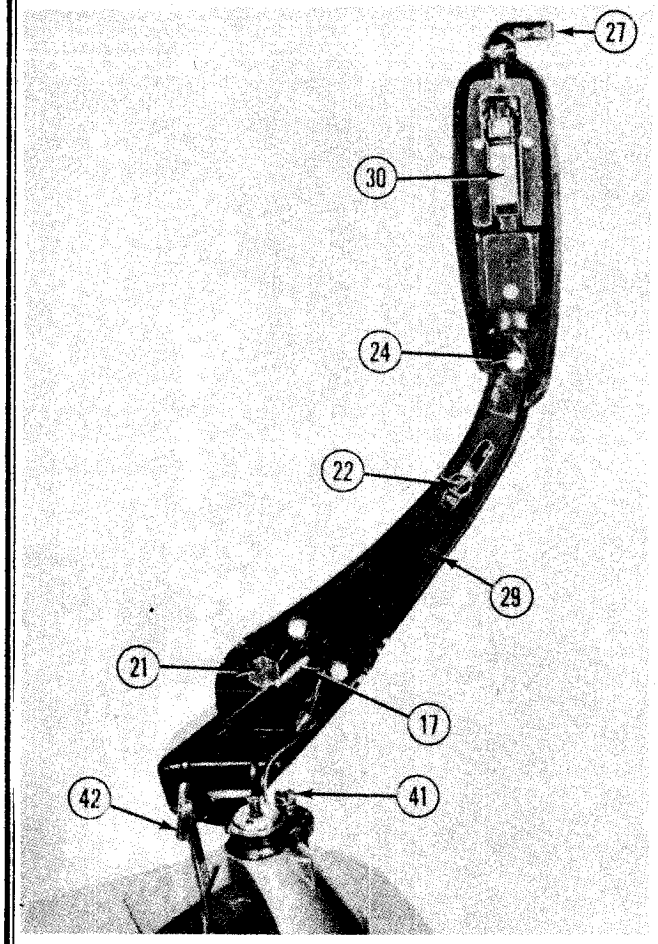


Figure 4

The pickup arm and hinge assembly and trip finger cam (105) are secured at opposite ends of the pickup arm shaft and sleeve (43) so that they move in unison. As the pickup arm nears the end of the record, the trip finger cam (105) pushes the trip link (110), which, in turn, engages the trip lever (68) rotating the pawl lever (65) to move the trip pawl (69) toward the hub on the turntable. While a record is playing, the small motions of the trip pawl (67) are not sufficient to cycle the mechanism because on each revolution of turntable the wiping contact by the hub projection moves the trip pawl (67) back to clear the projection.

In the first revolution of the turntable during which the pickup arm advances rapidly, the trip pawl (67) is moved far enough to definitely engage the projection on the turntable hub. The gear on the turntable hub will now engage the main gear (62) and start its rotation. This, in turn, starts the lateral motion of the slide and cam assembly (120). The slide and cam assembly (120) moves to the rear through the action of an eccentric pin (71) on the main gear (62) moving in the cross slot on the slide and cam assembly (120).

As the slide and cam assembly (120) begins to move, the cam surface at the rear pushes the lift pin (35) upward, raising the pickup arm clear of the record. At the same time, the tab on the rear of the slide and cam assembly (120) contacts the trip finger cam (105) swinging the pickup arm clear of the turntable.

The front edge of the ejector link slot in the slide and cam assembly (120) then contacts the ejector link on the ejector link assembly (117). The ejector link moves the pusher shaft and housing assembly (14) upward actuating the spindle assembly (3), causing the record pusher (6) to move straight up so as to enter the center hole of the record, and then to be pivoted forward, dropping a record to the turntable.

The spindle guide (4) inside the spindle (3) prevents more than one record at a time from being ejected. When records are removed from the turntable, the guide slides straight up allowing free movement up the spindle, then slides back into position by gravity.

Simultaneously, the tab on the rear of the slide and cam assembly (120) contacts the pickup arm return locator (95), moving it clear of the reset lever (81); at the same time, the pickup arm return locator (95) is locked in position with the trip finger cam (105) by means of matching holes in the pickup arm return locator (95) and detents in the trip finger cam (105). This is accomplished by the pressure of the compressed conical lift pin spring (107) overcoming the pressure of the lift pin compression spring washer (97).

At the same time, the cam surface of the bracket on the main gear assembly (62) moves the reset lever (81) to mid-position (10" set-down) where it is held by the 12" record selector (42). The slide and cam assembly (120) continues to the rear and then starts forward. If 7" records are being changed, the rubber bumper (89) of the 7" set-down lever (90) is free to move upward permitting the other end to drop into the hole in the main gear (62) as this gear rotates. This action of the 7" set-down lever (90) raises the reset lever (81) to the upper position (7" set-down).

If 10" records are being changed, the 7" set-down lever (90) will not operate as the rubber bumper (89) will contact the edge of the record and the reset lever (81) will remain in the mid-position (10" set-down) as originally placed by the caming action of the bracket on the main gear (62).

If a 12" record is being changed, the edge of the record strikes the 12" record selector (42) releasing the reset lever (81) which drops to the bottom position (12" set-down).

As the slide and cam assembly (120) continues forward, the tab on the rear of the slide will move clear of the pickup arm return locator (95) and trip finger cam (105), which are still locked together. These rotate under the action of the pickup arm return spring (87) until one of the three set-down steps in the pickup arm return locator (95) strikes the reset lever (81), which has been positioned by the record being changed (see above). This stops the inward movement of the pickup arm return locator (95), trip finger cam (105) and pickup arm. The pickup arm is then lowered to the lead-in grooves of the record at this point as the lift pin (35) rides down the rear cam surface of the slide and cam assembly (120). As the pressure is released from the conical lift pin spring (107), the lift pin compression spring washer (97)

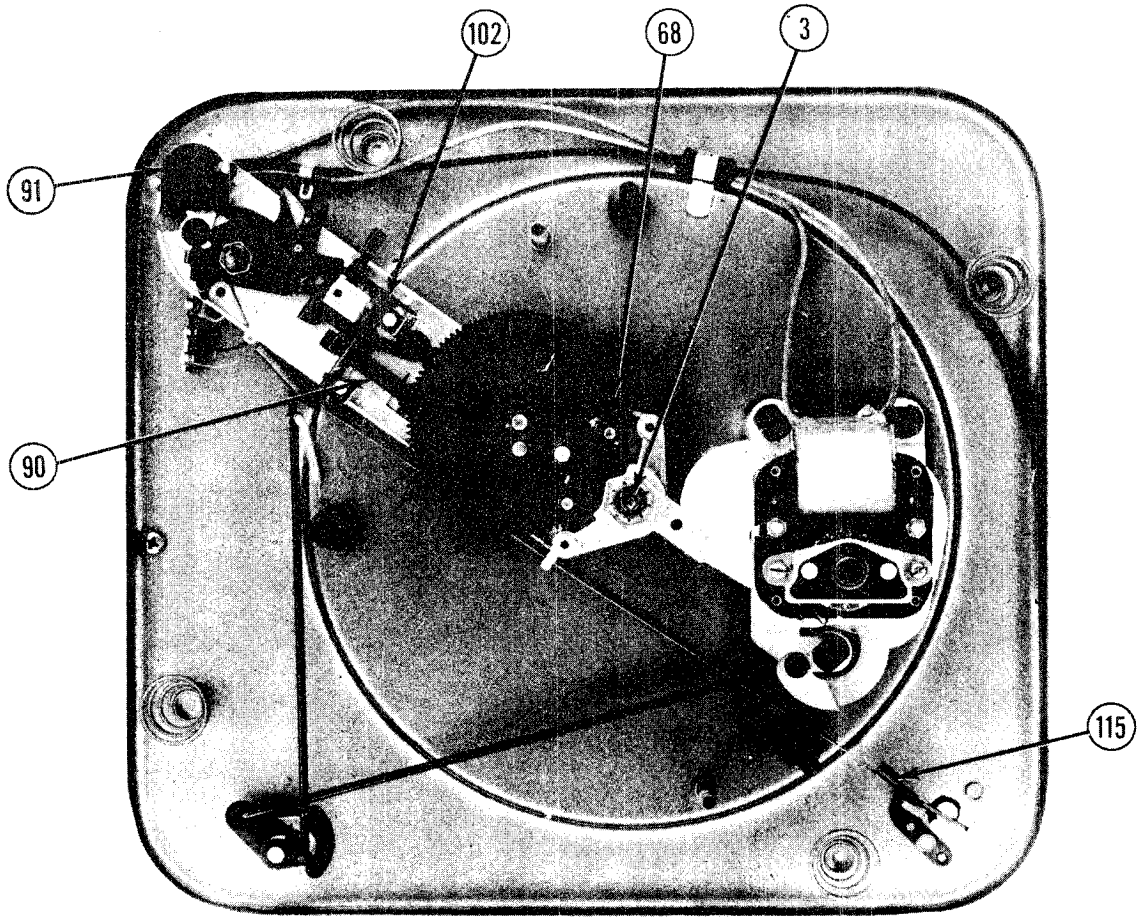


Figure 5

separates the pickup arm return locator (95) and trip finger cam (105), permitting the pickup arm to ride freely across the record.

As soon as the last record has been dropped, the record support assembly (1) drops below the shelf on the spindle assembly (3) and the lower end of the record support post contacts the arm of the shut-off lever on the shut-off lever bracket assembly (117). This pulls the control link (112), which, in turn, rotates the crank of the lever assembly (102). This forces the tab on the lever assembly (102) against the slide and cam assembly (120). At the end of the change cycle, which drops the last record, this tab on the lever assembly (102) drops into the cut-out in the main slot on the slide and cam assembly (120), and the other end of the lever assembly (102) is pushed against the pickup arm return locator (95).

When the last record has been played, the change cycle starts again; however, this time, as the pickup arm return locator (95) is pivoted clear of the reset lever (81) by the tab on the slide and cam assembly (120), the lever assembly (102) rises to the shut-off position. A tab on the lever assembly (102) raises the trip link (110) to the upper position. As the pickup arm return locator (95) starts to return the pickup arm to the record, it is stopped by the lever assembly (102) with the pickup arm positioned over the pickup arm rest post (45). The main gear continues to rotate pulling the trip link (110) forward to reset it. A tab on the upper surface of the trip link (110) contacts a lever on the control shaft assembly (88) rotating the control shaft assembly to turn off the motor and return the control knob to the "Off" position.

As the slide and cam assembly (120) moves forward, the lift pin (35) rides down the rear cam surface lowering the pickup arm to the pickup arm rest post (45).

LUBRICATION

Additional lubrication should not be required for the life of the changer, but in cases of unusual use or high-operating temperature, the changer should be lubricated as follows:

Apply Andok "B" to:

1. Edges of all slots in slide and cam assembly (120).

2. Outer edges of tines on forked end of slide and cam assembly (120).

3. Lift pin cam surface on slide and cam assembly (120).

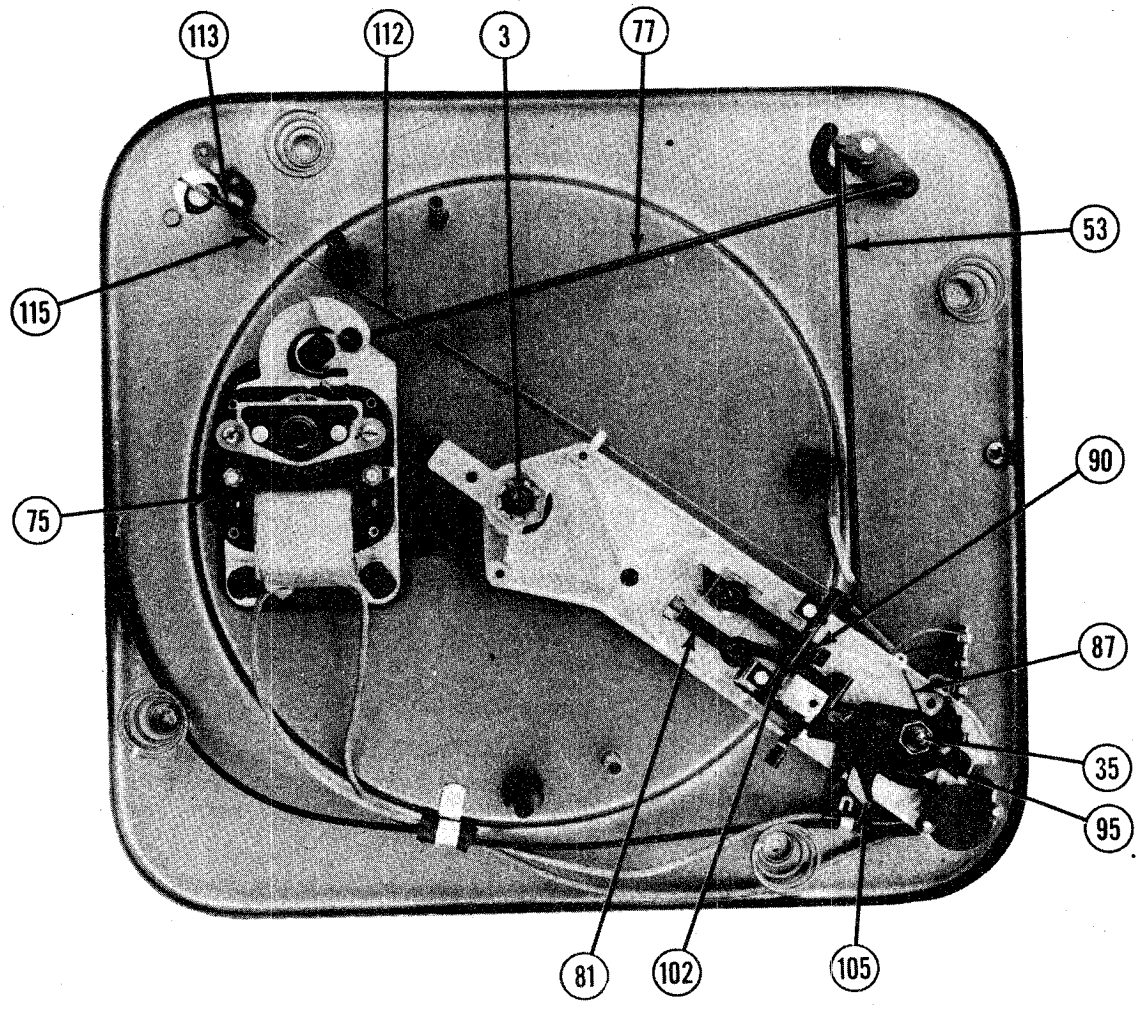


Figure 6

4. Lower surface of pickup arm return locator (95).

5. Inner surface of tab on rear of slide and cam assembly (120).

6. Turntable ball bearing (10).

7. Eccentric pin on main gear assembly (70).

Apply a small quantity of light mineral oil to:

1. Pickup arm shaft and sleeve bearing (43).

2. Turntable and spindle bearing.

ADJUSTMENTS

NEEDLE SET-DOWN (Refer to Figure 4); The set-down position of the needle is adjusted by means of the set-down adjustment screw (41) mounted on the hinge arm assembly (40). Turn this screw adjusting pickup arm for correct set-down on 10" record. When the correct set-down is obtained for the 10" position, the 12" and the 7" needle set-down will also be correct.

PICKUP ARM HEIGHT (Refer to Figure 4): The pickup arm height is adjusted by the lift screw (21) located at the rear of the strengthener. To raise the height of the pickup arm, turn this screw counter-clockwise. To lower the pickup arm, turn clockwise. The pickup arm height should be adjusted so that with a 1-1/8" stack of records the pickup arm lifts 1/4" straight up as the change cycle starts.

NEEDLE PRESSURE: The needle pressure should be between 10 and 12 grams. Adjustment may be made by loosening the screw (22) on the slide which moves in a slot in the tone arm strengthener (see Figure 4). Move the slide back and forth until the correct needle pressure is obtained.

MODEL 950

TROUBLE CHART

SYMPTOM	CAUSE	REMEDY
Turntable does not revolve when control is turned to "On."	1. No current at motor.	(a) Check that current is reaching ac leads of changer. (b) Check that switch is closing. (c) Check wiring and soldered terminals in the changer.
	2. Motor defective.	(a) Remove turntable to allow motor to operate without load. If current is reaching motor and drive spindle does not rotate, the motor is defective. Repair or replace.
	3. Motor idler wheel (74) not engaging turntable rim.	If drive spindle is turning but turntable is not: (a) Check motor idler assembly to determine if it is free to contact the drive spindle and turntable rim. (b) Wipe off inside rim of the turntable (2) to remove flock, or if oily, clean the turntable rim and rubber tire of the idler wheel (74) with naphtha.
Changer does not cycle when the control knob is turned to the "Rej."	1. The manual reject not actuating the trip.	(a) Turn the control knob (46) to the reject position, hold and see that the control shaft assembly (88) has moved the trip link (110) to the rear. This should actuate the trip pawl (67) on the main gear (62), which will bring the spur on the trip pawl (67) in contact with the hub gear on the turntable hub. (b) Check for binding of the pawl lever (65), the trip lever assembly (68) and the trip pawl (67). If binding occurs, clean out all foreign matter and check for freedom.
Control knob cannot be turned to "On" position.	1. Machine shut off during cycle.	Turn the turntable clockwise, by hand, until the control knob (46) is free.
Pickup arm strikes records on spindle when it raises, or pickup arm rest when it moves out.	1. Pickup arm height not adjusted properly.	(See instructions for adjusting pickup arm height under "Adjustments.")
Turntable speed too slow	1. Binding in turntable bearing.	Check the turntable bearing for freedom. Hold the motor idler wheel (74) out of engagement with the turntable and spin the turntable, by hand, to see if it turns readily and coasts for a long time. If binding occurs, remove turntable, clean off foreign matter, and lubricate with light mineral oil.
	2. Motor pulley too small in diameter.	Replace the motor pulley with one having a greater diameter.
	3. Line voltage too low.	The line voltage should not be less than 105 volts or the turntable may be too slow.
	4. Operating temperature too low.	If the machine has been stored in a cold place or operated in surroundings at a temperature of less than 60° F., the turntable speed may be too slow.
Turntable speed too fast.	1. Motor pulley too large in diameter.	Replace the pulley with one having a smaller diameter, or grind one or two thousandths off the pulley.
Turntable stalls or slows down during cycle	1. Motor idler not engaging turntable.	(See "Turntable Does Not Revolve When Control Knob Is Turned to 'On' Position.")

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
	2. Turntable bearing tight.	(See "Turntable Does Not Revolve When Control Knob Is Turned to 'On' Position.")
	3. Operating temperature too low.	The line voltage should not be less than 105 volts.
	4. Binding in drive mechanism.	Hold idler (74) away from turntable, or remove idler wheel. Cycle machine by turning turntable slowly by hand. The main gear should turn freely for the complete revolution without binding at any point: (a) If binding occurs, check for foreign matter in the gear teeth, a bent gear bearing, or bent spindle bushing. Straighten or replace. Clean and lubricate.
	5. Binding between pickup arm lift pin (35) and lift pin cam surface on slide and cam assembly (120).	Lift pin should ride freely on cam surface without binding.
	6. Spindle pusher spring compressing too far.	Cycle the changer and watch the relationship between the bottom of the pusher housing and the lower button of the pusher housing. Just before the slide and cam (120) has completed its backward motion, the pusher housing should stop its upward motion and the lower button should continue up .005 to .047" more, slightly compressing the pusher spring. If the spring compresses too much, the changer may stall on the shut-off cycle.
	7. Motor weak.	When everything checks all right, but the changer still stalls in cycle, the motor may be weak.
	8. Grease on idler wheel.	1. Wipe off idler wheel rubber tire; inner rim of turntable and rubber belts with naphtha.
	9. Idler wheel bent and not making positive engagement with drive pulley.	1. Straighten idler, or replace, as necessary.
	10. Turrets unseated from lock ring on turret shaft.	Remove turret and center lock ring. (If lock ring is disturted, replace with new lock ring.) Replace turret and press down to assure turret of being locked to the turret shaft. (Turret will snap into position when properly locked.)
	11. Idler wheel tension spring weak.	Replace spring or bend motor tension spring anchor bracket to give desired tension.
Changer continues to cycle.	Reject mechanism binding.	(a) Make certain the trip link (110) is not frozen in the reject position. (b) Make certain the changer control lever (88) is not binding and that it actuates the trip link (110) when the changer control knob (46) is turned to reject. (c) Check for binding of trip pawl (67), trip lever (68) and pawl lever (65); these must be free to turn easily. (d) Check the changer control linkage (23), (53) and (88).

MODEL 950

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
Noise during playing of record.	1. Motor rumble.	If a low-pitched rumbling sound comes from the loud speaker while a record is being played, check motor grommets to be sure the motor is freely suspended on them. The motor lead wires should have slack to allow the motor to float. Motor rumble may also come from an unbalanced motor rotor; in this case, replace the motor.
	2. Defective turntable bearings (10).	Defective turntable bearings can cause rumble. Check for foreign matter in the bearing, defective balls, binding between balls and ball retainer; rough surface on washers. Clean ball bearing, sleeve bearing, and washers; lubricate with Andok "B" and light mineral oil.
	3. Defective motor idler wheel.	A rapid thumping sound while the motor is running may indicate a flat spot on the motor idler wheel (74). If this condition does not clear up after ten minutes of running time, remove the turntable and check the rubber tire on the idler. If the surface of the rubber tire is not smooth and even, replace the idler. Should the bearing of the idler wheel show signs of excessive wear or be extremely wobbly, the idler wheel should be replaced.
	4. Defective record.	Worn or defective records cause needle scratch and distortion of the recorded sound. If the record is warped, it may slip on the other records causing "Wow" (a waver in the recorded sound). An enlarged hole in the record can also cause "Wow."
	5. Turntable scrapes.	If a scraping sound occurs as the turntable revolves, check: (a) Turntable warped, causing outer rim to rise and fall. (b) Motor idler or mounting plate bent.
	6. Squeaks.	Squeaking sound as changer operates indicates lack of oil. Lubricate points indicated under "Lubrication."
	7. Pulleys on motor not properly seated.	Check that pulleys are properly seated.
	8. 7" lever (81) loose.	Check 7" lever washer (100) and screw (101) to see if they are tight.
Distortion of Recorded Sound.	1. Defective record.	(See "Noise During Playing of Record.")
	2. Defective amplifier.	Check phonograph amplifier and speaker.
	3. Bad cartridge.	Replace. (See "Defective Cartridges.")
No Sound During Playing.	1. Defective cartridge.	Replace. (See "Defective Cartridges.")
	2. Defective wiring.	Check pickup leads for a shorted or open lead.
	3. Defective amplifier.	Check phonograph amplifier and speaker.
	4. Loose cartridge terminal clips.	Remove, squeeze together slightly, and replace.
Excessive Record Wear	1. Binding on pickup arm.	(See "Needle Does Not Track Across Record Properly."
Changer does not shut off after last record has been played	1. Record support binding (1).	The record support must drop below the off-set shoulder of the spindle or the changer will not shut off. (See "Two Records Drop at Once." - 3)

MODEL 950

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
	2. Lever assembly binding (100).	Clean out dirt and make sure this operates smoothly.
	3. Control link broken (112).	Replace.
	4. Spring (115) loose or broken.	Replace.
	5. Shut-off lever binding.	Check lever and if bent, straighten.
Rough pickup arm motion.	1. Horizontal defects.	(a) Check pickup arm return locator (95) for tightness. (b) Check that pickup arm return spring (87) is not weak and is hooked up properly. (c) Check that fiber washer (95A) is installed under pickup arm return locator.
	2. Vertical defects.	(a) Lift pin (35) binding; clean out dirt and lubricate. (b) Slide and cam (120) binds; check bearing points - - clean and lubricate. (c) Burrs in main slot in slide and cam (120) - - remove with fine file. (d) Ejector lever on ejector bracket assembly (117) binding in slide and cam slot: straighten, remove burrs, and lubricate. (e) Pickup arm shaft and sleeve binding: clean and lubricate.
Noise during change cycle.	1. Tines on the forked end of the slide and cam assembly (120) bent.	Replace.
	2. Control lever bent.	Straighten or replace. Check that "C" washer (95) holds.
	3. Lack of lubrication Grinding noise.	Lubricate ejector lever (117) where it contacts lower end of spindle (3).
Control knob does not detent on "33," "45," or "78" positions.	1. Bent parts.	(a) Insure that forked shaped stamping under idler is not catching in detent notch. Straighten or replace motor. (b) Insure that speed control arm (126) and speed control rod (77) are not bent.
Cartridge drags on record.	1. Needle bent.	Replace.
	2. Cartridge mounting screws loose.	Tighten.
Shuts off when last record drops.	1. Shut-off spring (115 and link (112) too short.	Check length of shut-off spring (115) and shut-off link (112) by comparing with another set - - may be too short. Replace.
	2. Shut-off bracket (113) bent.	Straighten or replace.
	3. Shut-off link (112) bent.	Straighten or replace.
	4. Shut-off lever assembly (102) binding.	(a) Check for burrs: remove with fine file. (b) Check for tight bearings: clean and lubricate.

MODEL 950

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
Will not play manually.	1. Trip link (110) bent.	Straighten or replace.
	2. Trip finger cam (105) bent.	Straighten or replace.
Impossible to adjust set-down.	1. Pickup arm shaft and sleeve assembly (43) defective.	Shift the safety plate (39) toward the eccentric set-down adjusting screw (41), and tighten pickup arm shaft and sleeve nut (36). Hold pickup arm against rear stop and push on trip finger cam (105). The safety plate (39) should move away from the set-down adjusting screw (41) and snap back when the trip finger cam (105) is released: if it does not, replace the pickup arm shaft and sleeve assembly (43). Hinge pivot screws may be adjusted favoring one side or the other.
Record does not drop when changer cycles.	1. Spindle pusher shaft and housing assembly (14) broken.	If the pusher shaft (inside the spindle) is broken, the lower end (housing) will drop out of the spindle (7) (see Figure 5). Loosen spindle nut (78) and remove spindle (3). Replace with new spindle unit.
	2. Record pusher (6) in spindle not moving far enough forward to reject a record.	The record pusher should move up inside the spindle body (7), then move forward until it has reached a point flush with, or a maximum of, .010" beyond the spindle body(7). To insure that the record pusher (6) is all the way forward, the lower button on the shaft and housing assembly (14) should be raised high enough by the ejector lever to slightly compress the pusher spring inside the pusher shaft and housing assembly (14). (See "Turntable Stalls During Cycle.") If the spring is compressed and the record pusher (6) does not move far enough forward to eject a record, the spindle (3) should be replaced. If a record is not pushed completely off the ledge, it may hang on the spindle momentarily, then drop on the pickup arm when it moves in over the turntable.
	3. Record pusher (6) raises outside the spindle body (7).	When changer cycles, the record pusher (6) should rise up just inside the spindle body, then move forward inside the center hole in the record. If the record pusher (6) rises outside the spindle body (7), it will raise the record instead of pushing it off the spindle ledge. Remove the spindle (3) and replace with a complete new spindle assembly.
Two records drop at once	1. Hole in record too large.	Check the diameter of the hole in the record. An oversize hole will cause two records to drop at once.
	2. Spindle guide (4) not fully down.	If the spindle guide is not all the way down, more than one record may be dropped at a time. (a) Check the guide to be sure it is free and does not bind at any point. Clean out foreign matter or straighten if necessary. Do not oil. (b) When records are placed on the spindle, be sure the guide is all the way down. The guide will normally raise as a record is being dropped, but it should return to place immediately, by gravity.
	3. Record support (1) binding on spindle, or bent out of square with shaft.	The record support (1) must be able to slide freely, by gravity, down the spindle. If the support does not follow the records down as they are being ejected, two or more records may be ejected at once. If binding occurs: (a) Check the spindle (3) to determine if it is straight. Bend carefully with the fingers, if necessary.

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
		(b) Straighten the record support (1) if it is not square with the record support shaft. (c) When the pin in the record support shaft has just entered the slot in the record support shaft post on the baseplate, the play in the record support (1), as it is swung from side to side, should be equal on both sides of the spindle. To correct bent condition, hold the support shaft and carefully force the record support into proper position. If the support is loose on the shaft, remove the knob and restake with hammer and punch.
	4. Record pusher (6) defective.	The record pusher (6) may be deformed, etc. This may cause two records to drop at once. Replace with new pusher or replace spindle assembly.
	5. Slide play in spindle (3).	Tighten spindle nut (78). If stripped, replace.
Record hits pickup arm	1. Record pusher (6) not moving far enough forward to eject record.	(See "Record Does Not Drop When Changer Cycles" -2.)
	2. Record pusher (6) extending beyond outside diameter of spindle.	Cycle changer, by hand, until pusher shaft and housing assembly (14) is at the top of its travel. Using new record as a gauge, pass it over the spindle to see if it binds at any point. File off high points on record pusher (6), with a fine file, until record will pass freely over spindle.
	3. Pickup arm not adjusted properly.	(See "Adjustments")
Needle does not set down on 10" record in proper position	1. Pickup arm not adjusted properly.	(See "Adjustments") (a) Loose nut (36) on pickup arm shaft and sleeve (43).
	2. Pickup arm shaft and sleeve (43) binding.	File off burrs and rough surfaces. Polish and lubricate shaft.
	3. 7" set-down lever (90) and 12" record selector (42) not operating properly.	Insure that the proper operation and reset of the 7" set-down lever (90) and 12" record selector (42) is not being interfered with.
	4. Needle bent.	Replace with new needle.
	5. Wire spring (83) broken.	12" record selector (42) does not cock: check for broken 12" record selector spring (83).
	6. Bent pickup arm return locator (95).	Straighten or replace.
	7. Bent trip finger cam (105).	Straighten or replace.
Needle does not set down on 12" record in proper position	1. Diameter of 12" record undersize.	The set-down position of the needle for 12" records is determined by the edge of the record striking the 12" record selector (42). If a 12" record has a diameter of less than the standard size of 11-7/8", plus or minus 1/32", it may fail to depress the 12" record selector far enough.
	2. Enlarged center hole in record.	An enlarged center hole might fail to set the 12" record selector because it could produce the same effect as a small record.

MODEL 950

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
	3. Pickup arm not adjusted properly	(See "Adjustments") (a) Loose nut (36) on the pickup arm shaft and sleeve (43). Tighten.
	4. Binding of pickup arm shaft and sleeve (43).	Clean and polish shaft (43), and lubricate with light oil.
	5. Reset lever spring (82) broken.	Replace spring (82).
	6. 12" record selector spring (83) broken.	Replace spring (83).
	7. 12" record selector (42) binding.	The 12" record selector must be free to operate smoothly. Clean out dirt and straighten if bent, or replace.
	8. Bent pickup arm return locator (95).	Straighten or replace.
	9. Bent trip finger cam (105).	Straighten or replace.
Needle does not set down on 7" record properly.	1. 7" set-down lever spring(99) broken or weak.	Replace.
	2. Pickup arm not adjusted properly.	(See "Adjustments") (a) Loose nut (36) on pickup arm shaft on sleeve: tighten.
	3. 7" set-down lever screw (101) loose.	Tighten.
	4. 7" set-down lever (90) hitting frame or baseplate when it goes through hole in frame.	Straighten, or replace.
	5. Reset lever (81) bent.	Replace.
	6. 7" set-down lever (90) does not fall into opening in main gear.	Replace.
	7. Bent pickup arm return locator (95).	Straighten, or replace.
	8. Bent trip finger cam (105).	Straighten, or replace.
Changer does not cycle when record has been played.	1. No finishing trip groove on record.	Check record for eccentric trip groove in center of record. Some old records and home recordings do not have this eccentric trip groove.
	2. Needle jumps out of grooves in record.	(a) Check trip pressure: the lateral pressure should not exceed 3 grams. (If pressure is excessive, see "Changer Trips Before Needle Reaches End of Record.") (b) The record may be defective: the finishing groove is often too shallow. Check with a record that is known to be good.

TROUBLE CHART - Cont.

SYMPTOM	CAUSE	REMEDY
		(c) The needle point may be damaged or affected by an excessive accumulation of dust, lint, etc.: check needle pressure as described under "Adjustments."
		(d) There may be binding in the pickup arm shaft and sleeve assembly (43) or between the pickup arm return locator (95) and the trip finger cam (105): see "Needle Does Not Track Properly Across Record.")
	3. Trip pawl (67) binding on gear face.	The trip pawl must be free to move forward and engage the boss on the turntable hub when the trip lever releases it. Check for burrs or foreign matter lodged between the trip pawl (67) and main gear (62). Do not oil as this might collect dirt and gum up the pawl.
	4. Trip finger cam (105) bent.	Straighten, or replace.
	5. Trip link (110) bent.	Straighten, or replace.
Changer trips before needle reaches end of record.	1. Hole in record too large.	If the hole in the record is too large, the groove may turn eccentric with the spindle and cause premature tripping.
	2. Binding of trip link (110).	With the trip link released, check the trip link for freedom of motion. It should be free to move without binding.
Needle does not track across record properly.	1. Needle may be clogged by accumulation of lint, dirt, etc., or worn.	(a) Clean foreign material from around needle (105).
		(b) Check needle to see if the tip is bent or broken. Replace, if necessary. (Refer to paragraph on "Damaged Needle.")
	2. Trip finger cam (105) does not disengage from the pickup arm return locator (95) when cycle is completed.	There should be a 1/32" gap between the trip finger cam (105) and the pickup arm return locator (95) when the machine is not in cycle. If the gap is small enough to allow the parts to touch and bind as the needle moves across the record, the compression spring washer (97) may be weak or broken. Replace.
	3. Check the bearing in the pickup arm post for binding.	(a) Check pickup arm return locator (76) and trip finger cam (80) for binding. (See 2 above.)
	4. Changer not level.	(See "Leveling Record Changer During Long Play" under "Preparation for Operation.")
	5. Pickup leads too tight.	Give the pickup leads enough slack to allow the tone arm to move freely across a record.

CARTRIDGES

1. Damaged Cartridge (Astatic LQD)

To remove the cartridge, proceed as follows:

(a) Rotate the cartridge so the cartridge mounting screw (28) is facing downward.

(b) Loosen the set screw (26) and remove the cartridge control knob (27).

(c) Carefully pull the cartridge lead up from the rear section of the arm until adequate slack is obtained.

(d) Remove the cartridge mounting screw (28).

(e) Disconnect the pickup leads and remove cartridge.

(f) Replace cartridge and connect pickup leads.

(g) Secure pickup cartridge to mounting bracket (18).

(h) Replace the cartridge control knob (27) and tighten set screw (26).

(i) Push excess pickup lead into rear section of pickup arm.

Damaged Needle (Astatic LQD)

(a) Rotate cartridge control knob to correspond with needle to be removed.

(b) The needle may now be removed by pulling it straight out of its mounting.

(c) In replacing the new needle, make sure that the colored needle is used on the side of the pickup cartridge having the corresponding color spot.

2. Damaged Cartridge (Shure P-81)

(a) Disconnect the pickup leads.

(b) Loosen the two cartridge mounting screws and remove cartridge.

(c) Replace cartridge and connect leads.

Damaged Needle (Shure P-81)

(a) Loosen knurled thumb nut that secures needle to the cartridge.

(b) Carefully remove needle and replace with a new needle of the same part number.

CAUTION: The replacement needle will have to be adjusted, before it is tightened in the pickup cartridge, to assure that the needle shank is securely held by the knurled thumb nut. Do not use pliers on knurled thumb nut. Tighten with fingers only.

3. Damaged Cartridge (Shure P-77)

(a) Rotate the cartridge so the cartridge mounting screws may be loosened.

(b) Remove the cartridge control knob (27).

(c) Carefully pull the cartridge lead up from the rear section of the arm until adequate slack is obtained.

(d) Disconnect the leads and remove the cartridge.

(e) Replace the cartridge and connect the pickup leads.

(f) Secure the cartridge to the mounting bracket (strengthener) (29).

(g) Push excess pickup lead into rear section of pickup arm and re-install plastic cartridge control lever.

Damaged Needle (Shure P-77)

(a) Rotate the cartridge control knob to the position corresponding to the type needle to be replaced.

(b) Loosen the knurled thumb nut that secures needle to the cartridge.

(c) Carefully remove needle and replace with a new needle of the same part number.

CAUTION: Make sure that the colored needle is used on the side of the pickup cartridge having the corresponding color spot. The replacement needle will have to be adjusted, before it is tightened in the pickup cartridge, to assure that the needle shank is securely held by the knurled thumb nut. Do not use pliers on knurled thumb nut. Tighten with fingers only.

ASTATIC CARTRIDGES

2753	Cartridge, Astatic LQD-1M complete
2754	Osmium one mil needle
2755	Osmium three mil needle
3137	Cartridge, Astatic LQD-1JM complete
2755	Osmium three mil needle
3135	Sapphire one mil needle
3168	Cartridge, Astatic LQD-1J complete
3135	Sapphire one mil needle
3136	Sapphire three mil needle
2816	Cartridge, Astatic LQD-1M not grounded complete
2754	Osmium one mil needle
2755	Osmium three mil needle
2876	Cartridge, Astatic CQ complete
3521	Sapphire one mil needle
2500	Cartridge, Astatic CQ ungrounded complete
3709	Sapphire one and one-half mil needle
3560	Cartridge, Astatic GCAG complete
3561	Osmium truncated needle
3547	Cartridge, Astatic GCAG complete
3559	Sapphire truncated needle

SHURE BROTHERS CARTRIDGES

2606	Cartridge, Shure Brothers, P-77 complete
2628	Osmium one mil needle
2629	Osmium three mil needle
3063	Cartridge, Shure Bros., 79-V complete
2629	Osmium three mil needle
3120	Sapphire one mil needle
3182	Cartridge, Shure Bros., P-76-A complete
3119	Sapphire three mil needle
3120	Sapphire one mil needle
3366	Cartridge, Shure Bros., P-71-A complete
3367	Sapphire Unipoint needle
3368	Cartridge, Shure Bros., P-37-C complete
3369	Osmium Unipoint Needle
3373	Cartridge, Shure Bros., P-81 complete
3374	Osmium Unipoint needle

3411 Cartridge, Shure Bros., P-81 complete
3412 Sapphire Unipoint needle
3415 Cartridge, Shure Bros., P-81-C complete
3369 Osmium two mil needle
3455 Cartridge, Shure Bros., P-76-AF complete
3120 Sapphire one mil needle
2629 Osmium three mil needle

3442 Cartridge, Shure Bros., P-72-V complete
2628 Osmium one mil needle
2629 Osmium three mil needle
3553 Cartridge, Shure Bros., P-37-D complete
3567 Osmium Unipoint needle
3579 Cartridge, Shure Bros., P-37-A complete
3412 Sapphire Unipoint needle

3691 Cartridge, Shure Bros., P-76-A complete
2628 Osmium one mil needle
2629 Osmium three mil needle
3719 Cartridge, Shure Bros., P-81-A complete
3720 Osmium 2.3 mil needle

WEBSTER CARTRIDGES

2197 Cartridge, Webster F-14-2 complete
2630 Duo Needle, Osmium tip
3239 Cartridge, Webster A-1 complete
3292 Sapphire one mil needle
3293 Sapphire three mil needle
3399 Cartridge, Webster A-1M complete
3400 Osmium one mil needle
3401 Osmium three mil needle
3555 Cartridge, Webster A-1M-Z complete
3292 Sapphire one mil needle
3401 Osmium three mil needle

PARTS LIST

Ref. No.	Part No.	Description
1	2908-A	Record Support Assembly - Consists of
1A		3286-P Plastic Button
1B		2902-J Record Support Arm
1C		2530 Record Support Rod
2	2528-A	Turntable and Hub Assembly
3	2576	Spindle and Bearing Assembly - Consists of
		2536 Spindle Assembly less Ball Race and Washers
4		2128 Spindle Guide
5		1535 Pin for Spindle Guide
6		1529 Record Pusher
7		2537 Spindle Body and Base Assembly
8		2078 Retaining Ring
9		2639 Bearing Washer
10		2624 Bearing (Ball Race)
11		2639 Bearing Washer
12		1527 Pusher Spring
13		2552 Pusher Shaft Spring
14		2539 Pusher Shaft and Housing Assembly
15	2310	Hinge Pivot Screw
16	2503-B	Plastic Tone Arm
17	2508	Hinge Spring
18	2945	Strengthener and Bracket Assembly
19	2275	Strengthener Screw #4 x 1/4" Thread Cutting
20	2255	Lock Spring
21	2912	Lift Screw
22	2449	Screw for Slide 6-32 x 1/8"
23	2934	Adjusting Slide
24	2275	Strengthener Screw #4 x 1/4" Thread Cutting
25	2753	Cartridge "Astatic LQD" (Also see Cartridge Breakdown)
26	2370	Cartridge Control Knob Screw
27	2860-G	Cartridge Control Knob
28	2817	Lockwasher and Screw-Cartridge Mounting
29	2509	Strengthener and Bracket Assembly
30	3691	Cartridge "Shure P-76V" (Also see Breakdown on Cartridges)
31	2542-B	Plastic Tone Arm Assembly Only
32	2917	Strengthener and Bracket Assembly
33	3373	Cartridge "Shure P-81" (Also see Cartridge Breakdown)
34	2904	Cartridge Mounting Screw
35	2220	Lift Pin
36	1975	Pal Nut
37	2247	Safety Spring

Ref. No.	Part No.	Description
38	2937	Washer 1/4 I.D. x 1/2 O. D. x 1/16"
39	2249	Safety Plate
40	2294	Hinge Assembly
	2933	Hinge Pin
	2505	Hinge Bracket Only
41	2269	Eccentric Set-Down Adjustment Screw (Part of Item 40)
41-A	2926	Speed Nut
42	2957	12" Record Selector
43	2921	Tone Arm Shaft and Sleeve
43-A	2952	Fiber Washer
44	409	Screw 10-24x5/16" - Casting Hold-down and Lockwasher
45	2558-G	Tone-Arm Rest Post
46	2907	Reject Knob
47	1651	"C" Washer - Switch Control
48	2906-G	Speed Control Knob
49	2594	"C" Washer - Switch Control
50	2593	Control Shaft Bearing
51	2523	Base Plate
52	1588	"C" Washer - 12" Record Selector
53	2600	Shut-off Rod
54	2442	Trip Spring - Control Link
55	1721	Reject Spring - Shut-off Rod
56	2221	Fiber Washer - Main Gear Assembly
57	1719	"C" Washer - Main Gear Assembly
58	2525	Die-Cast Frame
59	2077	Shipping Bolt
60	2918	Plastic Support Leg
61	2110	"C" Washer - Record Support Assembly
62	2575	Main Gear Assembly - Consists of:
		2512 Gear Only
63		1588 "C" Washer - Trip Lever Assembly
64		2829 Fiber Washer - Trip Lever Assembly
65		2940 Pawl Lever
66		2516 Spring Washer - Trip Lever Assembly
67		2939 Trip Pawl
68		2569 Trip Lever Assembly
69		2943 Rivet for Pawl Lever
70		2977 Roller
71		2227 Rivet for Roller
72	3361	Hairpin Clip - Idler Wheel
73	2583	Fiber Washer - Idler Wheel
74	3353	Idler Wheel
75	2727	Gen. Ind. 2-belt Motor 110 Volt 60 Cycle

MODEL 950

PARTS LIST - Cont.

Ref. No.	Part No.	Description
	2772	Idler Wheel
	2773	Mounting Grommet
	2765	Lever Grommet
	2797	Belt
	3088	Idler Spring
	3089	Pulley 45 RPM
	3090	Pulley 33-1/3 RPM
	3294	Hairpin Clip-Idler
	3295	Fibre Washer-Idler
	3355	Felt Washer-Pulley
		Note: Above parts may also be used to service:
	3321	Motor (110 Volt 50 Cycle)
	3322	Motor (220 Volt 50 Cycle)
	3129	General Industries Turret Motor 110 Volt 60 Cycles
	3139	Pulley 78 RPM
	3140	Pulley 45 RPM
	3141	Pulley 33-1/3 RPM
	2772	Idler Wheel
	2773	Mounting Grommet
	2765	Lever Grommet
	3088	Idler Spring
	3294	Hairpin Clip-Idler
	3295	Fibre Washer-Idler
	3355	Felt Washer-Pulley
		Note: Above parts may also be used to service:
	3395	Motor (110 Volt 50 Cycle)
	3396	Motor (220 Volt 50 Cycle)
	3211	Russel Turret Motor 110 Volt 60 Cycle
	3353	Idler Wheel
	3354	Pulley 33-1/3 RPM
	3356	Pulley 45 RPM
	3357	Pulley 78 RPM
	3358	Idler Arm & Pivot Assembly
	3359	Idler Arm Link
	3360	Idler Spring
	3361	Hairpin Clip Idler
	2638	Mounting Grommet
	3362	Felt Washer-Pulley
	3363	Fibre Washer-Idler
	2765	Lever Grommet
		Note: Above parts may also be used to service:
	3393	Motor (110 Volt 50 Cycle)
	3394	Motor (220 Volt 50 Cycle)
	3338	Alliance Turret Motor 110 Volt 60 Cycle
	3481	Idler Wheel
	3489	Mounting Grommet
	3487	Idler Spring
	3484	Pulley 78 RPM
	3483	Pulley 45 RPM
	3482	Pulley 33-1/3 RPM
	3488	"C" Washer for Idler Wheel
	3493	Fibre Washer for Idler Wheel
	3492	Fibre Washer for Pulleys
	3490	Felt Washer for Pulley
	3491	Felt Washer for Idler Wheel
		Note: Above Parts may also be used to service:
	3478	Alliance Turret Motor 110 Volt 50 Cycle
	3498	Alliance Turret Motor 220 Volt 50 Cycle
76	1685	Motor Fastener
77	2942	Motor Speed Control Rod
78	2208	Pal Nut for Spindle
79	2087	Screw 6/32 x 1/4" Reset Lever
80	492	Washer - Flat Steel-Reset Lever
81	2560	Reset Lever
82	2925	Spring - Reset Lever
83	2563	Spring - 12" Record Selector
83-A	1720	Speed Nut - Spring - 12" Record Selector
84	409	Screw 1-/24 x 5/16 and Lockwasher
85	2951	Terminal Strip
86	2087	Screw 6/32 x 1/4
87	2574	Return Spring-Pickup Arm
88	2284	Control Shaft Assembly
88-A	1652	"C" Washer for Item 88
89	2580	Rubber Bumper
90	2581	7" Set-down Lever
91	467	Switch
92	2931	Fiber Insulating Strip
93	2573	Switch Cover
94	1720	Speed Nut - Switch Cover Hold-down
95	2561	Locator Plate - Tone-Arm Return
95-A	2266	Fiber Washer
96	2271	Retaining Ring - Locator Plate
97	2953	Spring Washer
98	2585	Spring Shut-Off Lever
99	2579	Spring - 7" Set-down Lever
100	492	Washer - Flat Steel - 7" Set-down Lever
101	2087	Screw 6/32 x 1/4" - 7" Set-down Lever
102	2591	Lever Assembly - Shut-off
103	1587	Lever Assembly Bearing
104	2932	Screw 4/40 Hex Head
105	2520	Trip Finger Cam
106	1975	Pal Nut
107	2262	Conical Lift Pin Spring
108	1588	"C" Washer - Lift Pin Spring
109	1588	"C" Washer - Slide Retainer
110	2958	Trip Link
111	2245	Rivet-Trip Link
112	2935	Control Link
113	2586	Shut-off Bracket Assembly
114	2053	Screw 6 x 5/16
115	2978	Shut-off Spring
116	409	Screw 10/24 x 5/16 and Lockwasher
117	2571	Ejector Link Assembly
118	2274	Flat Washer
119	2087	Screw 6/32 x 1/4 Slide and Cam Assembly
120	2288	Slide and Cam Assembly
121	2211	Slide Bearing
122	2246	Spring - Slide Bearing
123	2208	Pal Nut
124	2909	Washer
125	2597	Control Shaft Assembly - Motor
126	2765	Rubber Grommet
127	2910	Compression Spring
128	2599	Switch Control Lever Assembly
129	2087	Screw 6/32 x 1/2"

GENERAL INFORMATION

THE MODEL 950 SERVICE MANUAL (V-M FORM 2544) MAY BE USED IN THE SERVICING OF ALL MODEL 950 TRI-O-MATIC RECORD CHANGERS, EVEN THOSE PRODUCED AFTER OCTOBER 15th, 1950 AT WHICH TIME MANY PRODUCTION CHANGES WENT INTO EFFECT. These changes are outlined in the following paragraphs and should be noted, as it is of the utmost importance when ordering replacement parts.

You will find that most of the new items are interchangeable with those used in earlier models with the exception of the shut-off lever (item 126) V-M part 2591. Should it become necessary to replace this item, the slide and cam assembly (item 120) V-M part 2288 should also be replaced and vice versa with the later design. (Refer to parts list in this supplementary manual).

The last record shut off mechanism has been altered slightly and functions as follows: When the last record is dropped to the turntable the record support arm also slides downward contacting the shut off bracket assembly. This, in turn, pivots the shut off lever (126) through the media of spring (131) and connecting shut off wire. However, the full pivot of the shut off lever (126) is blocked by the escape lever (130A) of the slide on cam assembly (130), which has moved in under the shut off lever. This prevents the changer from shutting off. As the changer completes the change cycle, the shut off lever (126) slides off the escape lever (130A) and drops into the slot of the cam and slide assembly (130). When the last record has been played, the change cycle starts again, however, this time, as the pickup arm moves outward, the way is clear for the shut off lever (126) to raise to the shut off position, thus causing the mechanism to shut off upon completing the change cycle (see "Change Cycle" in the V-M 950 Manual, Form No. 2544, for complete description of the shut off mech.).

MODEL 950

REASONS FOR ADDITIONS AND CHANGES
To The Record Changer Mechanism

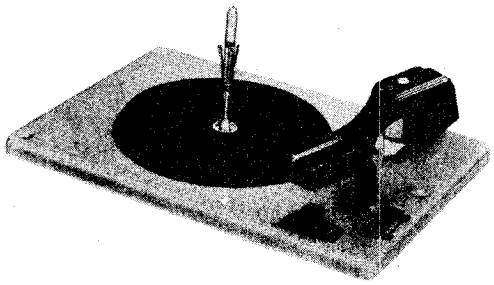
REF. NO.	PART NO.	DESCRIPTION	REASON
115	3602	Hinge Button Bearing	This hinge button bearing replaces the 2310 pivot screw in order to maintain better control over the vertical friction of the tone arm.
116	3887	Jam Nut	This jam nut replaces the 1975 palnut inasmuch as the palnut had tendancy to strip the threads of the brass housing in which the tone arm lift pin rides.
117	3888	Lock Washer	This lockwasher replaces the 2937 flat washer inasmuch as a locking device was needed to secure the 2887 jam nut into position. No lockwasher was needed with the 1975 palnut as the palnut was self-locking.
118	4088	Brace for Base Plate	This brace was added to the baseplate in order to straighten the well in which the turntable rides to prevent turntable scraping and also to prevent bending of the baseplate while in transit.
119	2546	Record Support Hold-down Spring	This spring was added shortly after the beginning of the 950 production in order to facilitate the shut off after the last record had been played.
120	2110	"C" Washer for Record Support	This "C" Washer was omitted from the original exploded view of the Model 950 and it was felt necessary to show it on this drawing.
121	4172	Spring for Trip Lever Assembly	This spring replaces the 2516 spring washer in order to maintain a more uniform friction within the trip lever assembly.
122	1736	Motor Mtg. "C" Washer	This "C" Washer was adapted for motor mounting purposes inasmuch as the original snap fastener proved to be unsatisfactory.
123	3915	Slide Support	This support was added to the mechanism to stabalize the slide and cam assembly during the change cycle.
124	2932	4-40 Hex Hd. Screw	This screw is used to secure the #3915 slide support in position.
125	3901	Reject Spring	This spring replaces the 1721 reject spring and tends to give better return action on the reject rod assembly.
126	4013	Shut Off Lever Assembly	This replaces the 2591 shut off lever assembly which consisted of two separate items and will also serve to simplify and improve upon the last record shut off.
127	2579	Shut Off Lever Spring	This replaces the 2585 shut off lever spring inasmuch as the 2585 spring did not have the proper tension for the new shut off lever.
128	3916	Tinnerman Nut	This Tinnerman nut replaces the 2932 self tapping screw on some models due to a change in the die cast subframe.
129	2585	Escape Lever Spring	This spring was necessary to help actuate item 130A which is an escape lever located on the main slide and cam assembly.
130	4014	Slide and Cam Assembly	This replaces the 2288 slide and cam assembly inasmuch as the earlier assembly did not carry the escape lever and spring for the shut off mechanism.
131	4016	Shut off Spring	This spring replaces the 2978 shut off spring inasmuch as the 2978 spring did not have the proper tension when used with the new shut off mechanism.

Most of the changes which have taken place on the Model 950 Tri-O-Matic record changer were so done to improve upon the product and from time to time we will incorporate more changes either to simplify or improve upon the mechanism.

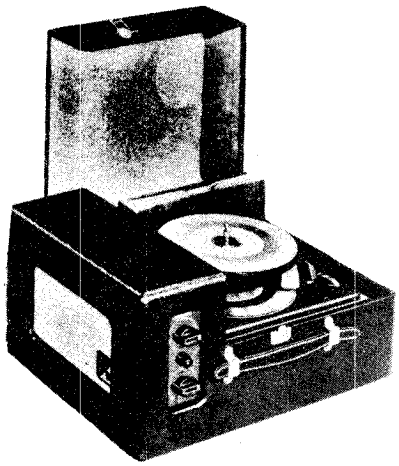
PARTS LIST V-M 950

REF. NO.	PART NO.	DESCRIPTION	REPLACES
115	3602	Hinge Button Bearing	2310 Pivot Screw
116	3887	Jam Nut	1975 Palnut
117	3888	Lock Washer	2937 Flat Washer
118	4088	Brace for Base Plate	Addition to Mech.
119	2546	Record Support Holddown Spring	Addition to Mech.
120	2110	"C" Washer for Record Support	Addition to Mech.
121	4172	Spring for Trip Lever Assembly	2516 Spring Washer
122	1736	"C" Washer-Motor Mounting	Addition to Mech.
123	3915	Slide Support	Addition to Mech.
124	2932	Screw 4-40 Hex Hd.	Addition to Mech.
125	3901	Reject Spring	1721 Reject Spring
126	4013	Shut-Off Lever Assembly	2591 Shut Off Lever Assembly
127	2579	Shut Off Lever Spring	2585 Shut Off Lever Spring
128	3916	Tinnerman Nut	2932 Screw
129	2585	Escape Lever Spring	Addition to Mech.
130	4014	Slide and Cam Assembly	2288 Slide and Cam Assembly
130A	4005	Escape Lever (Part of item 130)	Addition to Mech.
131	4016	Shut Off Spring	2978 Shut Off Spring

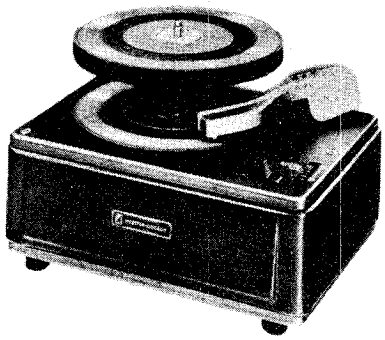
MODELS 77,
755, 760, 762



MODEL 77



MODEL 762



MODEL 755

MODEL 760

DESCRIPTION

The Webster-Chicago Model 77 basic mechanism is a two speed, automatic record changer. Simple in design and operation, it will automatically play up to eight 7" records of either 33⅓ or 45 rpm.

The 1½" center hole records are played on the Model 77 by inserting an RS-46 center hole adapter in the record. An important feature of the RS-46 adapter is its weight. The adapters are metal and the added weight is just enough to prevent the records from slipping.

Model 77 repeats the last record of a stack until the Speed Selector wheel is turned to the center or OFF position. The idler wheel is pulled away from the motor shaft when the control is at OFF, preventing flat spots on the rubber idler which would cause wow and rumble.

Model 77 features the Webster-Chicago Velocity Trip which guarantees fast record change regardless of the position of the trip grooves or the speed with which they move the pickup arm toward the center of the record. The Velocity Trip also eliminates lateral pressure against the delicate sides of the record grooves that would be present if "lead in" springs were used. This lack of lateral pressure is considered to be as important as extra-light vertical pressure or needle weight.

Model 760 is a Model 77 mechanism combined with an amplifier and speaker in a beautiful plastic case to form a complete table model automatic phonograph.

Model 755 is a Model 77 mechanism mounted on an attractive, convenient, metal base. Model 755 is usually connected to the phono input of a radio receiver. A switch is provided to conveniently play either the 10-inch and 12-inch changer in the radio-phono combination or the Model 755.

Model 762 is a Model 77 mounted in an attractive burgundy leatherette carrying case, together with an amplifier and speaker, to make a fine portable phonograph.

These service instructions apply to the changer mechanism of all models. The circuit diagrams for the phonograph models are included in the operating instructions included with each unit.

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PICKUP CARTRIDGE

The pickup cartridge may be of the crystal or ceramic type. Replacement cartridges and needles are available from most radio parts distributors and should be ordered by the manufacturerers name and part number printed on the cartridge. If a substitute cartridge is used, it may be necessary to use a different needle pressure adjusting weight to maintain the correct needle pressure of approximately 5 grams. When ordering the removable weight, specify the cartridge to be used.

A. C. CONNECTIONS

Connect the motor cord to a source of 105-115 volt 60 cycle current only. Do not under any circumstances connect the motor to a Direct Current plug (DC) or alternating current of any other frequency.

To Play Records — See Operating Instructions supplied with the changer or phonograph.

SERVICE NOTES

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

Service parts are available from your Webster-Chicago distributor. All parts must be ordered by piece part number and also record changer model and production number, stamped on the under side of the main plate.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the photographs on page 7).

THE AUTOMATIC TRIP FAILS TO FUNCTION

Model 77 uses a Velocity trip mechanism in order to reduce "non play" time to a minimum, in other words to secure a fast change cycle.

As indicated in Fig. 1 when the pickup arm (4) moves toward the center of the record the weight (7) and the felt washer (7B) cause the Velocity trip arm (7A) to move with it. The arm in turn pushes the tail end (11A) of pawl (11). Each time the hub "H" of the turntable rotates, the cam shaped lug "S" pushes the pawl (11) to the "restore" position. This prevents the pawl engaging the lug "L" to start the change cycle. Whenever the pawl (11) is pushed quickly, it engages the lug "L" before the cam can push it back and the mechanism goes through its change cycle. The quick push is provided by the pickup arm when it follows the "velocity" grooves in the center of the record.

If the automatic trip fails to function, check for:

1. Bent "pawl tail" (11A) or bent arm (7A).
2. No trip groove on records.
3. Arm (7A) binding and not following the movement of the pickup arm.
4. Pawl may be dirty and sticky. Remove and clean.
5. The Arm (7A) and the weight (7) should be free to move back slightly each time the cam "S" resets the pawl (11), as explained in the discussion of the Velocity Trip above. Clean the felt and arm with Carbon Tetrachloride or similar cleaning agent.

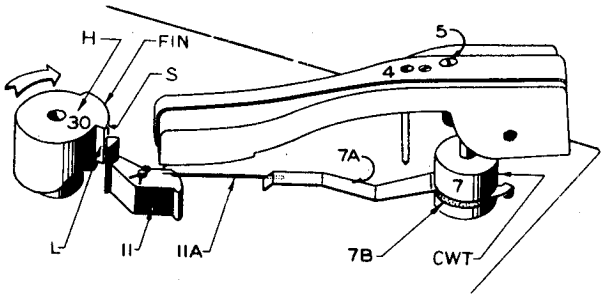

Fig. 1

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the motion of the lever (10) Fig. 2 as the cam follower pin "P" follows the up and down contour of the cam in the bottom of the turntable. Adjustment of the vertical lift of the pickup arm can be made by means of the pickup arm post (6A) Fig. 2.

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NEEDLE SET DOWN POINT INCORRECT

The pickup arm should set the needle down just inside the "lead in groove" of the record.

The horizontal movement of the pickup arm, like its vertical movement, is controlled by the motion

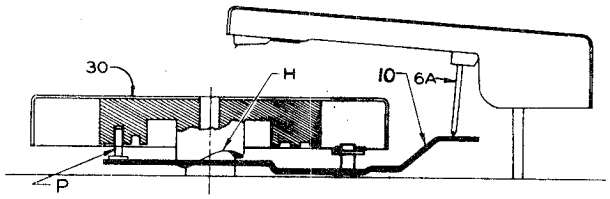


Fig. 2

of the lever (10) Fig. 2. As the cam follower pin "P" follows the eccentric grooves on the under side of the turntable, the pickup arm post (6A) is moved forward and back to permit the next record of the stack to drop.

Any final adjustment of the movement of the arm is made by means of the eccentric screw driver slot "E" Fig. 3.

1. Loosen the pickup arm mounting screw (5) slightly. This screw is the anchor post for the eccentric adjustment lever.
2. Insert a screw driver in the slot "E" and move the arm in or out, slightly, as required.
3. Tighten the mounting screw (5), being careful to not change the set down adjustment setting.

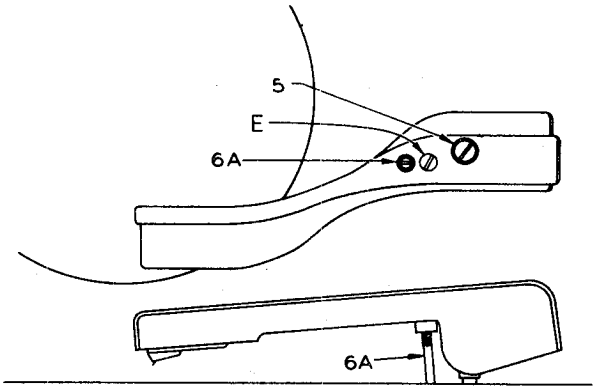
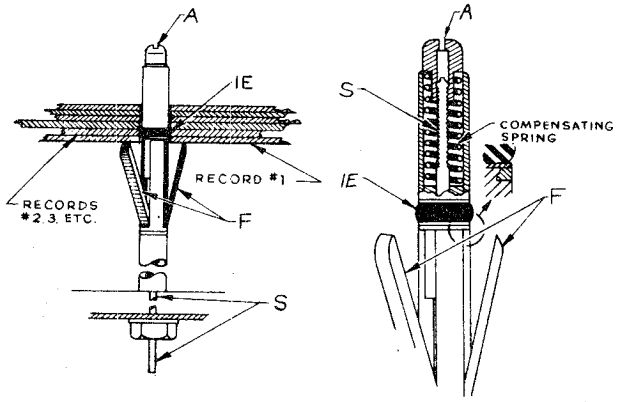


Fig. 3

MORE THAN ONE RECORD IS DROPPED DURING A CHANGE CYCLE

The three fingers of the center post support the unplayed stack of records and drops them one at a time, onto the turntable.

In operation the sequence of functions consists of the following. Referring to Fig. 4, the actuating wire "S" is pulled downward part way at the start of the change cycle. This expands the rubber



Figs. 4 and 5

collar (1E) which suspends the second and remaining records, while the bottom record No. 1, lowers slightly to provide air separation between Nos. 1 and 2 records, breaking the partial vacuum between the two records. The 3 fingers "F" meanwhile have closed slightly, although remaining in the expanded position. As the change cycle proceeds to the point where the tone arm is swung to one side ready for the dropping of the next record, a further downward pull on wire "S" retracts the fingers "F", permitting the record to drop, as shown in Fig. 6.

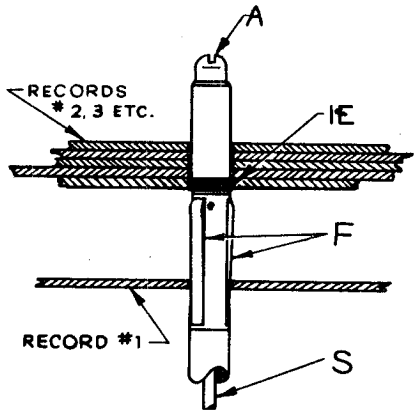


Fig. 6

If the expansion rubber does not hold the stack of records up, adjust the bulge by means of the screwdriver adjustment "A". To do this:

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1. Do not turn the power on.
2. Trip the reject button and turn the turntable clockwise by hand until the three fingers are fully closed.
3. With a screwdriver turn the adjusting screw "A" until the rubber expansion ring (1E) expands sufficiently to support a stack of records.
4. Turn the turntable on through the change cycle and see if the expansion rubber is entirely free when the change mechanism is in the neutral or rest position. It should be possible to move the top of the spindle shaft up and down slightly.
5. Put a stack of records on the spindle and make certain that the expansion rubber is correctly adjusted.

Important Note: Any grease or oil on the expansion rubber will make it slick and the records will not be held up. Remove any grease or oil with Carbon Tetrachloride.

WILL NOT DROP RECORDS

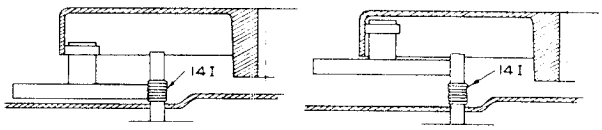
Check for:

1. Foreign matter, dust, etc. inside the spindle to prevent the fingers from closing fully and at the same time.
2. Bent or broken spindle finger.
3. Insufficient pull on wire "S" inside spindle. To adjust, be certain the set screw holding the nut (27), Fig. 14, is tight. Loosen the set screw in nut (28). Trip the mechanism and turn the turntable until the fingers close as much as possible. Back off nut (28) until the fingers are loose, then retighten until the fingers are just closed into the shaft. Notice the position of any one of the flat sides of nut (28) and tighten the nut 3 or more "flats". Tighten the set screw.

   If the mechanism stalls in cycle and all other adjustments are correct, loosen the set screw and back off the nut one or two "flats"

STALLS IN CYCLE

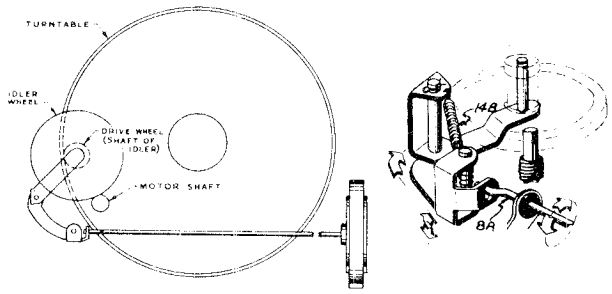
1. Tap the motor to seat the self aligning bearings more perfectly.
2. On early models the sleeve (14I) was placed at the top of the motor shaft, not as Figs. 7 and 8. If the bushing is at the top of the shaft, force it on down to the position indicated. The speed selector wheel will then be calibrated wrong so it would be well to replace it.



Figs. 7 and 8

TURNTABLE TURNS AT 45 R.P.M. AT EITHER SPEED SETTING

The power from the motor is transmitted to the turntable by means of a compound diameter idler as illustrated in Fig. 9. The turntable speed is changed by shifting the idler up or down to contact the motor shaft or the shaft sleeve as shown in Fig. 10.



Figs. 9 and 10

If the motor shaft sleeve (14I) is too high on the shaft, the idler will contact it in either speed control position. Gently force the sleeve down on the shaft until the idler just clears it when in the 45 rpm position.

TO REMOVE TOP COVER FROM MODEL 760

Fig. 12 shows a Model 77 basic mechanism with the top cover removed for easy access to the mechanism. Fig. 12 also shows how the mechanism will look after the Model 760 has been removed from its cabinet. The top cover or the cabinet must be removed in order to make some of the adjustments or repairs mentioned in the Service Notes. To do this:

1. Remove pickup arm mounting screw (5), remove the pickup cord terminal clips from the pickup cartridge, remove the anchor spring (through which the leads are threaded) from the pickup arm, note the routing of the pickup leads as you pull them out of the arm through the hinges.

2. Use a #6 Bristol wrench to loosen the pickup arm mounting assembly screws (6F) and remove the mounting assembly (6). Lift off the Reject button (19) and felt washer.
3. Remove the 6 mounting screws "A" indicated in Fig. 12. (Caution: Remove only these screws — No others at this point.)

   Lift the cabinet off the mechanism and amplifier.

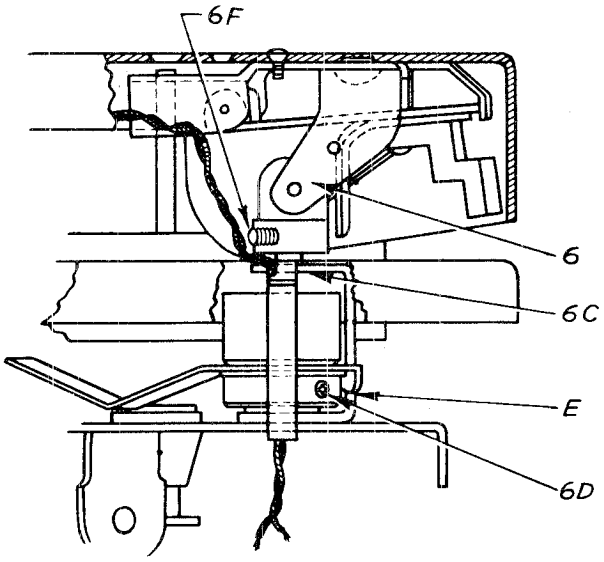


Fig. 11

TO REMOVE THE AMPLIFIER

1. Remove the dial knobs by pulling them straight out, remove the mounting nuts holding the volume and tone controls in place, remove the 4 mounting screws "B" Fig. 12. Save the heavy cardboard spacers.

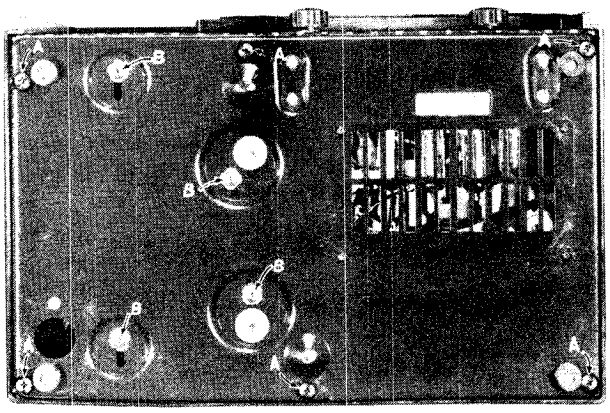


Fig. 12

2. Unplug the leads connecting the amplifier and changer mechanism. Lift the amplifier out of the chassis.

To reassemble Amplifier to Phonograph, put together in reverse order to the above disassembly instructions. Be certain to place the heavy cardboard spacer in position.

TO REASSEMBLE TOP COVER TO MECHANISM AND PICKUP ARM TO MECHANISM

It is imperative that the following steps be followed in the order listed. Failure to do so may result in difficulty in making the necessary final adjustments for needle set down point positioning.

1. Place the cabinet over the mechanism, etc. and fasten in place with the 6 mounting screws. (Fig. 12.)
2. Trip the mechanism and turn the turntable by hand until the pickup arm raising lever (10) is at the extreme limit of its outward movement (the fingers of the spindle will be fully closed into the spindle at this point). Force the mounting post (6C) Fig. 11 to turn until the extended set screw (6D) is firmly against the bracket at point "E". The ear of the velocity trip arm will of course be carried with the set screw.

   Hold the mounting post in this position by means of the pickup leads while the pickup arm mounting assembly (6) is placed in position and tightened. BEFORE TIGHTENING the set screws, position the mechanism (6) carefully so the pickup arm height adjusting pin (6A) is exactly in the shallow groove on the pickup arm actuating assembly (10). Failure to adjust this properly will result in an incorrect needle set down point on the record. It may be advisable to just lightly tighten the set screw (6F) and check the needle set down adjustment. Tighten them securely if the adjustment is correct.

   Be very careful to not tighten the set screws too firmly in the wrong place, forming dents in the mounting post that will prevent a correct adjustment.
3. Attach the pickup arm (4) to the hinge and mounting assembly (6) by means of set screw (5).

MODELS 77,
755, 760, 762

4. Make any final needle set down adjustment by means of the screw driver slot (E) as explained on page 3.

   If you should get a false needle set down point, remove the mounting screw (5) and the pickup arm, then bend the bottom ear of the bracket holding the pickup arm height adjusting pin (6A) until the point of the pin (6A) fits exactly in the groove of the actuating assembly (10). Be careful not to bend the rest of the pickup arm mounting assembly. Remount the pickup arm and recheck the adjustment of the screw driver adjustment "E".

TO REMOVE TOP COVER FROM MODELS 77, 755 AND 762

1. Remove the mechanism from the cabinet or base pan.
2. Remove pickup arm mounting screw (5), remove the pickup cord terminal clips from the pickup cartridge, remove the anchor spring (through which the leads are threaded) from the pickup arm, note the routing of the pickup leads as you pull them out of the arm through the hinge.
3. Use a #6 Bristol wrench to loosen the pickup arm mounting assembly screws (6F) and remove the mounting assembly (6) from the mounting post (6C). Lift off the Reject button (19) and felt washer.
4. Remove the 3 nuts from the mounting studs and lift the top cover from the mechanism.

TO REASSEMBLE THE TOP COVER TO THE MODELS 77, 755 AND 762

1. Place the top cover in position and replace the lockwashers and nuts on the 3 mounting studs.
2. Follow steps 2, 3 and 4 for reassembly of Model 760 cover.

MODEL No. 77—REPLACEMENT PARTS LIST

Figure Number	*Part Number*	*Description*
1	11X529	Spindle Cap and Wire Assembly
2	11X528	Main Spindle Assembly
3	25P432	Fibre Washer
4	42P209	Tone Arm
5	26P912	Tone Arm Mounting Screw
6	21X304	Tone Arm Mounting Assembly
6A	41P713	Height Adjusting Pin
7	11X496	Automatic Trip Assembly — Complete
7A	45P871	Trip Lever
7B	25P420	Felt Washer
8	11X501	Speed Control Knob, Lever Bracket Assembly
9	45P838	Switch Slide
10	11X498	Tone Arm Actuating Lever Assembly
10A	46P206	Spring for 11X498
10B	25P439	Retainer for 11X498
11	11X499	Pawl and Wire Assembly
11A	50P225	Retainer Pin
12	46P145	Tension Spring for Actuating Lever
13	24P043	Rubber Sleeve Bumper
14	15X103	Motor
14A	11X507	Idler Wheel
14B	25P429	Washer — Fibre
14C	50P034	Retaining Clip
14D	50P125	Retaining Clip
14E	46P130	Tension Spring
14F	46P212	Tension Spring
14G	24P043	Rubber Sleeve Bumper
14H	25P074	Rubber Grommet
14I	46P188	Speed Bushing
15	26P046	Nut — Motor Mount
16	25P211	Lock Washer — Motor Mount
17	25P367	Washer — Motor Mount
18	25P363	Shock Mount — Motor
19	49P132	Reject Control
20	11X493	Manual Trip Lever Assembly
21	46P223	Tension Spring — Trip Lever
22	46P196	Tension Spring
23	46P209	Tension Spring
24	11X495	Spindle Actuating Assembly
25	27P212	Retaining Pin for 11X495
26	45P891	Pull Down Spring
27	41P688	Hold Down Anchor
28	41P687	Lock Nut
29	32P044	A.C. Switch
30	11X489	Turntable
31	49P130	Tone Arm Res

MODELS 77,
755, 760, 762

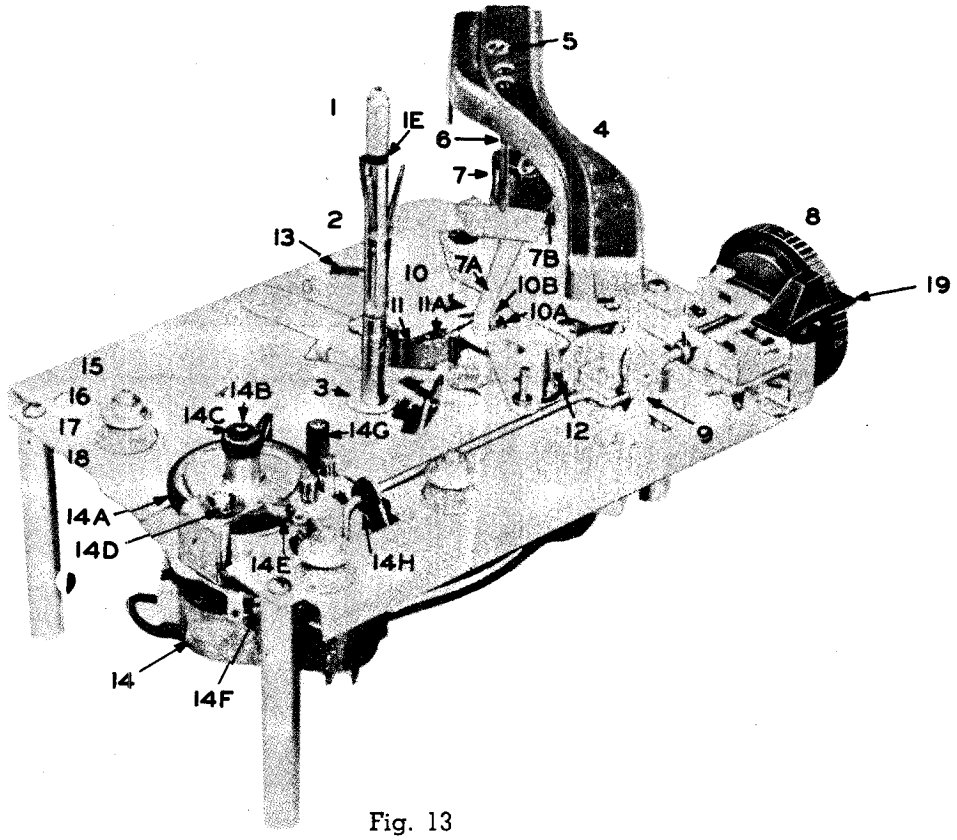


Fig. 13

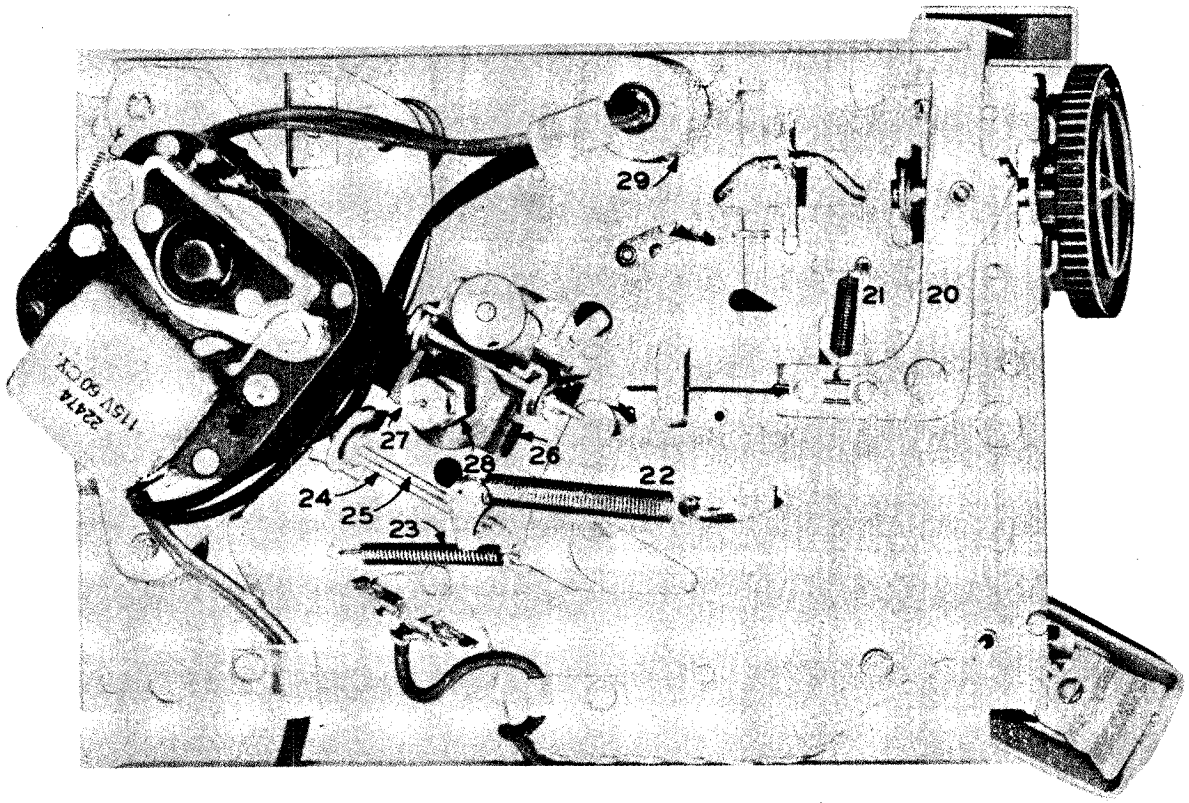
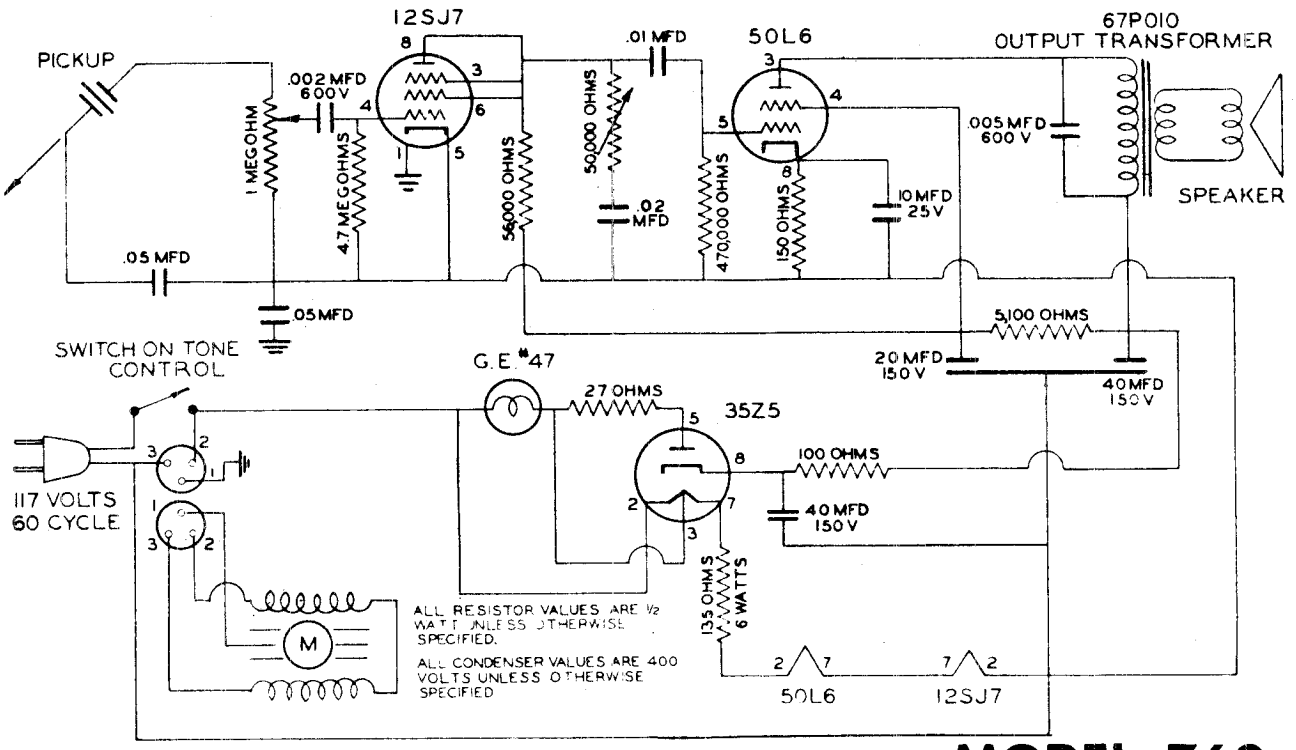


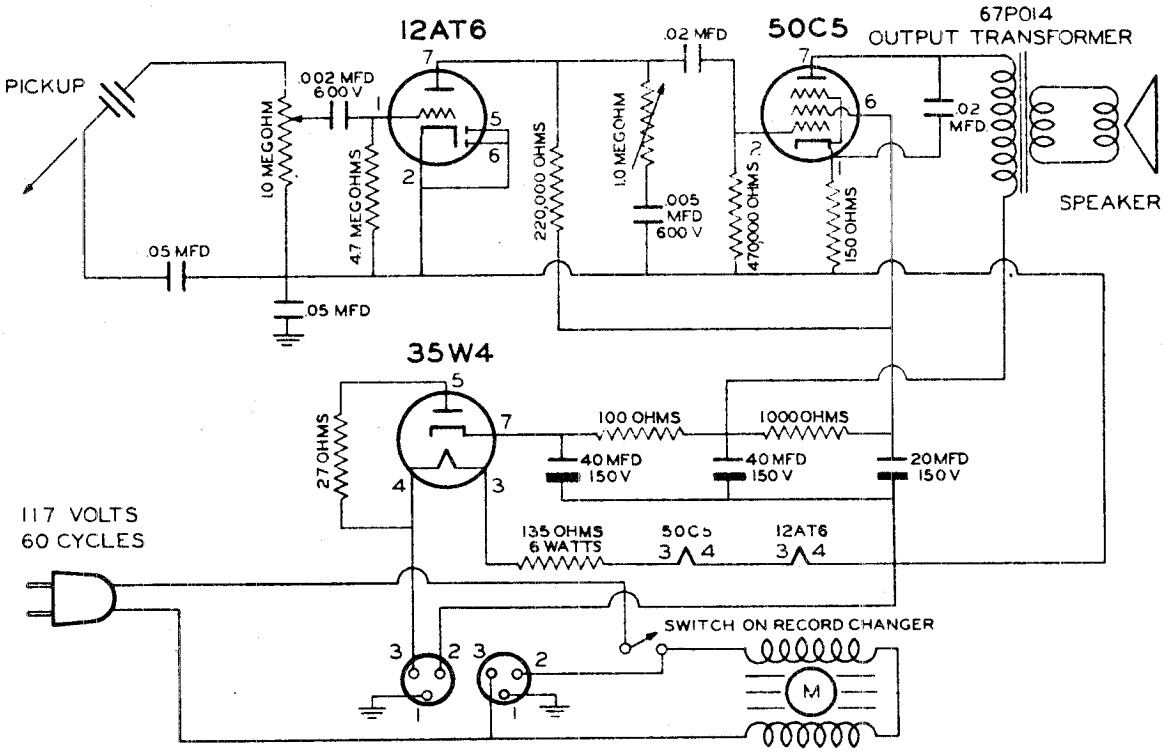
Fig. 14

MODELS 760, 762

MODEL 762



MODEL 760



MODEL S-14001

GENERAL

The Record Changer will automatically play up to twelve 10 inch or ten 12 inch records at one loading. The Record Stack rests on the Spindle and the Record Shelf. The Selector Sprocket drives the Ejector Plate which pushes the records off the Shelf and Spindle allowing them to drop on the Turntable. To load for automatic operation, set the Record Size Selector Knob to 10 or 12, raise the Pressure Bar, place the stack of records on the Spindle, lower the Pressure Bar until it rests on the Record Stack. Set the AUTO-MAN-OFF switch to AUTO and press the Record Change Button. The Changer will play the entire selection of records and will repeat the last record until it is turned off. For manual operation set the AUTO-MAN-OFF switch to MAN and play the records singly as on a non-automatic record player.

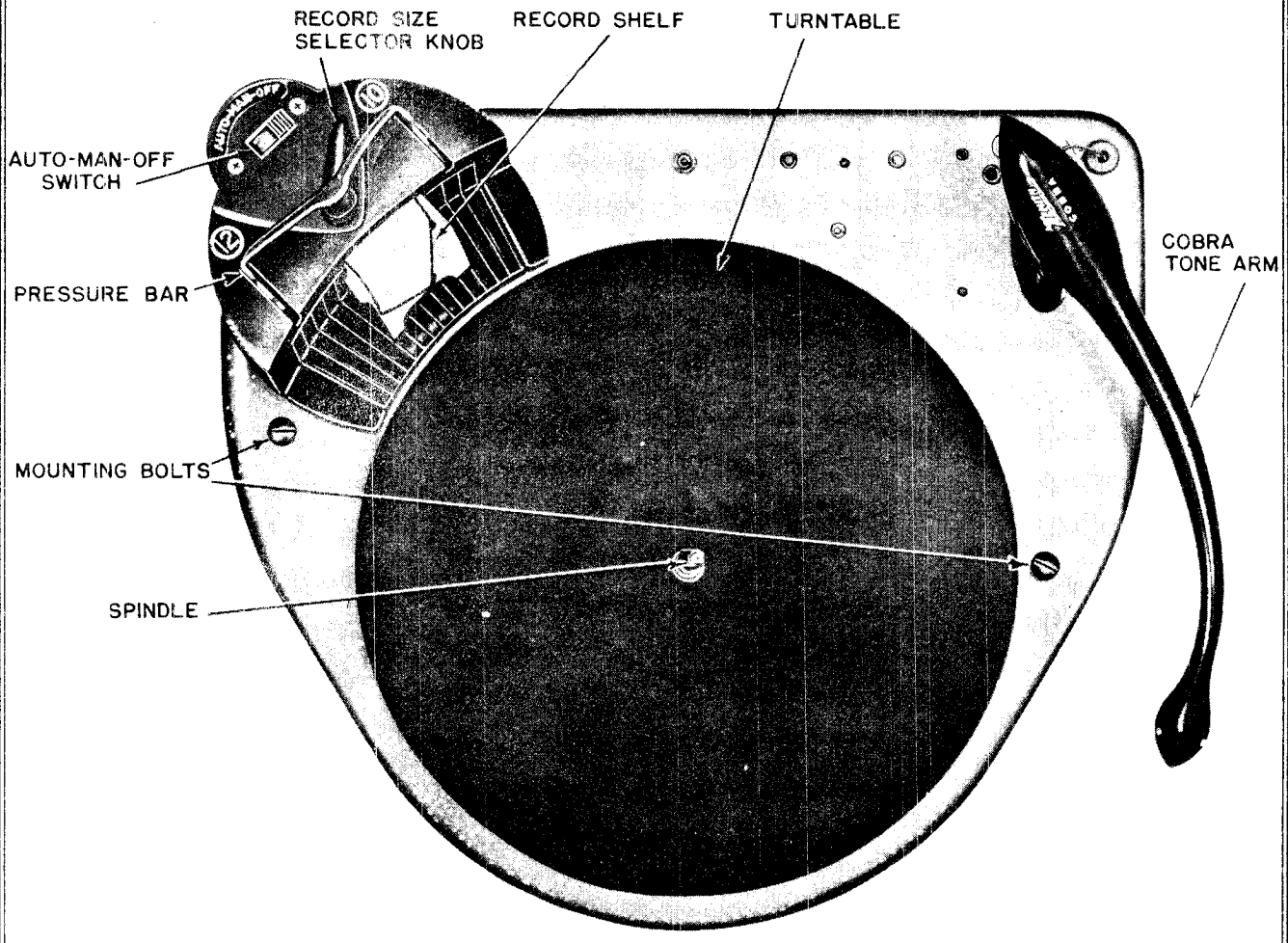


Fig. 1. Top View of Record Changer.

Z800

MODEL S-14001

DESCRIPTION OF CYCLING

The phono motor friction drives the idler wheel. The idler wheel rim drives the turntable, and the turntable shaft. To the turntable shaft is attached the segmented clutch drive plate. The pawl on the clutch drive sprocket assembly engages the drive plate causing the sprocket to rotate. The pawl pusher lever on the clutch release arm assembly causes the clutch to engage or disengage.

Closing either the trip switch or the record change switch energizes the solenoid. The magnetic flux of the solenoid attracts the clutch release lever causing the mechanism to trip and move the pawl pusher arm away from the clutch pawl. This action allows the clutch pawl spring to pull the pawl into position for the drive plate segment to engage and start the clutch sprocket rotating. The clutch sprocket is meshed with the chain drive sprocket and the chain drives the selector and timing sprockets.

The timing sprocket completes 7 functions through 360° rotation. These functions are as follows: 1. Applies the tone arm brake. The brake lever is actuated by the brake stud on the timing sprocket. The brake prevents coasting and erratic landing of the needle. 2. The inclined groove pushes the lift pin upward. The lift pin raises and lowers the tone arm. 3. The locating pin laterally swings the tone arm off the record stack. 4. The locating pin or bushing swings the tone arm over the starting groove of the record. With 12" records, the locating pin swings the tone arm in while the locating bushing swings the tone arm with 10" records. The locating bushing is pushed upward by the record selector lever. 5. The reset stud resets the clutch trip mechanism. Moves the pawl pusher arm in the path of the clutch pawl. 6. The lift pin lowers the tone arm over the starting groove of the record. 7. The brake stud releases the brake. When the clutch pawl hits the pawl pusher arm, the clutch selector disengages.

The selector sprocket actuates the record ejector plate and must be timed with the timing sprocket to drop the records on the turntable when the tone arm is at its greatest outward swing. This occurs immediately after the No. 3 function of the timing sprocket.

As the record is played, the tone arm gradually moves toward the center. The ratchet on the tone arm control lever moves toward pawl on the trip switch lever. As the ratchet comes in contact with the pawl, the oscillating action produced by the eccentric groove on the record causes the trip switch to close, complete the solenoid circuit and repeat the cycle. If the record does not have an eccentric groove, the position trip will close the trip switch and start the next cycle.

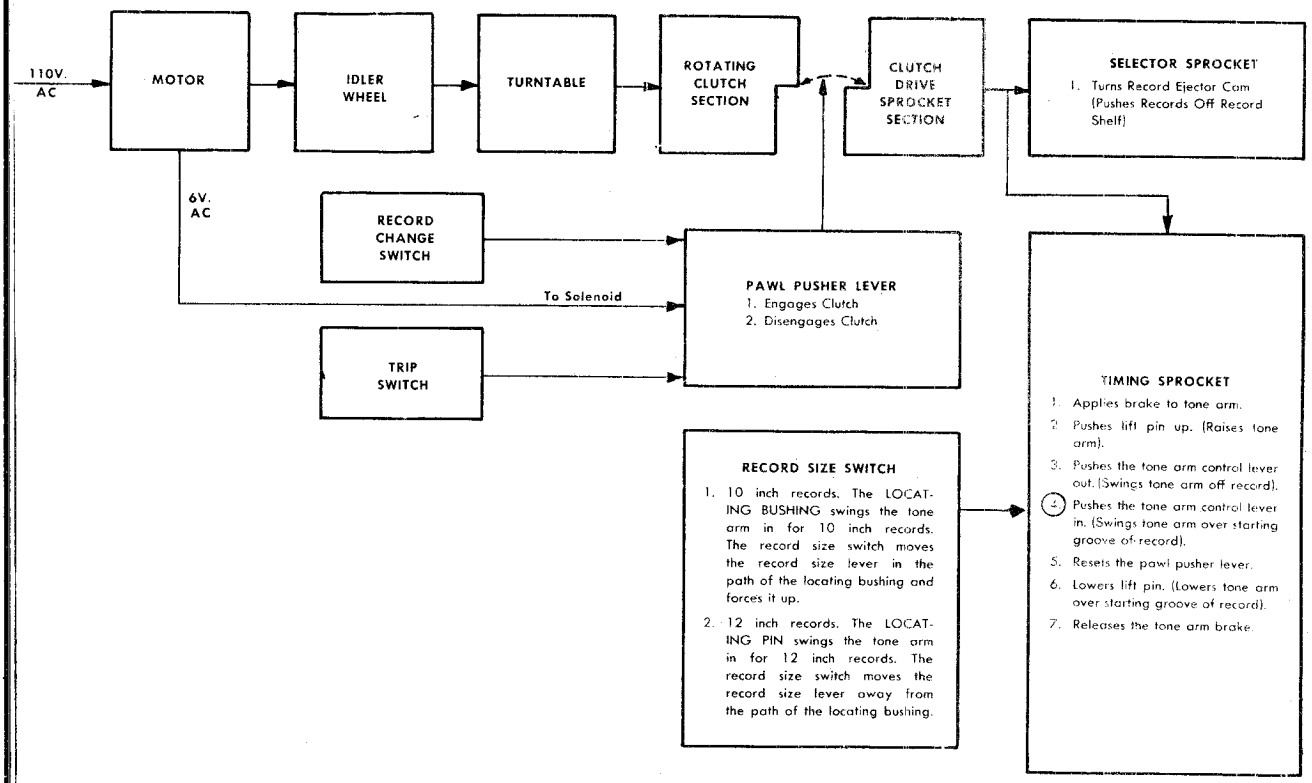


Fig. 2. Sequence of Operation—Zenith Record Changers.

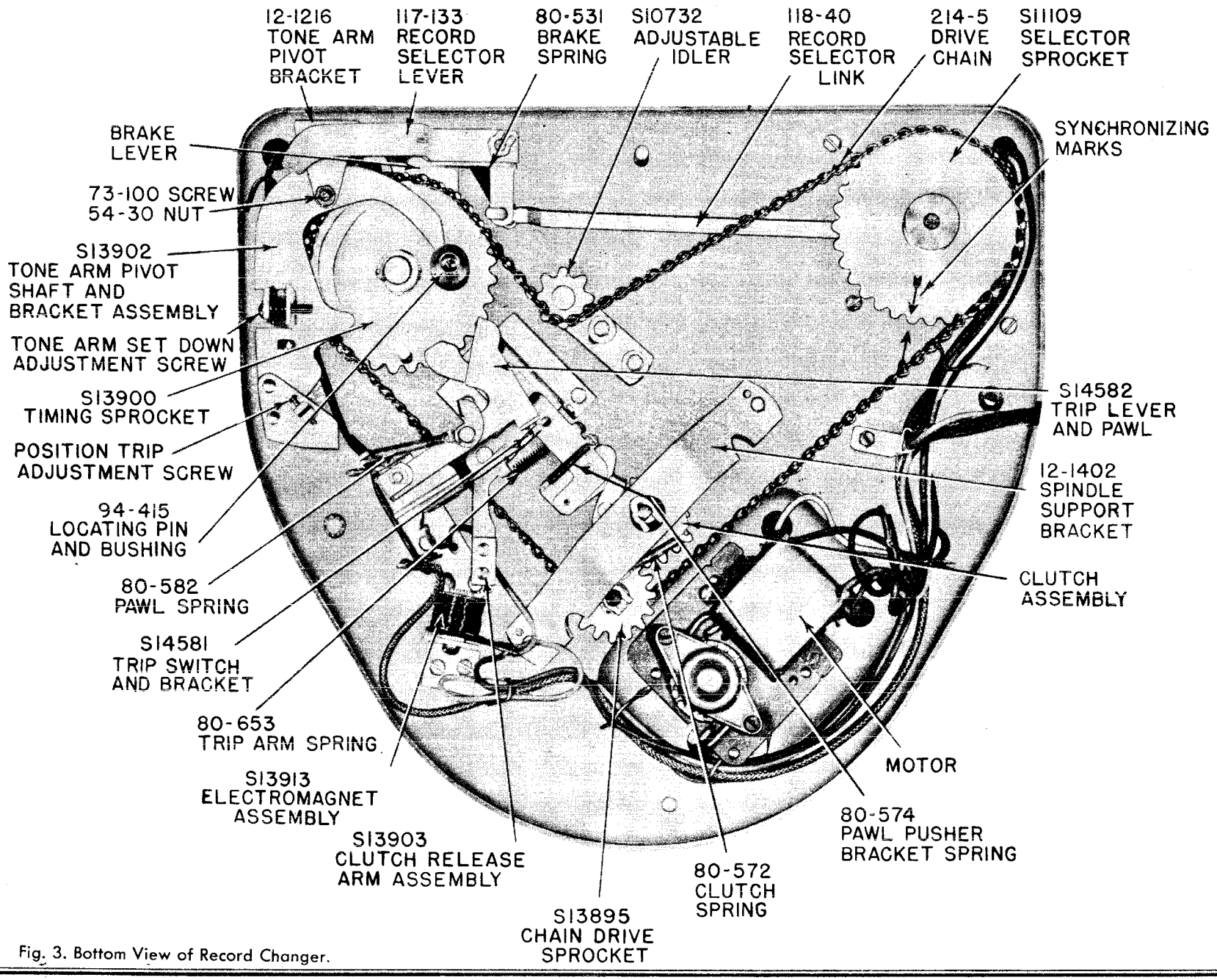


Fig. 3. Bottom View of Record Changer.

MODEL S-14001

THEORY OF THE COBRA RADIONIC PICKUP

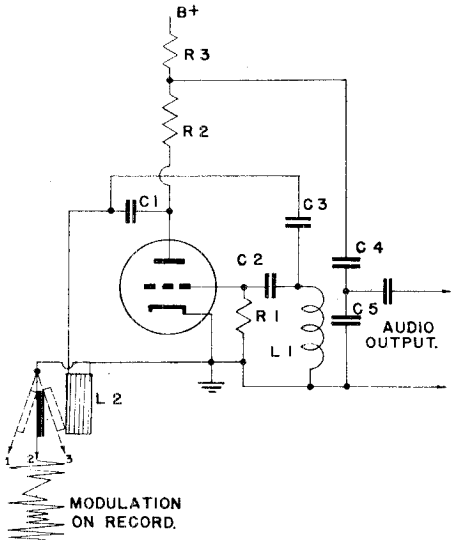


Fig. 4. Simplified Circuit of Oscillator.

The operation of the Cobra pickup is considerably different from Crystal and Dynamic pickups. These pickups generate audio power, while the Cobra controls power generated by a radio frequency oscillator. The triode tube is a modulated oscillator, detector and audio amplifier. The oscillator operates at a frequency of 2.5 Mc. Modulation is accomplished by changing the energy losses in a tuned circuit. These losses may be represented by an equivalent resistance in series with the reactance of the coil. The ratio of the resistance to the reactance determines the efficiency or Q of the coil. The amplitude of the RF voltage developed across this coil by the oscillator will vary with changes in Q.

The grid coil L_1 and other components of the oscillator are mounted in the receiver chassis, while the plate coil L_2 is in the Needle Cartridge with the vane and needle assembly. The coil is fixed and has 40 turns of No. 40 wire (approximate DC resistance 2½ ohms). The stainless steel vane, which is in the field of the coil, is spot welded to the osmium-iridium tipped stylus.

Any movement of the stylus will cause a corresponding movement of the vane. As the stylus and vane follow the modulations in the record, changes in the mutual inductance between the vane and coil occur (see Fig. 4). In position 2 the vane is at rest; and a constant RF voltage appears across the plate coil. As the vane is set in motion and reaches position 1, it is at its greatest outward swing from the coil, resulting in low mutual inductance, low reflected resistance, higher Q, and a higher RF voltage across the coil. In position 3 it is at its greatest inward swing; resulting in a high mutual inductance, high reflected resistance, lower Q and a lower RF voltage. It can be seen that the amplitude of the RF voltage which appears across the coil will vary with changes in Q, satisfying the condition for amplitude modulation. The position of the vane changes both the Q and L of the coil. Changes in L shift the frequency slightly, and a certain amount of frequency modulation is present, but since there is no frequency discrimination it remains undetected.

Since the grid and plate coils are part of a single tuned circuit, any variations of amplitude of the RF voltage brought about by the changes in Q across the plate coil will also appear across the grid Coil L_1 causing a shift in the average plate current through the plate load resistor across which the audio output voltage is developed. Plate bend detection takes place since only the positive half of the grid swing causes an increase in the average plate current. These changes in the average plate current appear as audio voltage across the plate load resistor.

The 2.5 Mc. RF voltage and the audio voltage both appear at the plate of the oscillator triode. R_2, C_4 and C_5 filter out the RF voltage allowing only the audio component to the grid of the phono amplifier where it is amplified and reproduced by the loud-speaker.

LUBRICATION

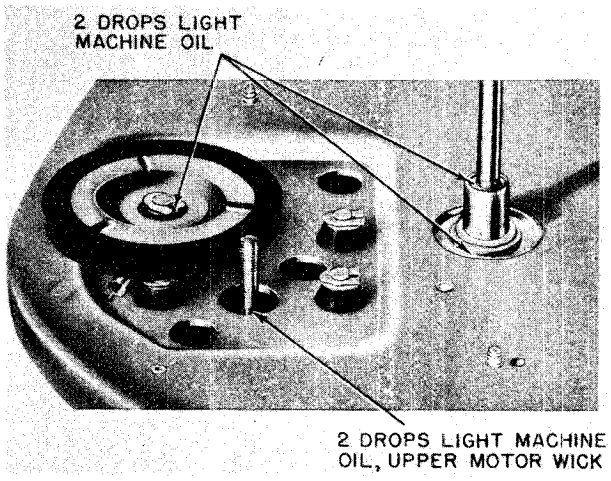


Fig. 5. Lubrication Top of Record Changer.

Sta-Put grease No. 512 (light grease of the vaseline type) and light machine oil of No. 10 consistency are used for lubrication throughout.

Figures 5 and 6 indicate the points to be lubricated and the type of lubricant to use. The Motor has two oil wicks which should be saturated with oil. The Record Spindle Guide Bearing, Idler Wheel Bearing, Lower Drive Shaft Bearing, Drive Shaft Thrust Bearing and the Motor Bearings are of the OILITE type and require very little attention. If squeaks develop, be certain that they are not caused by friction between the Spindle and records on the Turntable. A thin coat of wax on the Spindle will remedy this condition.

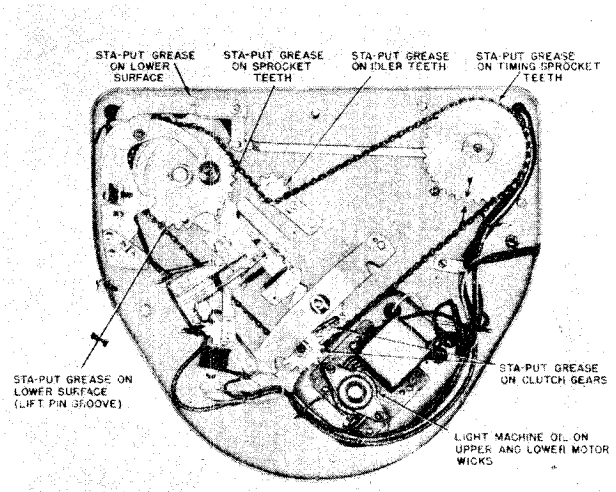


Fig. 6. Lubrication Bottom of Record Changer.

ADJUSTMENTS

1. Tone Arm Set Down Adjustment.

The Tone Arm Set Down Adjustment determines the landing position of the needle on the starting groove of the record. The adjustment screw can be reached with a screwdriver (Fig. 7). The tone arm must be held in the rest position while the adjustment is made. Clockwise rotation of the screw moves the tone arm in, while counter-clockwise rotation moves it out.

2. Position Trip Adjustment.

The Position Trip does not depend on an eccentric groove in the record to start the record change cycle, but will trip the mechanism whenever the needle comes within a pre-determined distance from the Spindle. Older type records that do not have an eccentric groove can in most cases be played automatically by the proper adjustment of the Position Trip. Under normal conditions with the needle approximately 1⅞" from the center of the Spindle, adjust the Position Trip Adjustment Screw (Fig. 7) until the trip switch contacts close. This distance is generally satisfactory since no modern record will be cut off before it has completed its play, and none will fail to trip the mechanism at the end. In special cases, screw the Position Trip Adjustment Screw clockwise for earlier tripping and counter-clockwise for later tripping as the individual case may be.

It may be impossible to find an adjustment that will always trip the mechanism and never cut off on all type records, and in these special cases the record must be played manually.

3. Trip Switch Adjustment.

As the record is played, the ratchet on the tone arm pivot shaft engages the trip pawl. The oscillating action developed by the eccentric groove on the record closes the trip switch contacts and allows the solenoid to become energized. The magnetic flux attracts the trip lever which moves the pawl pusher lever from the path of the clutch pawl. This allows the clutch to engage and start the next cycle.

The gap between the trip switch contacts should be approximately 1/16 inch. If the spacing is incorrect, bend the contact spring. To adjust the contact spring tension, insert a screwdriver between the contact and guide springs and bend the contact spring so that an approximate pressure of one ounce is necessary to move the contact spring from the guide spring. Be certain that the contact spring exerts some pressure on the guide spring after adjustment.

The spacing between the trip magnet solenoid and trip lever should be approximately 3/32". (See Fig. 7.)

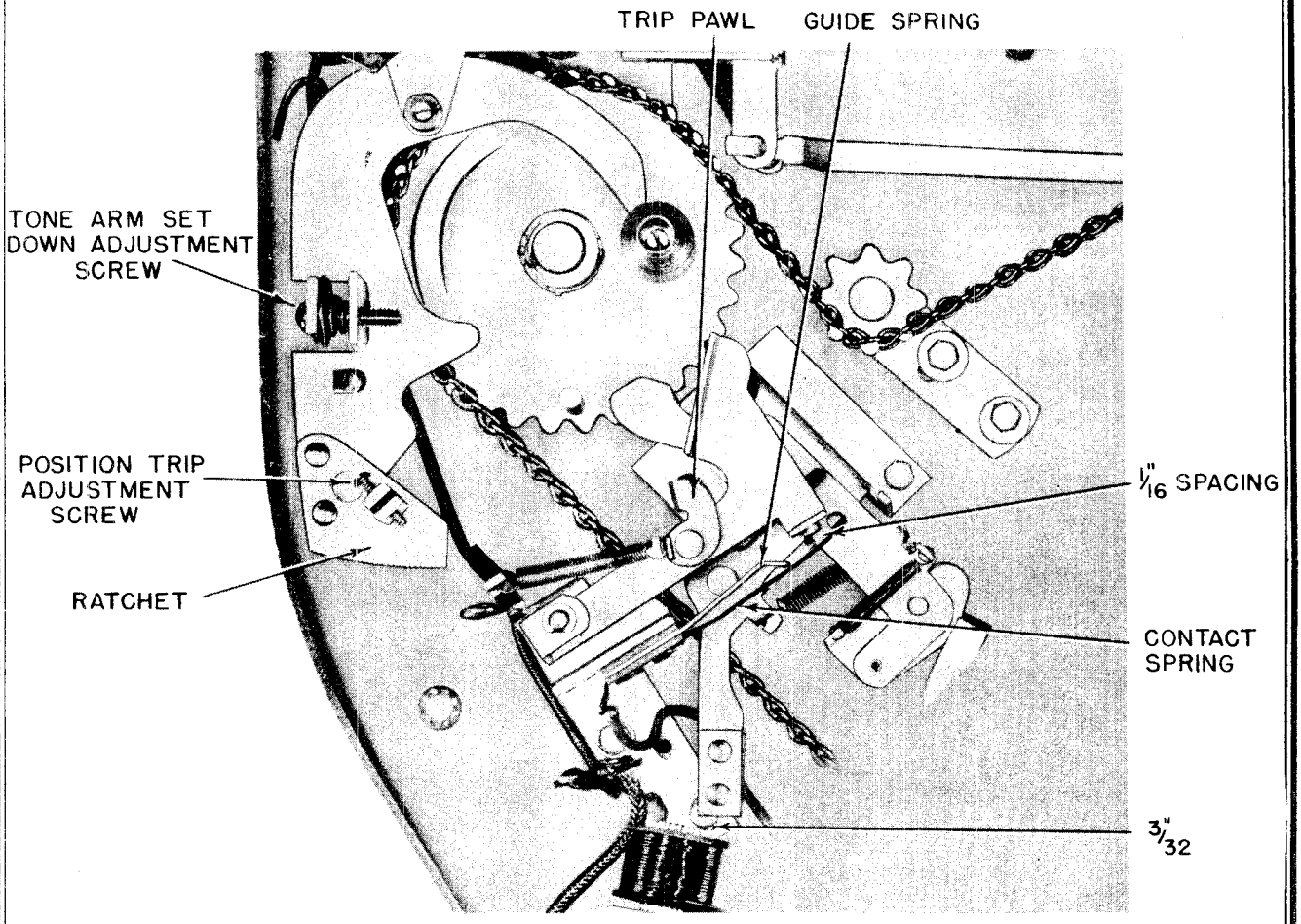


Fig. 7. Tone Arm Set Down, Position Trip and Trip Switch Adjustments.

MODEL S-14001

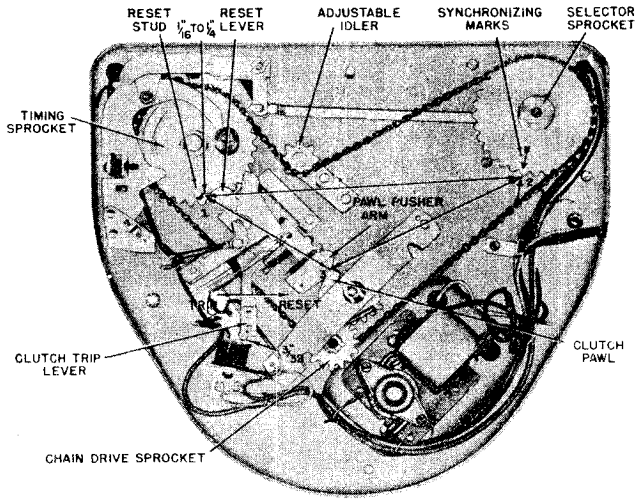


Fig. 8. Synchronization.

4. Synchronization.

A properly timed changer drops records on the turntable when the tone arm is at its greatest outward swing. Improper timing results in the records hitting the tone arm. The record changer is kept in time by the drive chain. If the chain is removed, the changer must be synchronized.

Fig. 8 indicates the correct position of the timing sprocket, selector sprocket and the clutch. To synchronize, study Fig. 8 and proceed as follows:

1. Reset the clutch trip lever.

2. Turn the timing sprocket until the reset stud is approximately 1/16" from the reset lever (1). Turn the selector sprocket until the synchronizing mark lines up with the mark on the base plate (2). THESE POSITIONS MUST BE MAINTAINED DURING THE NEXT OPERATION.

3. Thread the chain over the timing sprocket, chain drive sprocket, adjustable idler, selector sprocket and set the adjustable idler for medium tension of the chain. Check the position of the synchronizing marks and the reset stud.

4. Remove the retaining washer and lift the chain drive sprocket until the gears disengage.

5. Turn the clutch until the clutch pawl touches the pawl pusher arm (3).

6. Lower the chain drive sprocket until it engages the clutch gears and reinsert the retaining washer.

5. Tone Arm Height Adjustment.

The Tone Arm vertical rise is governed by the Lift Pin. The Lift Pin is adjustable (see Fig. 9). Too long a Lift Pin will cause the Tone Arm to hit the underside of the records on the Spindle. If the Lift Pin is short the needle will not clear twelve records on the Turntable. To make the proper adjustment, trip the Clutch by hand and rotate the Turntable clockwise until the Tone Arm starts to swing toward the Spindle. Gently push the Tone Arm as close to the Spindle as it will go, place a record over the Spindle and observe the spacing between it and the Tone Arm. The spacing "A" (Fig. 10), should be approximately the thickness of a record. If the spacing is incorrect, lift the Tone Arm, remove the Lift Pin, and adjust the Lift Pin to the proper length.

Fig. 9. Lift Pin.

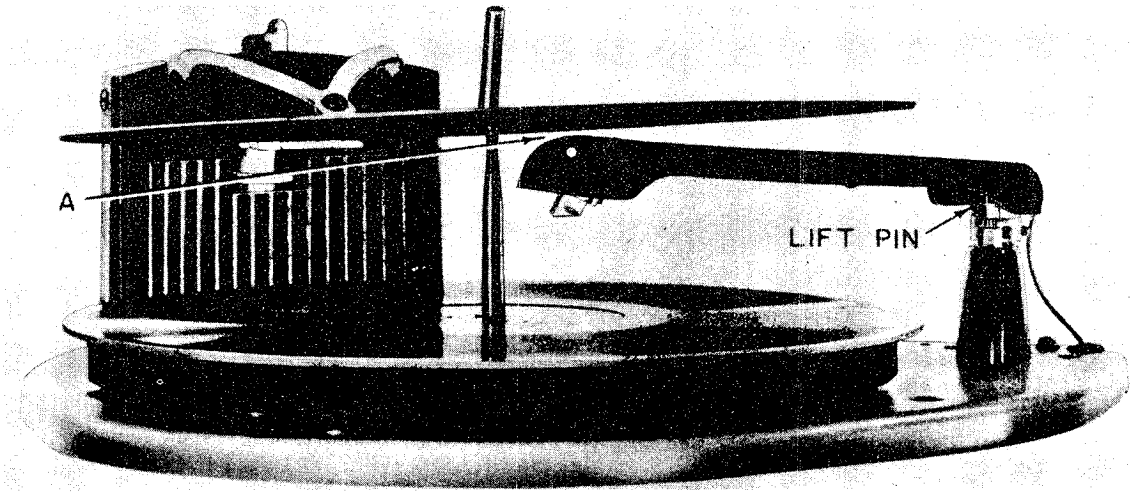


Fig. 10. Tone Arm Height Adjustment.

REMOVING THE TURNTABLE

Hold the clutch by inserting a wide blade screwdriver against the spindle bracket and a segment of the drive plate. Apply a twisting, pulling force to the turntable.

Before seating the turntable, be certain that the idler wheel is pushed inside the turntable rim.

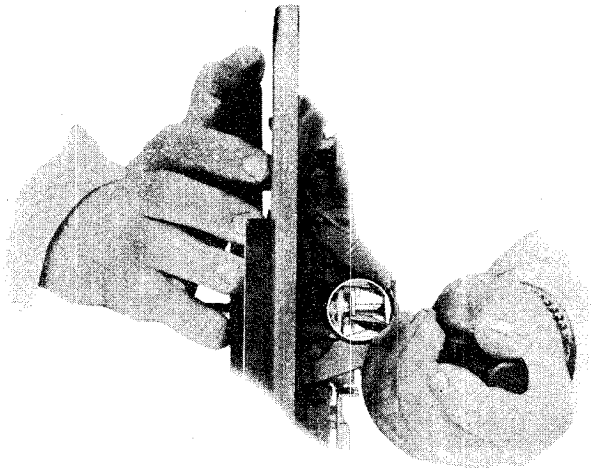


Fig. 11. Removing the Turntable.

REPLACING THE MOTOR

When a replacement Motor is ordered, be certain that the line voltage and frequency of the receiver are given.

To replace the Motor, unsolder the connecting leads, remove the Turntable, the three retaining washers and allow the Motor to drop out. When the Motor is installed do not draw the connecting leads tight as this will prevent the Motor from "floating" on its mounts. Be certain that the retaining washers are crimped and the leads securely soldered and taped.

REPLACING THE CHAIN

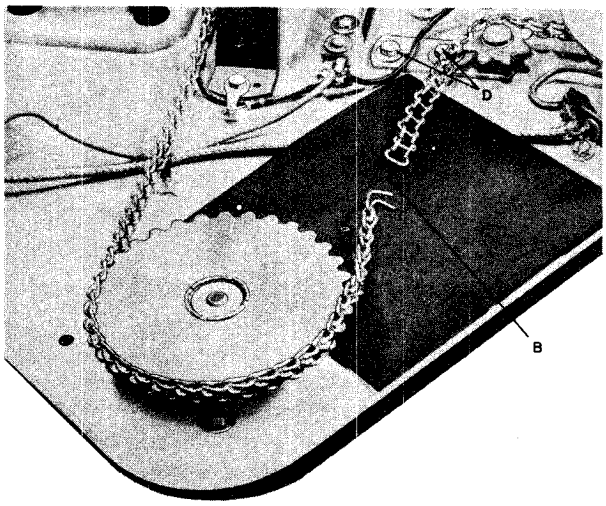


Fig. 12. Replacing the Chain.

The chain may be removed by loosening the adjustable idler (Screws "D", Fig. 12), and opening one of the links (B) It will be noted that on some models the open ends of the links face inward while on others outward as in Fig. 12. The reason for this is to get the quietest operation. Normally the open ends of the links will face outward with all replacement chains.

After the chain is threaded in place, carefully close the open link and be certain that there is no stiffness in its action. Read the paragraph on Synchronization before the chain is permanently installed.

TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

MECHANISM STARTS SLOWLY AND MOTOR GETS HOT.

a. Check line voltage and frequency.
b. Check lubrication.
c. Motor windings damaged.
d. Room temperature abnormally low.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check electrical continuity of solenoid circuit.
d. Check the solenoid energizing voltage.

MOTOR FAILS TO RUN EVEN WHEN IT IS DISCONNECTED FROM CHANGER AND PROPER VOLTAGE AND FREQUENCY APPLIED DIRECTLY TO THE TWO INPUT LEADS OF THE WINDING.

a. Open windings.

b. Damaged or frozen bearings.

c. Lower Bearing Support Bracket bent. Remove and straighten bracket—Re-center armature.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Remove packing strip. Loosen mounting bolts.

b. Motor retaining rings rubbing on the idler wheel.

c. Motor leads pulled too tight preventing motor from "floating" freely.

d. Noisy phono oscillator tube.

e. Impression on Idler Wheel.

NEEDLE SETS DOWN PROPERLY ON RECORD BUT SLIDES OVER THE RECORD GROOVES.

a. Cabinet tilted.

b. Badly worn or broken needle cartridge.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment. (Adjustment 5.)

CHANGER CYCLES WITH AUTO-MAN-OFF SWITCH ON MAN.

a. Check AUTO-MAN-OFF switch.

b. Reset stud does not engage clutch reset lever.

MODEL S-14001

TONE ARM FALLS OFF RECORD.

a. Check Tone Arm set down adjustment. (Adjustment 1.)
b. Check Tone Arm Pivot Bracket.
c. Changer not level.

TONE ARM SET-DOWN POSITION VARIES.

a. Check Tone Arm Brake and Spring.
b. Loose Tone Arm mounting screw.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check the phono oscillator tube.
d. Check Needle Cartridge.
e. Check Tone Arm Housing for broken leads.

TONE ARM SETS DOWN TOO FAR IN OR OUT ON RECORD.

a. Check Tone Arm set down adjustment. (Adjustment 1.)

CHANGER CONTINUES TO CYCLE.

a. Check the trip switch adjustment. (Adjustment 3.)
b. Check Record Change switch.
c. Clutch release mechanism sticks.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Be certain that the record has an eccentric center groove.
c. Check the Trip Switch.
d. Check the solenoid energizing voltage.

SQUEAKS WHEN CHANGER IS IN CYCLE.

a. Friction between Lift Pin and Timing Sprocket. Apply a thin coat of Sta-Put.

MOTOR RUNS BUT TURNTABLE SLIPS OR STOPS.

a. Turntable not fully seated. Tap gently.

NUMERICAL PARTS LIST

S-10732	Idler Assembly
S-11105	Record Ejector Plate and Pin Assembly
S-11106	Record Support Plate—Shaft and Pin Assembly
S-11107	Record Support and Ejector Bracket Assembly
S-11109	Selector Sprocket and Bushing Assembly
S-11111	Turntable Shaft and Bearing Assembly
S-11118	Idler Wheel Assembly
S-11441	Record Change Lever and Stud Assembly
S-11473	Cobra Needle Cartridge
S-11657	Idler Stud and Washer Assembly
S-12633	Needle Cartridge Socket and Cable Assembly
S-13060	Cobra Tone Arm Hinge Plate and Swivel Bracket Assembly
S-13062	Cobra Tone Arm Hinge Plate, Swivel Bracket, Needle Cartridge Socket and Cable Assembly
S-13466	Cobra Tone Arm Assembly
S-13894	Clutch Pawl Assembly
S-13895	Drive Sprocket and Bushing Assembly
S-13896	Turntable Drive Shaft Bearing Assembly
S-13900	Timing Sprocket Assembly
S-13901	Trip Switch Assembly
S-13902	Tone Arm Pivot Shaft and Bracket Assembly
S-13903	Clutch Release Arm Assembly
S-13913	Magnet Coil Assembly
S-13931	Turntable Assembly
S-13933	Main Base Plate Assembly
S-14140	Record Spindle Assembly
S-14172	Cable Assembly
S-14581	Trip Lever Mounting Bracket Assembly
S-14582	Trip Lever and Pawl Assembly
12-1216	Tone Arm Pivot Bracket
12-1390	Magnet Mounting Bracket
12-1402	Record Spindle Support Bracket
17-81	Cable Clamp
23-22	AC Wire Connector
24-445	Record Ejector Housing Cover
43-152	Record Ejector Housing
43-157	Tone Arm Support Housing
46-695	Record Selector Knob
54-30	No. 8-32 x 5/16" Hex Nut—Steel N.P.
54-66	No. 10-32 x 5/16" x 1/8" Hex Nut—Steel N.P.
56-128	Groove Pin (Sprocket Bushing)
56-226	Tone Arm Lift Pin—Lower
56-227	Tone Arm Lift Pin—Upper
57-1323	Turntable Shaft Plate
58-158	Five Prong Plug (for S-14172)
63-1744	100 Ohm Carbon Resistor 1/2 W. Insulated
69-38	No. 8-32 x 3/4" R.H.M.S.—Steel N.P.
69-43	No. 8-32 x 3/8" R.H.M.S.—Steel N.P.
73-90	No. 8-32 x 5/16" Hex Head Slotted Set Screw—Conepoint
73-99	No. 8-32 x 1/4" Slab Head Set Screw—Steel Conepoint
73-102	No. 8-32 x 7/16" Slab Head Set Screw—Steel—Conepoint
76-409	Record Ejector Cam Shaft
80-367	Toggle Spring (S-11106)
80-368	Idler Wheel Tension Spring
80-448	Pressure Arm Spring
80-531	Brake Spring
80-538	Landing Adjustment Spring (S-13902)
80-572	Clutch Spring (S-13894)
80-574	Pawl Pusher Bracket Spring (S-13903)
80-582	Pawl Spring (S-13901)
80-584	Tone Arm Lift Pin Spring
80-605	Cobra Cartridge Socket Tension Spring
80-653	Trip Arm Spring (S-13903)
83-1349	Tone Arm Shipping Strip
83-1453	Two Lug Terminal Strip
85-371	3 Position Slide Switch
93-10	.025 x .260 x 5/8" Steel Washer—Cadmium
93-216	.015 x .255 x 7/16" Steel Washer—Cadmium
93-125	No. 6 Int. Shakeproof Lockwasher No. 1206
93-126	No. 8 Int. Shakeproof Lockwasher No. 1208
93-617	Sprocket Shaft Retaining Washer
93-673	Idler Wheel Stud Washer
93-677	Idler Wheel Stud Fishpaper Washer (Large)

93-678	Idler Wheel Stud Fishpaper Washer (Small)
93-679	Idler Wheel Stud Felt Washer (Large)
93-764	Spring Washer—Shakeproof
93-900	Fibre Washer (Motor Mtg.)
93-901	Spring Washer Shakeproof
93-903	Steel Washer—Copper Flash (Motor Mtg.)
93-905	Spring Washer—Shakeproof No. 3502-16-01
94-415	Tone Arm Locating Bushing
112-450	No. 4-40 x 1/8" Phillips Binding Hd. M.S. Steel Cad. Pl.
112-451	No. 8 x 5/16" B.H. Self Tapping Screw—Stan-Tap—Cad.
112-581	No. 6 x 3/8 R.H. Self Tapping Screw
112-619	Cobra Tone Arm Housing Mtg. Screws
112-687	Pivot Screw
112-688	No. 8 x 3/8" Flat Hd. Screw—Shakeproof Type 25—Cad. Pl.
112-689	No. 8 x 3/8" R.H. Screw—Shakeproof Type 25—Cad. Pl.
112-706	No. 4-40 x 3/16" lg. R.H.M.S. (Sems)—Steel N.P.
112-719	No. 6 x 3/8" Flat Head Screw—Self Tapping.
114-88	No. 8-32 x 1/2" Hex Acorn Hd. M.S.—Steel N.P.
114-201	No. 8-32 x 5/16" Hex Head Slotted—STAN-TAP—Thread Forming Screw—Cad. Pl.
114-248	No. 6-20 x 5/16" Hex Head Slotted—Self Tapping Screw
117-133	Record Selector Lever
118-40	Record Selector Link
125-45	Rubber Grommet
125-60	Pressure Arm Grommet
125-61	Rubber Grommet
128-20	Record Ejector Cam
128-40	Record Selector Cam
141-108	A.C. Motor—60 Cycles
148-83	Cobra Tone Arm Housing
148-87	Record Pressure Arm
166-41	Rubber Bumper
188-27	Record Spindle Retaining Washer
188-32	Retaining Ring
188-52	Retaining Ring
214-5	Sprocket Drive Chain

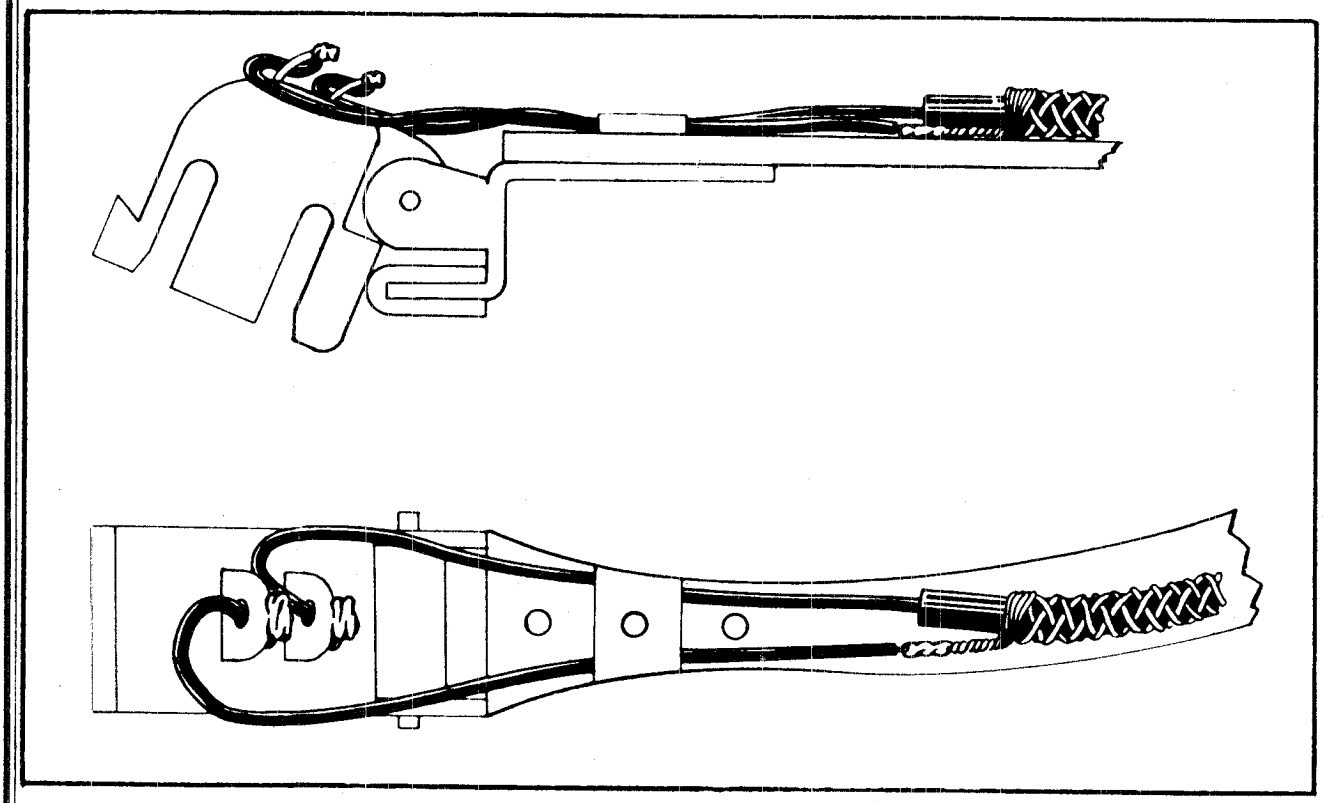


Fig. 13. Needle Cartridge Socket Connections.

Fig. 13 shows how the leads are connected to the Needle Cartridge Socket. The lead and insulation are run through the hole in the contact and the lead is soldered with a light soldering iron. Great care must be exercised, and very little heat applied as the socket is made of lucite and will burn easily. The complete lead, socket and bracket are supplied as S13062.

MODEL S-14001

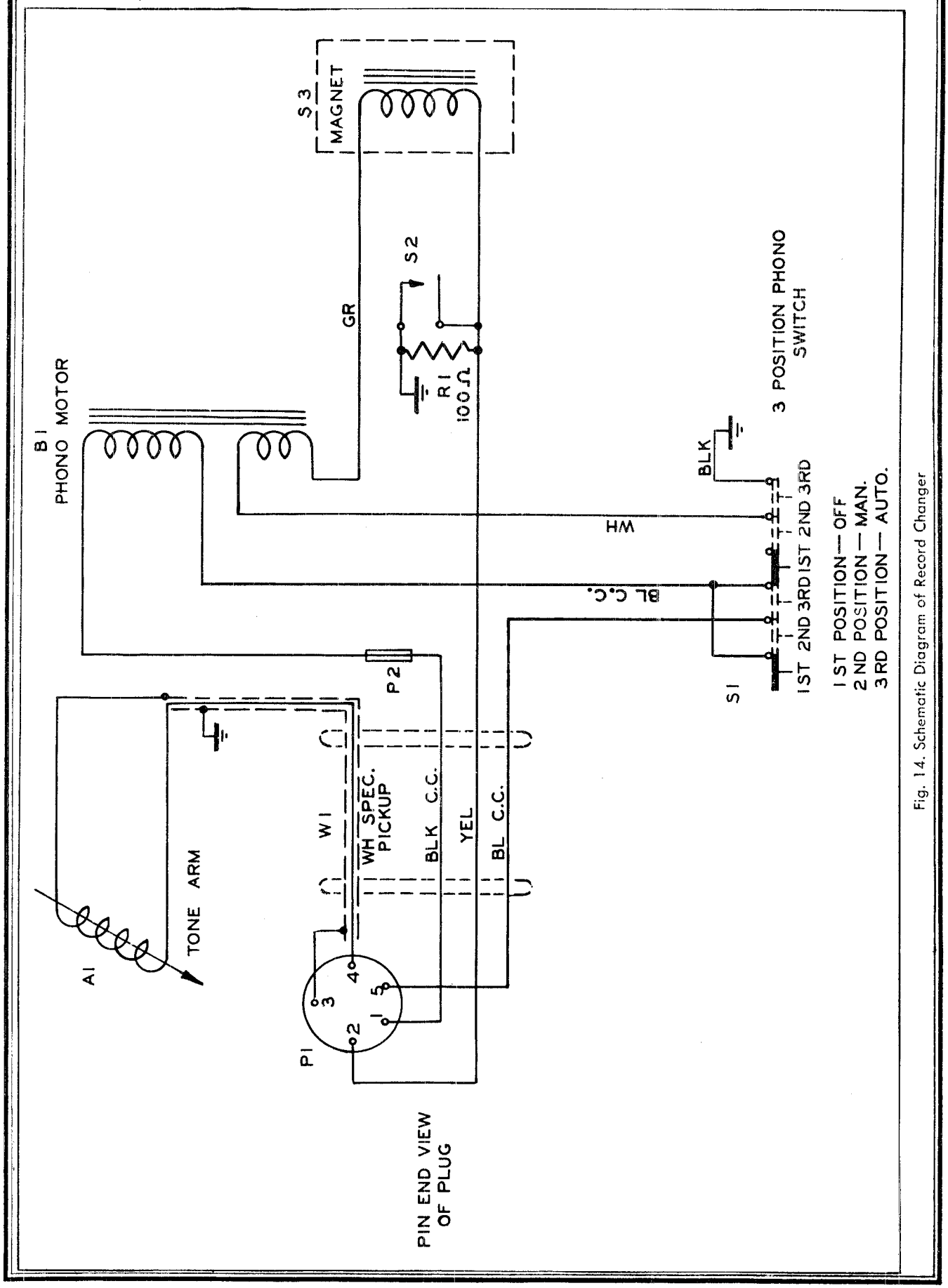


Fig. 14. Schematic Diagram of Record Changer

MODEL S-14001

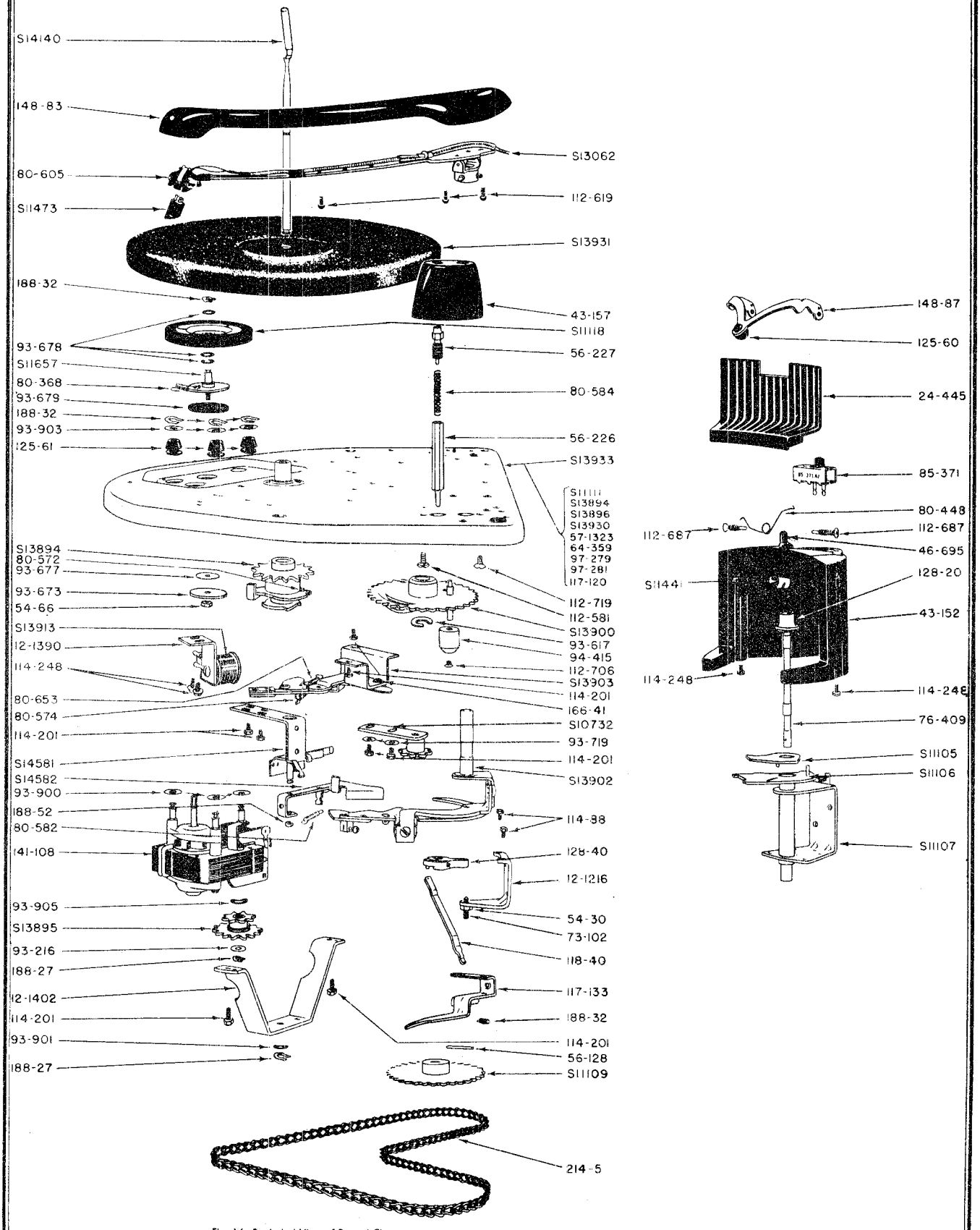


Fig. 16. Exploded View of Record Changer.

MODELS S14012, S14014, S14019, S14021

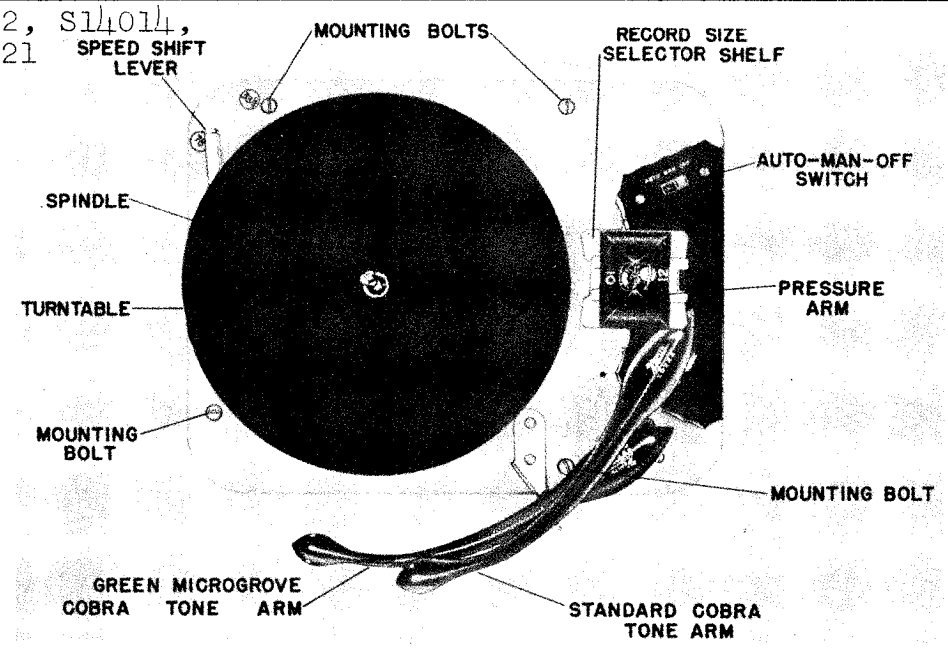


Fig. 1. S14012 and S14014 Record Changers.

GENERAL

The Models S14012 and S14014 record changers are used in Zenith Models 9H995RLP and 6R980LP respectively. These changers are designed to play 12 ten inch or 10 twelve inch 78 RPM records automatically. They will play 33-1/3 RPM records manually. Odd size and warped records must be played manually. Mechanically the changers are alike. There are slight electrical differences. Model S14012 receives the solenoid energizing voltage from the receiver proper while the S14014 supplies its own energizing voltage from a separate winding on the motor. When servicing these changers, check the schematic diagrams for electrical differences. The mechanical operation and adjustments of both changers are identical. To load for automatic 78 RPM operation, set the record size selector shelf to either ten or twelve, depending on the size of the records to be played. Lift the pressure arm and place a stack of records over the spindle. Lower the pressure arm until it rests on the record stack. Set the AUTO-MAN-OFF switch to AUTO. Move the speed shift lever to 78 RPM and press the record change button on the receiver panel. The record changer will play the complete selection of records, and will repeat the last record until turned off. For manual operation set the AUTO-MAN-OFF switch to MAN, place a record on the turntable and set the needle on the starting groove of the record. For 78 RPM records use the standard tone arm and place the speed shift lever to 78 RPM. For 33-1/3 RPM records use the green tone arm and place the speed shift lever to 33-1/3 RPM. To turn the changer off, set the AUTO-MAN-OFF switch to OFF, and place the tone arm in the rest position.

DESCRIPTION OF CYCLING

The motor drives the turntable thru the media of shafts and idler wheels. Closing the contacts of the trip switch or the record change switch allows current to flow through the solenoid. The magnetic field of the energized solenoid attracts the trip pawl lever which releases the gear pawl tooth and allows it to engage the rotating turntable gear. This action starts the clutch gear to turn. A stud on the clutch gear engages the tone arm lift lever which engages the tone arm stud and raises the tone arm. The tone arm lift lever also applies the tone arm brake which prevents coasting and erratic landing of the needle. The clutch gear moves the tone arm actuating lever and laterally swings the tone arm off the turntable. During the lateral swing of the tone arm, the record ejector link and arm assembly operates the record push plate and when the tone arm moves to its maximum outward position, the record push plate ejects the record and allows it to drop on the turntable. The clutch gear then moves the tone arm actuating lever which swings the tone arm over the starting groove of the record. The tone arm swings 1 inch nearer the spindle with 10 inch records than it does with 12 inch. This difference in inward swing is controlled by the discriminator lever assembly. When the record size selector shelf is turned to the 10 or 12 inch position, its shaft moves the discriminator cam and sets the discriminator lever assembly for the correct inward swing of the tone arm. After the tone arm swings over the starting groove of the record, the tone arm lift lever lowers it and releases the brake. As the clutch gear completes the revolution, the gear pawl tooth bracket hits the trip pawl and the action removes the gear pawl tooth from the path of the turntable gear, causing the clutch gear to stop thus completing the cycle.

The velocity trip depends on the ratio of oscillations of the trip switch contact to the rate of movement of the tone arm. As the record is played, the tone arm lever moves slowly inward. The oscillating lever comes in contact with the ratchet on the tone arm lever and then moves out before the ratchet can drag the oscillating lever and close the trip switch contacts. When the record is completed and the needle enters the oscillating groove, the inward speed of the tone arm increases. This makes it impossible for the oscillating lever to move out of the ratchet in time and as a result is dragged inward, closing the trip switch contacts and starting the next cycle.

MODELS S14012, S14014, S14019, S14021

The S14012 and S14014 record changers use the famous Cobra pickup. On S14012, S14014 and S14019, use only a red cartridge in the red tone arm and only a green cartridge in the green tone arm. On S14021 which has a red tone arm use only a red-green cartridge. Previously published service manuals Z800 and Z801 explain in detail the theory and operation of the Cobra pickup. If these manuals are not available, they may be obtained from your Zenith distributor.

RECORD CHANGER MOUNTING CLIPS

Clamp on pivot clips are used to mount the record changer in the cabinet. The changer is released by applying an upward pressure to the slotted ends of the clips (see Fig. 3) until the clips pivot to a vertical position. When the changer is installed, the clips are pivoted back to the horizontal or holding position.

LUBRICATION

Sta-Put grease No. 512 (light grease of the vaseline type) is used for lubrication throughout. Fig. 7 indicates the various lubrication points. Do not apply grease to the top surface or teeth of the clutch gear.

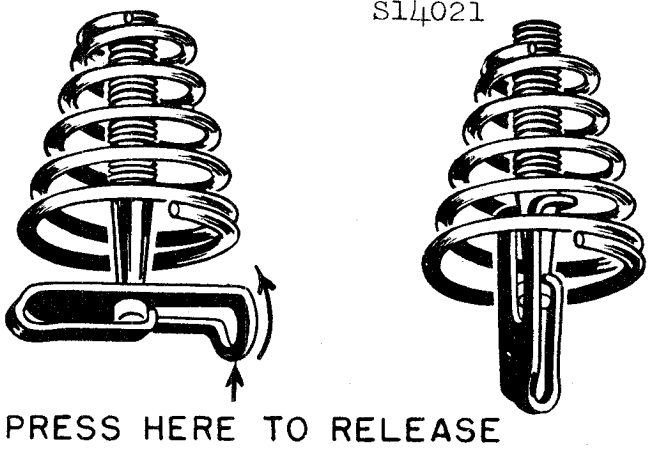


Fig. 3. Record Changer Mounting Clip.

ADJUSTMENTS

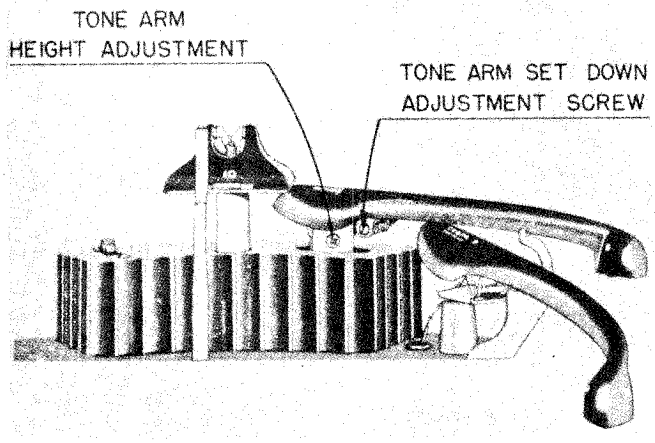


Fig. 2. Tone Arm Set Down and Height Adjustment.

TONE ARM SET DOWN ADJUSTMENT

The landing position of the needle on the record is determined by the setting of the tone arm set down adjustment screw (see Fig. 2). Clockwise rotation of the screw moves the tone arm in, while counter-clockwise rotation moves it out.

TRIP SWITCH ADJUSTMENT

The tone arm lever must be moved so that its ratchet does not engage the oscillating switch lever. With a pair of long nose pliers simultaneously bend the stationary contact and guide spring until the spacing between the trip switch contacts is 1/16 inch to 3/32 inch. The contact spring must always rest against the heavier guide spring after adjustment.

TONE ARM HEIGHT ADJUSTMENT

The tone arm height adjustment determines the vertical rise of the tone arm. If the tone arm does not rise sufficiently, the record changer will not play a full load of 12 ten inch records. If, on the other hand, the tone arm is raised too high, it may hit the records on the record shelf. Set the adjustment screw so that the needle clears 12 unwarped ten inch records on the turntable. The tone arm housing must not hit the underside of the records on the record shelf when the changer is cycled after adjustment.

SLAB HEAD SET SCREWS

For maximum rigidity, the spindle, discriminator cam and tone arm lever are locked in position with slab head screws. A slab head set screw wrench is available as Zenith part No. 68-8

REMOVING THE 78 RPM TONE ARM ASSEMBLY

The complete tone arm assembly can be removed by loosening the two slab head holding screws and pulling the unit out. When the tone arm assembly is installed, the cone points of the slab head screws must enter the indentations previously made. A new assembly does not have these indentations, and must be assembled as follows:

1. See that the changer mechanism is out of cycle.
2. Turn the tone arm set down adjustment screw (see Fig. 2) as far as it will go in the clockwise direction.

MODELS S14012, S14014,
S14019, S14021

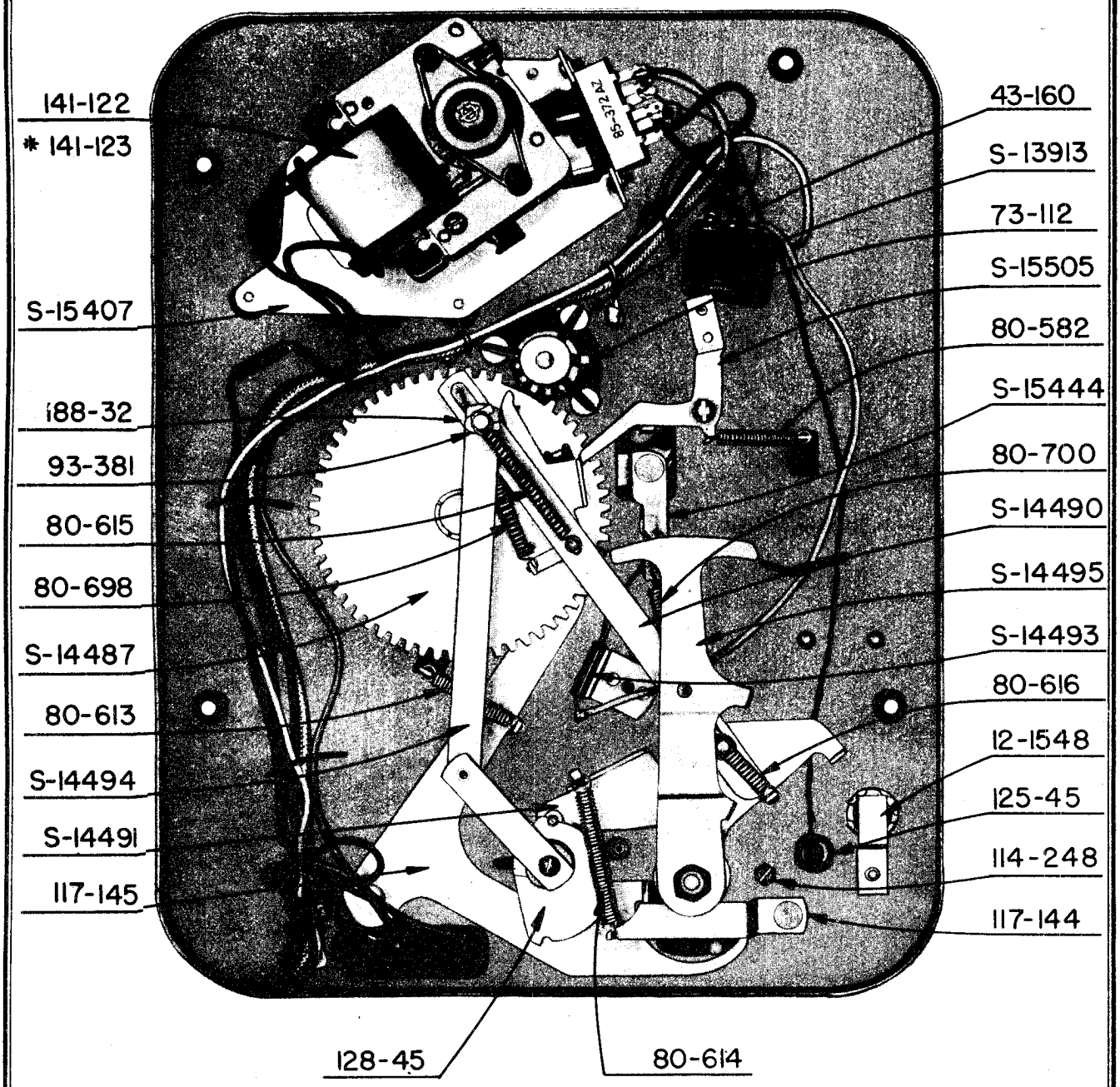


Fig. 4. Bottom View.

3. Insert the tone arm support shaft through its mounting hole.
4. Place a 12 inch record on the turntable and hold the Cobra tone arm housing against the edge of the record. Move the tone arm lever (Part No. S14495) to its maximum outward position. These two positions must be maintained during the next operation.
5. See that the tone arm lever bushing has approximately .005" inch play and tighten the slab head screws.
6. Adjust the tone arm set down adjustment screw (see Fig. 2) for proper landing of the needle.

REMOVING THE RECORD SHELF

The record shelf is removed by unscrewing the slab head screw at the bottom of its shaft and the machine screw which holds the record ejector link. When the unit is assembled, see that the changer is out of cycle and turn the slotted shaft until the record push off plate is retracted into its housing before attaching the record ejector link.

MODELS S14012, S14014, S14019, S14021

OPERATION OF DUAL SPEED MECHANISM

Figs. 5. & 6. illustrate the items involved in the two speed drive mechanism.

On 78 RPM operation the motor drive shaft comes in contact with idler wheel S15383 and in turn this idler wheel drives the turntable.

On 33 1/3 operation the motor drive shaft drives the idler wheel S15383. A flange on the lower portion of this idler wheel drives a second idler wheel S15382. This second idler wheel drives the slow speed drive plate on the turntable. See Fig. 6.

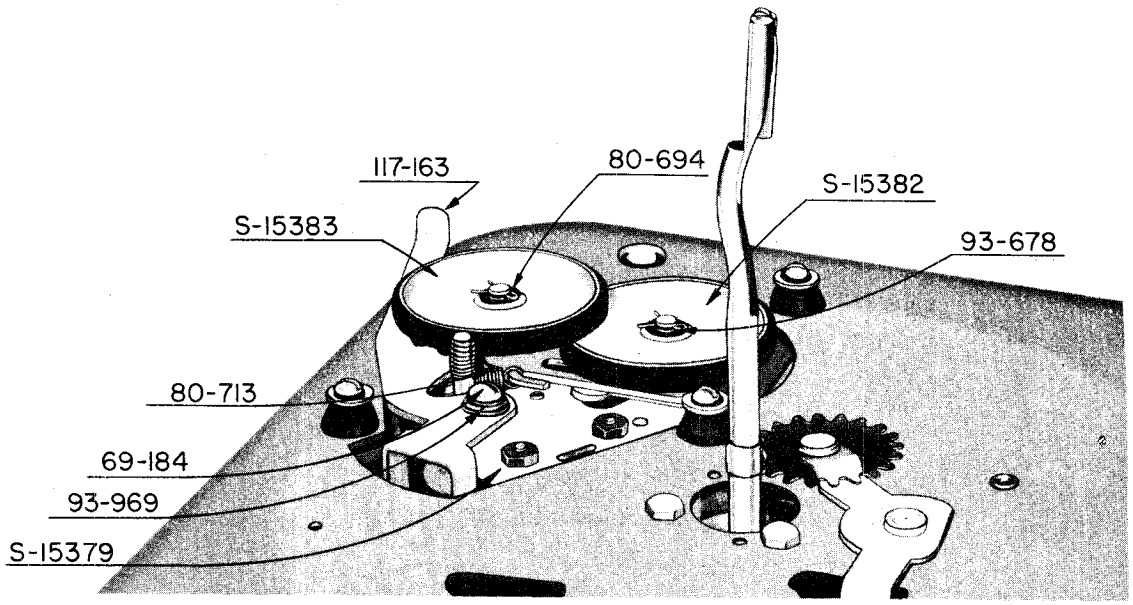


Fig. 5. Speed Changing Mechanism.

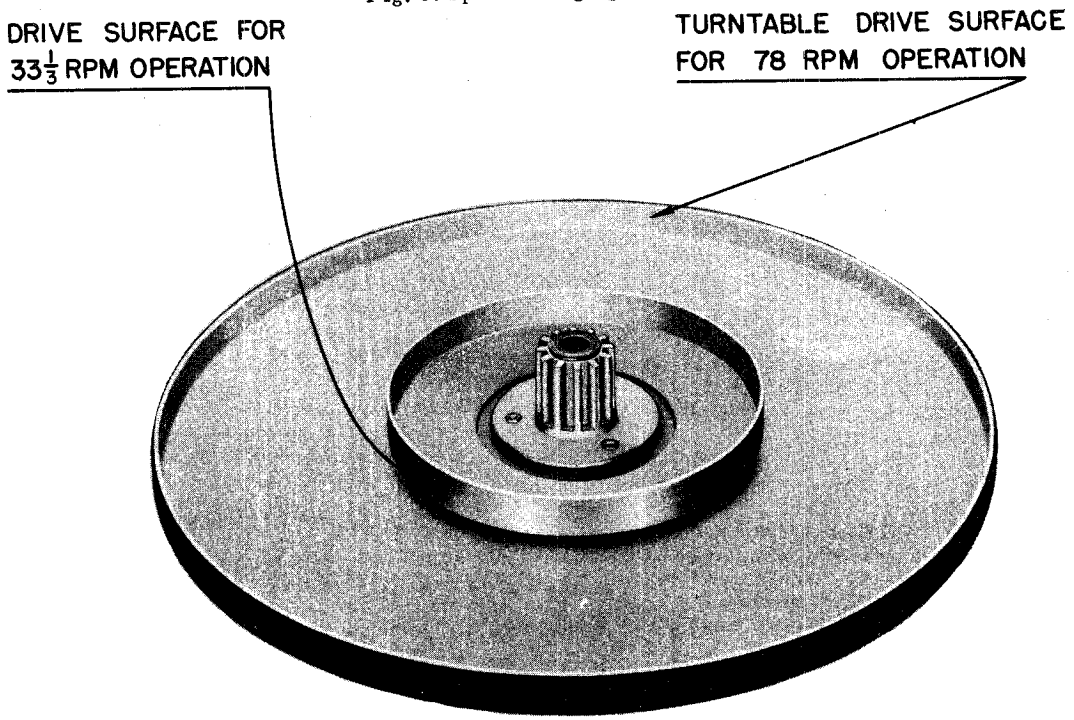


Fig. 6. Turntable Assembly S15411.

MODELS S14012, S14014, S14019, S14021

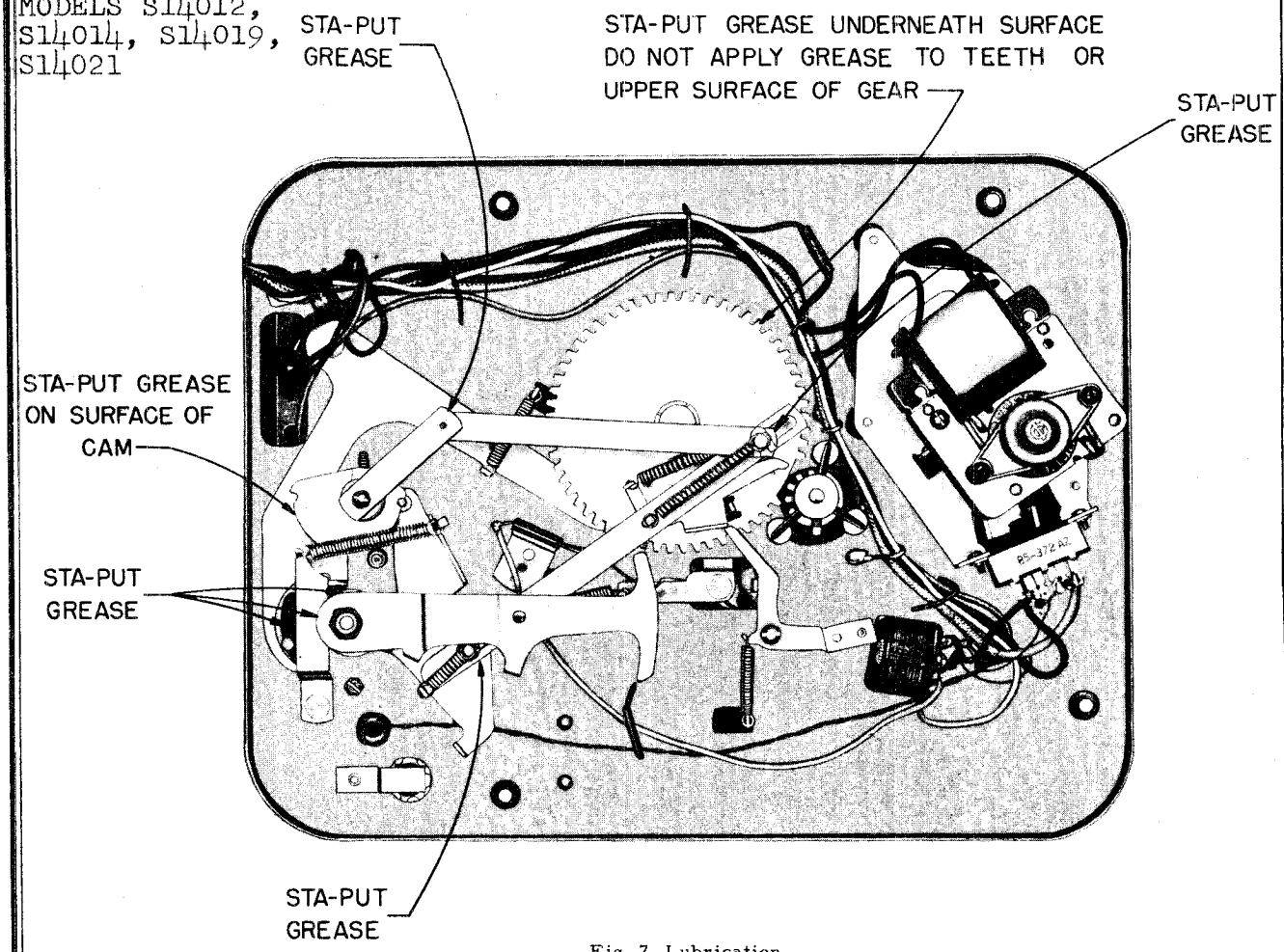


Fig. 7. Lubrication.

TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check the phono oscillator tube.
d. Check Needle Cartridge.
e. Check Tone Arm Housing for broken leads.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check electrical continuity of solenoid circuit.
d. Check the solenoid energizing voltage.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Remove packing strip. Loosen mounting bolts.

b. Motor retaining rings rubbing on the idler wheel.

c. Motor leads pulled too tight preventing motor from "floating" freely.

d. Noisy phono oscillator tube.

e. Impression on Idler Wheel.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment.

TONE ARM SETS DOWN TOO FAR IN OR OUT ON RECORD.

a. Check Tone Arm set down adjustment.

TONE ARM SET-DOWN POSITION VARIES.

a. Check Tone Arm Brake and Spring.
b. Tone Arm pivots loosely.

CHANGER CONTINUES TO CYCLE.

a. Check the trip switch adjustment.
b. Check Record Change switch.
c. Trip Pawl sticks.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Be certain that the record has an eccentric center groove.
c. Check the Trip Switch.
d. Check the solenoid energizing voltage.

SOLENOID FAILS TO TRIP MECHANISM.

a. Check the pawl lever positioning stud. The tip of the pawl must be in approximately the same position in relation to the gear pawl tooth lever as indicated at "A" in Fig. 4. If the position is not the same as indicated, the positioning stud can be bent slightly.

b. Tension on the trip pawl actuating spring too high.

MECHANISM JAMS.

a. Burr or sharp point on the gear pawl tooth. Smooth out with a small file.

MODELS S14012, S14014, S14019, S14021

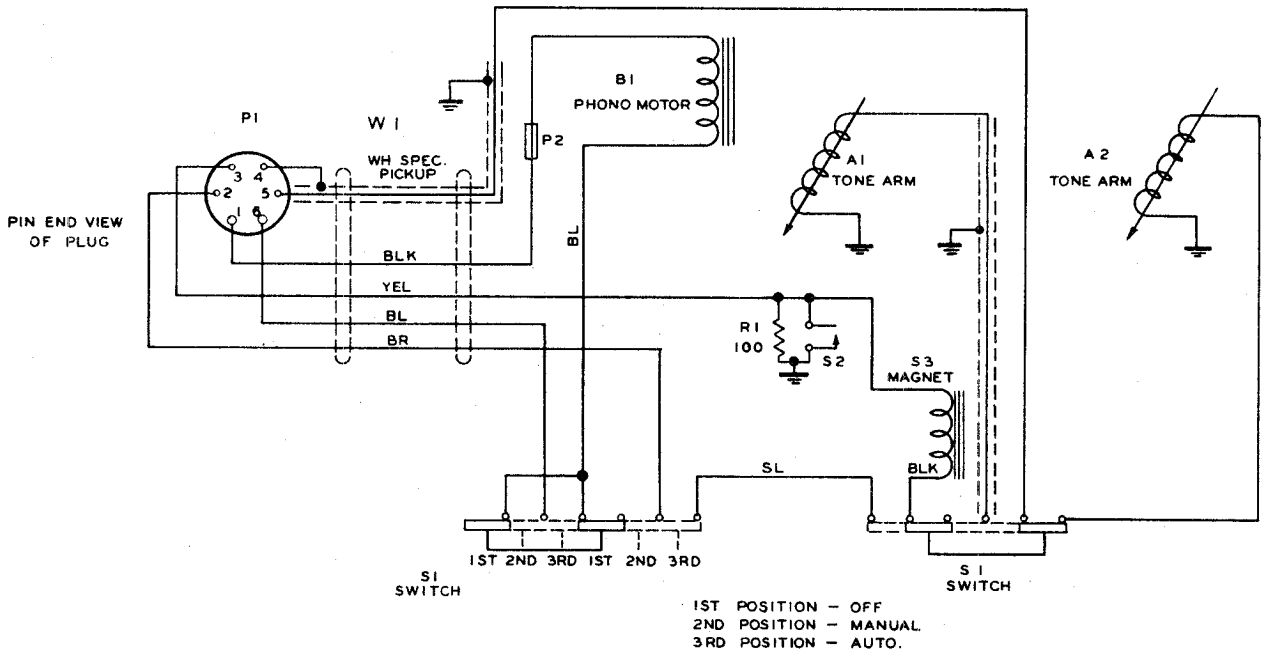


Fig. 8. Schematic Diagram S14012 Record Changer.

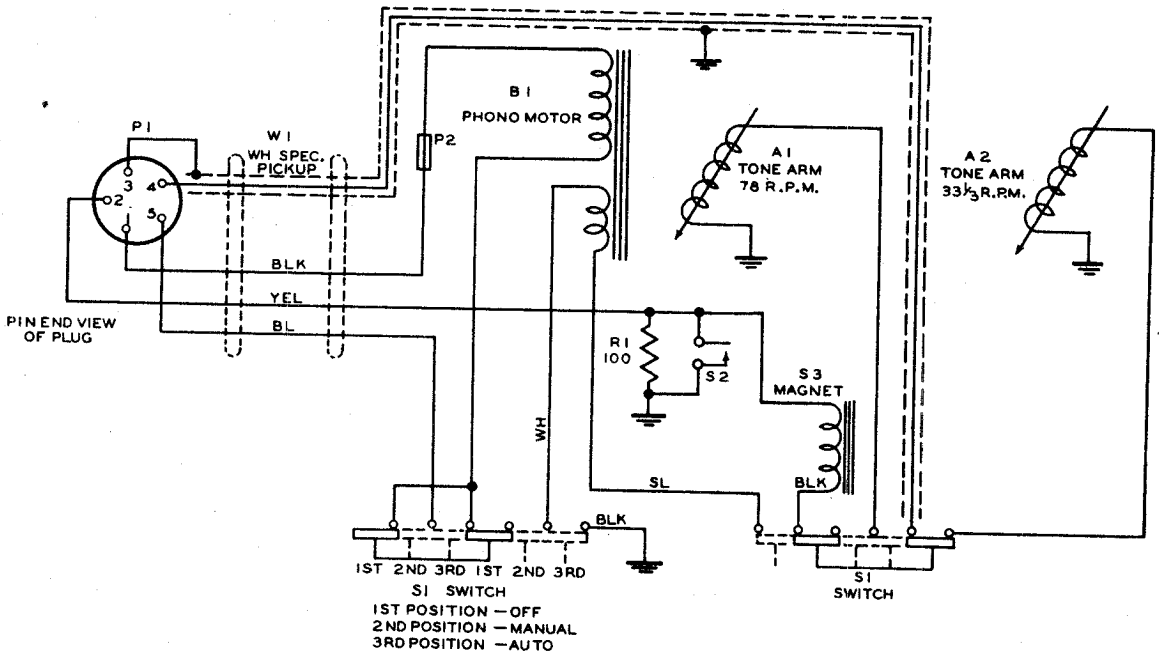


Fig. 9. Schematic Diagram S14014 Record Changer.

MODELS S14012, S14014, S14019, S14021

PARTS LIST FOR S-14012-14-19 and 21.

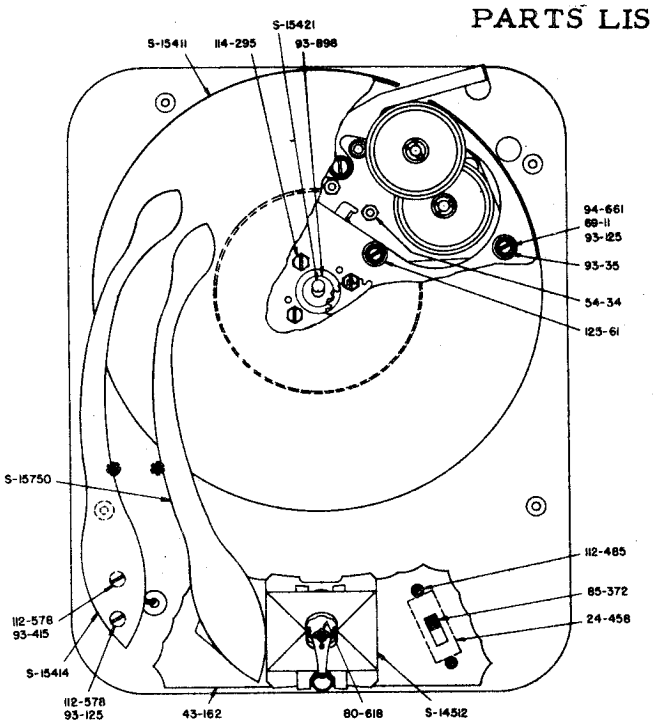


Fig. 10. Parts Identification, Top View.

17-81	Cable Clamp
*17-88	Cable Clamp
23-22	A.C. Wire Connector
24-458	Switch Cover
43-160	Turntable Gear Assembly
43-162	Record Ejector Housing
56-144	Socket Retaining Pin
*56-240	Groove Pin (2 used on S-14521)
57-1375	Record Push Plate
57-1577	Record Post Adj. Plate
*58-158	Five Prong Plug (Used on S-15466)
*58-166	Six Prong Plug (Used on S-15443)
63-1744	100 Ohm Ins. 1/2W. Res.
*64-430	Shoulder Rivet (6 used)
*64-431	Shoulder Rivet (2 used)
69-11	#6-32 X 3/4" R.H.M.S. Steel N.P.
69-43	#8-32 X 3/8" R.H.M.S. Steel N.P.
69-141	#5-40 X 1/4" R.H.M.S. Steel N.P.
69-184	#8-32 X 1/4" R.H.M.S. Steel Cad.
69-262	#8-32 X 1/2" Phillip R.H.M.S. Steel Stat. Bronze
73-99	#8-32 X 1/4" Slab. Hd. Set Screw Cone Pt (2 used)
73-112	#8-32 X 1/2" Slab. Hd. Set Screw Cuppoint
73-121	Special Set Screw
x73-123	Allen Hd. Set Screw - cone point
76-538	Tone Arm Shaft (33 1/3 R.P.M.)
78-561	Cartridge socket
*78-844	Socket (45 R.P.M. Adaptor)
80-582	Pawl Spring
80-605	Socket Tension Spring
80-609	Landing Adj. Spring
80-610	Switch Contact Spring
80-613	Lift Pin Lever Spring
80-614	Brake Spring
80-615	Tone Arm Link Spring (Long)
80-616	Tone Arm Link Spring (Short)
80-618	Pressure Arm Spring
80-619	Tone Arm Swivel Spring
80-631	Pawl Spring
80-645	Tone Arm Height Adj. Spring
80-650	Lever Spring (Fast Speed)
80-692	Detent Lever Spring
80-694	Idler Wheel Retaining Spring
*80-698	Pawl Spring
80-700	Oscillating Lever Spring
x80-737	Oscillating Lever Tension Spring
x80-738	Oscillating Lever Spring
x80-739	Trip Pawl Spring
83-1121	Felt Strip
85-372	Three Position Slide Switch
93-35	.032 X .144 X 3/8" Steel Washer N.P. (3 used)
93-53	1/32" X 11/64" X 3/8" Steel Washer N.P.
93-125	#6 Int. Shakeproof Lockwasher (5 used)
93-381	1/32" X 7/32" X 3/8" Steel Washer - Cad.
93-415	#6 Ext. Shakeproof Lockwasher
93-781	#8 Split Lockwasher Steel N.P.
93-876	Fibre Washer
93-898	Steel Washer
93-899	Steel Washer N.P. .025 X .129 X 5/16"
93-969	Spring Washer, Shakeproof
94-620	Stop Bushing
94-659	Tone Arm Shaft Bushing
94-661	Motor Mounting Bushing (3 used)
97-298	Trip Pawl Stud
97-301	Clutch Gear Retaining Stud
97-329	Change Lever Spring Stud
97-333	Change Lever Mounting Stud
112-485	#4-40 X 1/4" B.H.M.S. Steel Black Zinc Plate (4 used)
112-619	#2 X 5/16 R.H.S.T. Screw Cad. Plate Shakeproof Type #25 (3 used)
114-248	#6-20 X 5/16" Hex. Hd. Slotted S.T. Screw Steel Cad. (4 used)
114-295	#8-32 X 5/16" Hex. Hd. Slotted S.T. Screw Steel Cad. (4 used)
117-144	Brake Lever
117-145	Tone Arm Lift Lever
117-163	Speed Control Lever
117-164	Detent Lever
125-61	Rubber Grommet (3 used)
125-65	Rubber Grommet Pressure Arm
135-13	Counterweight
x135-14	Counterweight
128-45	Discriminator Cam
141-122	Phono Motor A.C. 110V 60 Cycle
*141-123	Phono Motor A.C. 110V 60 Cycle
148-83	Tone Arm Housing
148-96	Record Ejector Arm
148-97	Record Pressure Arm
148-109	Plastic Tone Arm Only
149-60	Magnet Core
x159-32	Plug Button
x159-73	Plug Button
x159-74	Plug Button
188-32	Retaining Ring
199-85	Tone Arm Sleeve
S-13913	Magnet Coil Assembly
S-14487	Clutch Gear Assembly
S-14490	Tone Arm Actuating Lever Assembly
S-14491	Discriminator Lever Assembly
S-14493	Trip Switch Assembly
S-14494	Record Ejector Link & Arm Assembly
S-14495	Tone Arm Lever Assembly
S-14499	Ejector Cam Shaft Assembly
S-14510	Record Support Plate & Post Assembly
S-14512	Pressure Arm & Mounting Assembly
S-14513	Tone Arm Shaft Assembly
S-14514	Tone Arm Bracket & Lift Pin Assembly
S-14516	Tone Arm Assembly (78 R.P.M.) or S-15428
S-14673	Hinge Plate Socket & Stop Assembly
S-15379	Motor Mounting Plate Assembly
S-15380	Speed Cnange Lever & Stud Assembly
S-15381	Detent Lever & Stud Assembly
S-15382	Idler Wheel Lever & Stud Assembly (Slow Speed)
S-15383	Idler Wheel Lever & Stud Assembly (Fast Speed)
S-15384	Idler Wheel Lever & Swivel Plate Assembly
S-15407	Dual Speed Mechanism Final Assembly - Complete
S-15411	Turntable Assembly
S-15414	Cobra Tone Arm Assembly (33 1/3 R.P.M.)
S-15421	Spindle Assembly (or S-14496 with 147-157)
S-15428	Cobra Tone Arm Assembly (78 R.P.M.)
S-15443	Cable & Plug Assembly
*S-15466	Cable & Plug Assembly
S-15444	Oscillating Lever & Gear Assembly
S-15451	Hinge Plate Assembly - Complete
S-15453	Hinge Plate & Socket Assembly
S-15454	Hinge Plate Assembly - Complete
S-15505	Trip Pawl Assembly
xS-15780	Red-Green Cobra Cartridge Assembly
12-1444	Socket Mounting Bracket
12-1447	Tone Arm Mounting Bracket (Upper)
12-1548	Tone Arm Shaft Pivot Bracket

* Denotes Parts Used On S-14014 Only

x Denotes Parts Used On S-14021 Only

Those that are blank denote parts used on S-14012, S-14014, S-14019 & S-14021

S14019 & S14021

MODELS S14012, S14014, S14019, S14021

The S14019 is identical to the S14012 except it uses a 50/60 cycle phono motor #141-124 motor and a 85-445 phono reject switch mounted on the record changer base plate. For 50 cycle operation the 60 cycle spring on the phono motor drive shaft must be replaced with a 50 cycle spring #80-732. See fig. 13 for electrical circuit.

The S14021 is identical to the S14012 except the S14021 has only one Cobra Tone Arm which contains a red-green cartridge. This cartridge allows both 33-1/3 and 78 R.P.M. 10" and 12" records to be played. 10" and 12" records can be played automatically but are not to be intermixed. The electrical circuit is shown in fig. 14.

To adjust the velocity trip switch assembly proceed in the following manner. Adjust trip pawl spring 80-739 so that the end of the spring is in line with an imaginary center line through the center of the shoulder rivet and the coil spring 80-738. (See fig. 12).

Rotate the turntable until the oscillating lever has moved as far to the right as possible. Spring 80-739 should just touch the ratchet on the tone arm lever assembly at a point that is 3/8" from the end of the lever (See fig. 12). The spring should be adjusted by bending it until it will conform to the prescribed limits. Only when the velocity trip switch assembly is adjusted in this manner will the changer trip properly.

When the tone arm fails to track, and jumps grooves, the pivot bearing pressure is too great, this inhibits the movement of the arm. This can be corrected by loosening the lock nut (See fig. 11) and with the use of an Allen wrench adjust the pivot bearing so it will be free enough to allow the tone arm to track properly. Holding the pivot bearing in this position, tighten the lock nut.

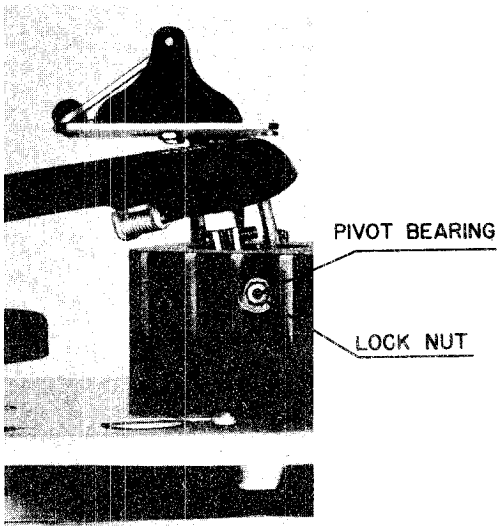


Fig. 11. Pivot Pressure Adjustment.

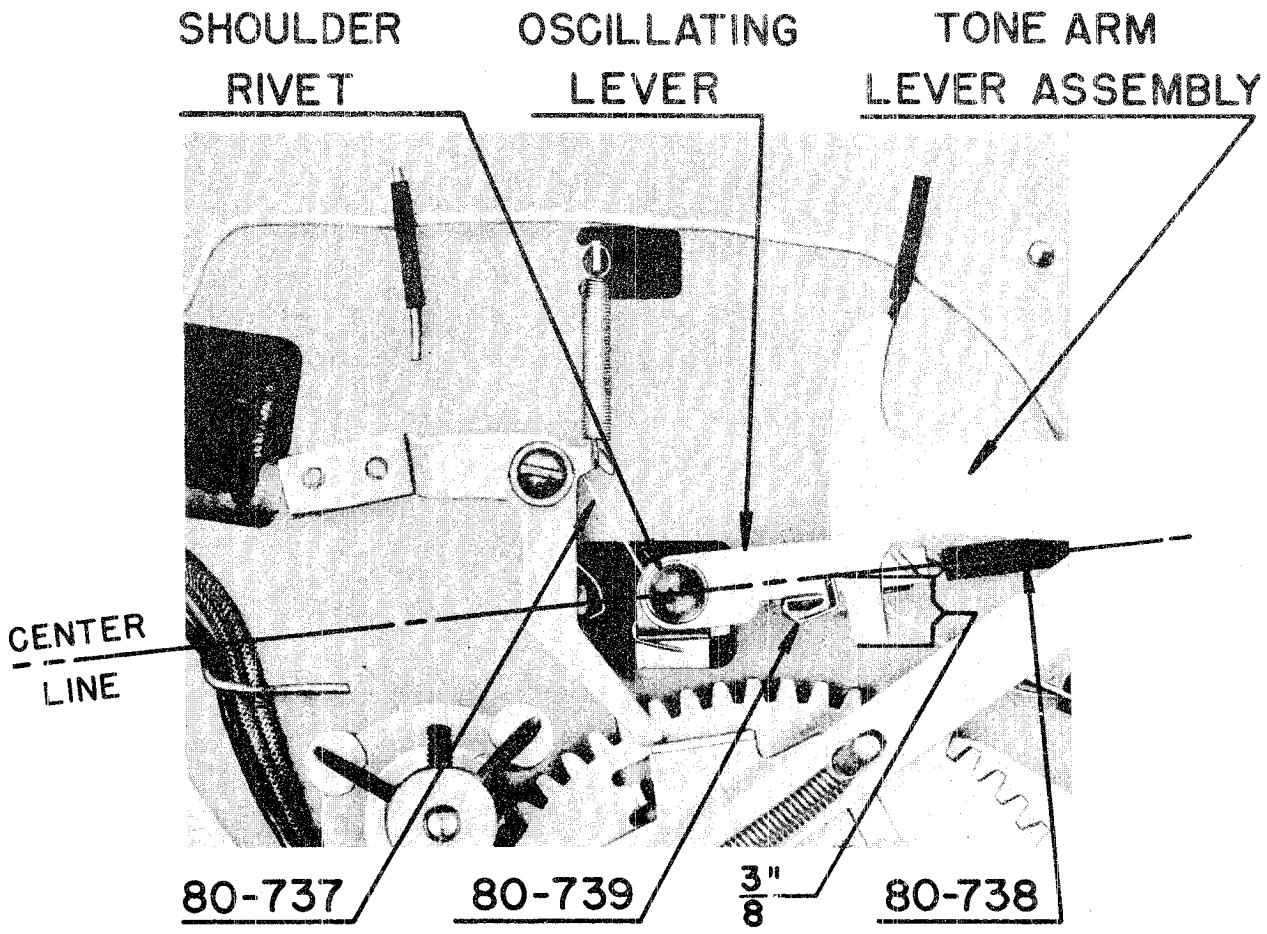


Fig. 12. Velocity Trip Adjustment.

MODELS S14012, S14014, S14019, S14021

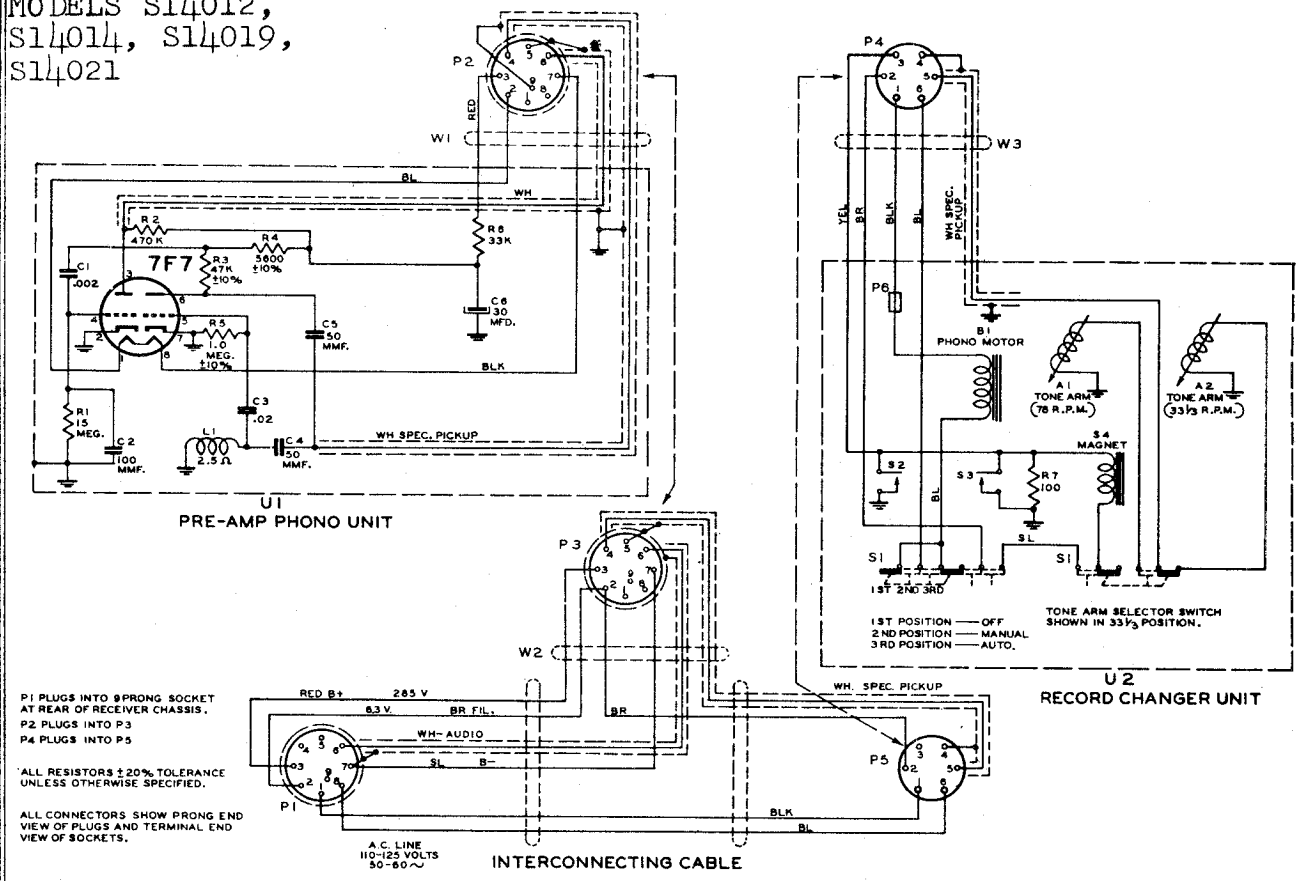


Fig. 13. Schematic For S14019.

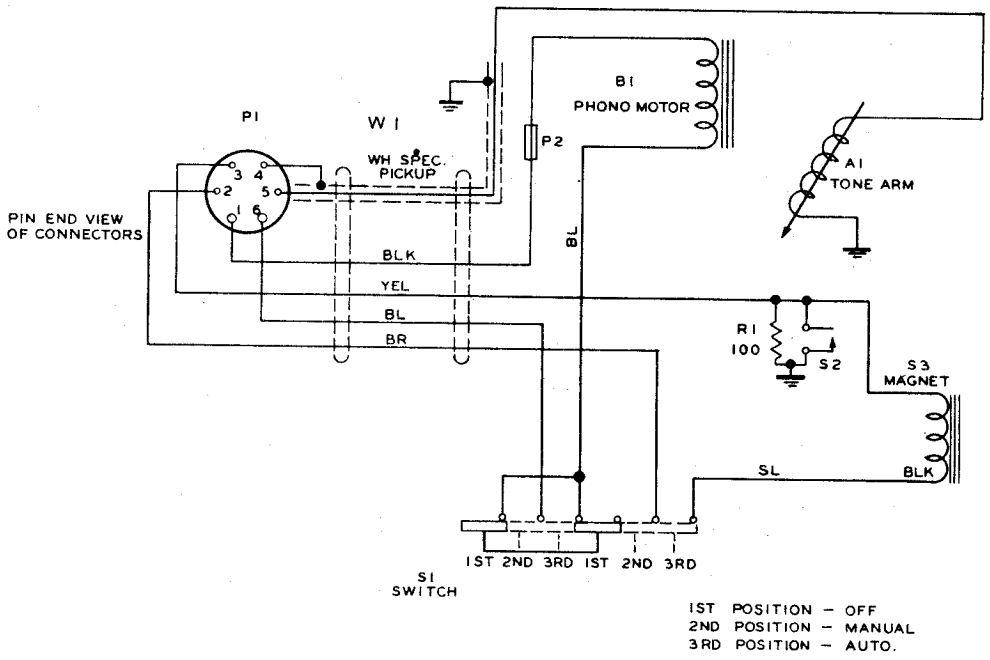
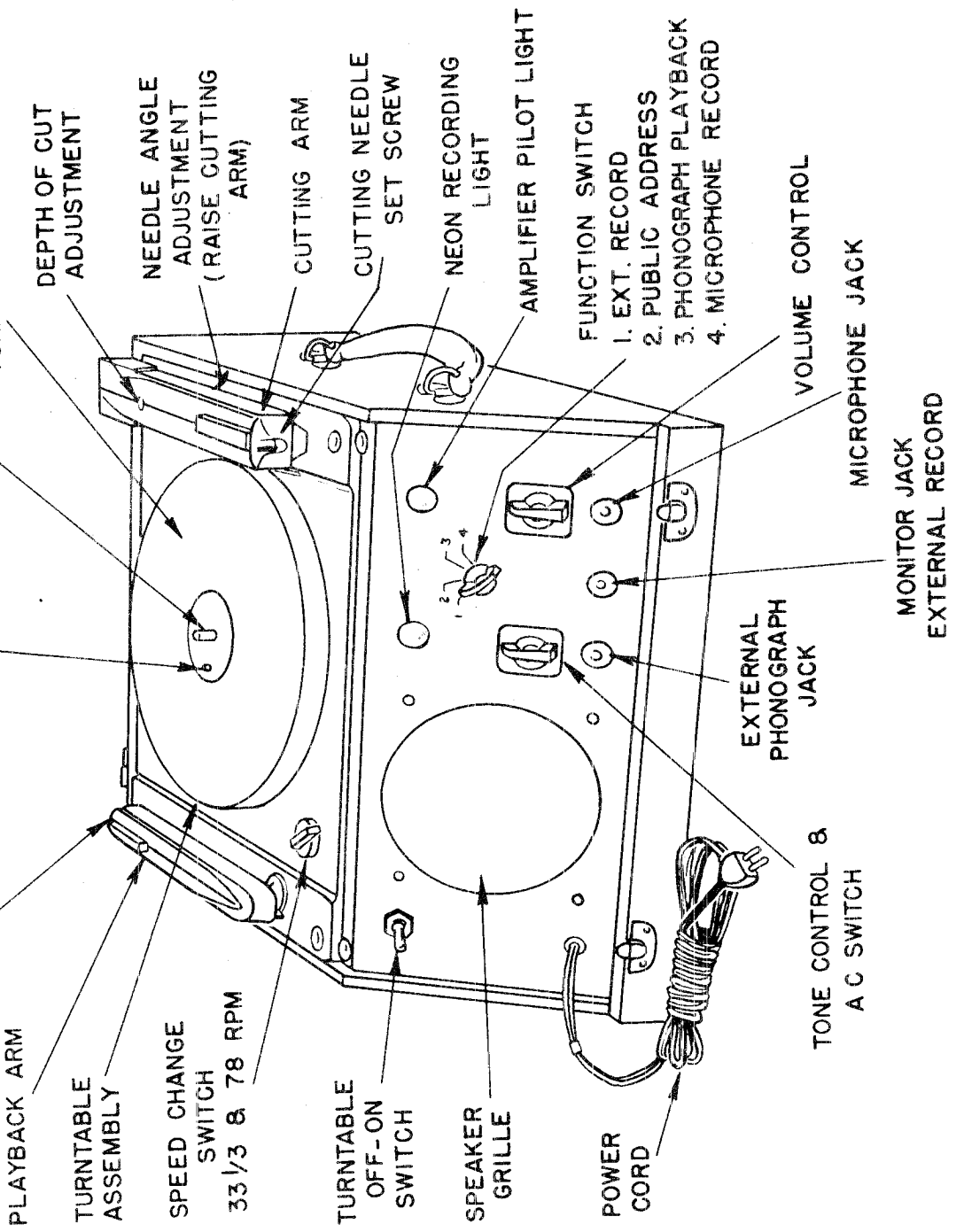


Fig. 14. Schematic For S14021.

MODEL RC-47



MODEL RC-47

General Description - (See Outline Illustration)

The Model RC-47 Bell Re-Cord-O-Fone is a compact, completely portable three-tube disc recorder and playback unit capable of many uses. Complete with crystal microphone and stand; it is ready to record any sound and provide immediate playback. The slanting panel allows easy access to all controls. Phone jacks permit quick and easy connection of additional devices. Adequate tone and volume control provide exceptional, natural reproduction in any recording situation.

Receiving Inspection

Immediately upon receiving your Re-Cord-O-Fone, please check to see that no damage has occurred in shipment. Mount turntable on spindle with idler pulley properly seated. For carrying, place microphone base on post over spindle to prevent turntable coming off.

Connect AC plug to source of power (115V 60 cycles). Turn on phono switch. Turntable should run smoothly on both speeds as selected by rotating green plastic knob on motor board. Microphone should be plugged in and various functions checked. Check cutter by touching needle with fingertip.

If unit fails to operate, remove top and bottom screws holding front panel and chassis. Lift up and outward. See that tubes are plugged in securely. Be sure turntable cable is plugged in tightly to rear of chassis. Reassemble.

SETTING UP RECORDER

Place recorder on solid level surface. An accidental jar during recording might cause the cutting arm to shift, thereby spoiling an otherwise good recording. Set microphone at level of speaker's face, at least 15" away. Do not attempt to make recordings in large hard-walled rooms. Good results will be had in average living room. For best results rehearse material to be recorded so that proper settings and procedure may be ascertained.

NOTE: Be sure to read "Operating Instructions and Auxiliary Information" sections before using this Recorder.

OPERATING INSTRUCTIONS

Recording with Microphone

Turn amplifier on by rotating "tone control" knob clockwise. Set volume control knob at zero. Insert mike plug in "microphone" jack. Set function switch at "microphone re-cord" and place mike in position for pickup. While subject is test performing, adjust "volume control" while watching neon light. Place recording blank on turntable being sure spring-actuated pin fits in one of the off-center holes in blank. Install new cutting needle. Be sure needle screw bears against flat side of needle. Turn on "turntable" switch and select proper speed, 33 1/3 or 78 r.p.m. Lower cutting arm on record and make test cut. Thread should throw toward center of record where rubber finger will cause it to wrap around spindle out of the way. Record may be played back at once.

NOTE: Care must be exercised at all times that this thread never gets under the turntable where it can be caught in the mechanism. This will cause irregular operation or complete stoppage.

External Record - (From Radio or External Amplifier)

Note: - Three methods are possible. Use one most suitable.

METHOD 1

To record from an external amplifier or radio, proceed as follows: Secure a two-wire cable to the voice coil of the radio (3-6 ohms impedance) or to low impedance output of amplifier. Connect a phone plug to free end, being sure grounded side of radio is connected through wire to sleeve or plug. Recorder amplifier is not used for this purpose but may be left turned on if desired. Insert plug in "external Re-Cord" jack and set function switch to "external re-cord". Adjust volume and tone controls of radio or amplifier for satisfactory results. Best results will usually be obtained with tone control on radio turned up for maximum "high" response. Re-cord as above.

NOTE:- Radio or amplifier must be capable of supplying 5 to 6 watts undistorted, in order to produce good recording. At this power level, considerable sound is produced by the loudspeaker.

METHOD II
(Preferred)

Connect as in Method 1 except insert plug in "external phonograph". Set function switch to "external re-cord" with recorder volume off. Adjust radio (or amplifier) volume to slightly above normal listening level and tone control for good treble response. Advance recorder volume control to proper level. Readjust controls if necessary. NOTE:- It may be necessary to reverse one or both AC plugs to secure lowest hum level.

METHOD III

Set up as for "mike record". Place mike 15" to 24" in front of, and to one side of speaker. Re-cord as usual. This method is the simplest to use but care must be used to prevent pickup of room noises.

External Re-cord from external Phone unit

Any record may be copies or re-corded on another blank. Proceed as follows: Insert plug from phono unit in "external phonograph" jack. Set function switch to "external record". Place record to be copies on other turntable and blank on recorder. Place external playback arm on record and adjust volume control on recorder. Start recorder turntable and re-cord as usual.

DUBBING

If desired, vocal comments may be added to (dubbed in) recordings by setting function switch to "mike re-cord" and speaking comments into the microphone. This procedure should be monitored by headphones in order to get good balance. Neither should be much louder than the other if good results are to be obtained. The external phone unit must have a separate volume control for this purpose. Adjust the microphone volume control first, then set the external volume control of phone or radio for proper.

PLAYBACK

Always use new needles on instantaneous recordings to prolong their useful life. Turn "turntable" switch on. Be sure turntable speed is correct for record being played. Turn function switch to "phonograph" position. Lower playback arm to record surface--do not drop. Adjust volume and tone for most pleasing results. Mike cable may be left plugged in. Any record up to 12" may be played back. (See Auxiliary Speaker paragraph)

MODEL RC-47

Public Address Usage

To use as a Public Address System, turn on amplifier by rotating "tone control" knob clockwise. Set function switch at "Public Address" position. Insert mike plug into "microphone" jack. Extend mike cable to full length or use extension cable to allow turning up volume control. In some applications it may be desirable to use external speaker and locate it at one side for better results. Adjust volume and tone controls for proper level. (See speaker on auxiliary speaker)

The speaker will howl if volume control is turned up to high and the microphone is too close to speaker. Separation of the two or turning down volume control is only cure.

External Phonograph

To use an external phono unit such as Bell Sound Models 10T, 10R or "C" with this recorder, proceed as follows: Terminate the shielded cable from the phono unit with a phone plug and insert into the "external" phonograph jack. Turn function switch to "phonograph" position. Adjust volume and tone controls for best results. (See paragraph on auxiliary speaker.)

AUXILIARY INFORMATION

Adjustment of Cutting Arm

There are two adjustments of the cutting arm; one to vary the needle pressure, and another to adjust the needle angle. These are necessary because needle length and blank material and thickness vary. They are interlocking to a slight extent and it may be necessary to recheck one after varying the other. Do not attempt to change these adjustments until the following is thoroughly understood.

Refer to the outline drawing. The needle pressure adjustment is made by turning the screw in the top of the cutting arm. Turning clockwise increases needle pressure and vice versa. The needle pressure should be such that a thread approximately the size of human hair is produced. It should be straight, not curly or fuzzy. The latter condition may also denote a damaged cutting needle.

The other adjustment is found when the cutting arm is raised to a vertical position. The bolt with locknut may be turned so that the end of the cutting arm is raised or lowered. This varies the angle which the needle makes with the vertical to the blank. The cutting surface of the needle should be at a 90° angle to the blank. This may be checked by setting the cutting needle on an uncut blank and raising or lowering the arm until the face of the needle and its reflection form a straight line.

If the needle pressure is too much or the angle wrong, the needle may be forced through the coating with damage to tip. It may also slow down the turntable and cause "wows". If the pressure is too little, the groove will be too shallow to hold the playback arm, causing it to slide across the record.

Recording Level

It is quite important that the recording level be carefully adjusted, otherwise results will be discouraging. Three factors govern the strength of the signal delivered to the recording head:

(1) Setting of volume control; (2) loudness of sound; and (3) distance from microphone. If the voltage to the cutting crystal is too great the crystal

may be damaged and the record groove walls broken down. If this voltage is too small the playback will be weak and noisy. Also, needle scratch and motor rumble may interfere with the recorded sounds.

To help the operator correctly adjust this voltage a neon light is provided. This begins to flash when the volume control is set right. Proper adjustment is made when the lamp flashed on the louder parts and goes out on the softer. Too much volume will light the bulb continuously and even cause it to have a bluish glow.

NOTE:- Riding the level or continuously adjusting the volume during the recording is not recommended. Adjustment should be made so that the loudest passage will be recorded satisfactorily.

An AC voltmeter may be plugged into the monitor jack and the average volume set at approximately 1.5 volts. Loudest sounds should not cause the meter to read more than 2.0 volts.

Crystal headphones may be plugged into this monitor jack and the quality and balance of the recording judged.

Needles

Sapphire cutting needles should be used for best results. Stellite and steel needles may be used with poorer results and shorter useful life. Sapphire, precious metal tipped or steel needles may be used for playback. Personal preference should be guide in selection. Useful life will usually be in proportion to cost. Never use worn or damaged playback needles on instantaneous recordings. Never use thorn, cacti, or fibre needles on acetate recordings.

Cutting Blanks

Best results are had with metal or glass base blanks. Paper base blanks are adequate for test purposes or where not much importance is given the finished product. They are also cheaper while learning. As the operator becomes expert he will find that the more expensive blanks are necessary for best results.

On good blanks, the coating is thick enough that a deep cut will not allow the needle to catch in the base or be dulled or broken. Bubbles, surface irregularities or warping are enough to reject any record.

It may be necessary to adjust both depth of cut and angle on blanks of different manufacturers, even when using the better makes of recording discs. (See section on adjustment of cutting arm.)

Auxiliary Speaker

If desired, an external speaker in suitable housing may be connected in place of the built-in speaker. Terminate cable with phone plug and insert in monitor jack. Better volume and tone as well as a more advantageous speaker location will result. It should have an impedance of 3.4 ohms to properly match output of amplifier.

Speed - 78 or 33 1/3 R.P.M.

Best results will be had when recording music at 78 r.p.m. However, where material to be recorded is long or where highest fidelity is not necessary, the lower speed will allow more recording on a given blank. Recording should not be started too near the outer edge because of irregularity of coating; nor, carried too close to label because of loss of tone quality.

MODEL RC-47

Consult table below for specific date.

Blank Size	Speed (r.p.m.)	Outer Margin	Recording Time	Width
10"	78	1/4"	4 1/2 Min.	3
10"	33	1/4"	11 "	3
12"	78	5/8"	5 1/2 "	3 1/2
12"	33	5/8"	12 1/2 "	3 1/2

Routine Care

While these units are quite sturdy, they should not be subjected to unnecessary rough treatment. Playback and cutting arms should be handled carefully. Neither should be dropped on turntable, nor should the needles be struck against any part. Such treatment may damage either the needle or cartridge or both.

Periodically, the turntable should be raised and any dust and cutting threads removed. Oil motor and idler pulleys with a few drops of light oil, being extremely careful not to apply oil on rubber pulley tire. Microphone cords should be checked for loose connections. Tubes should be checked and doubtful ones replaced.

Playback and cutting crystals and the microphone are sensitive to heat and should never be subjected to temperatures greater than 120° F. Continued exposure to direct sunlight should be avoided.

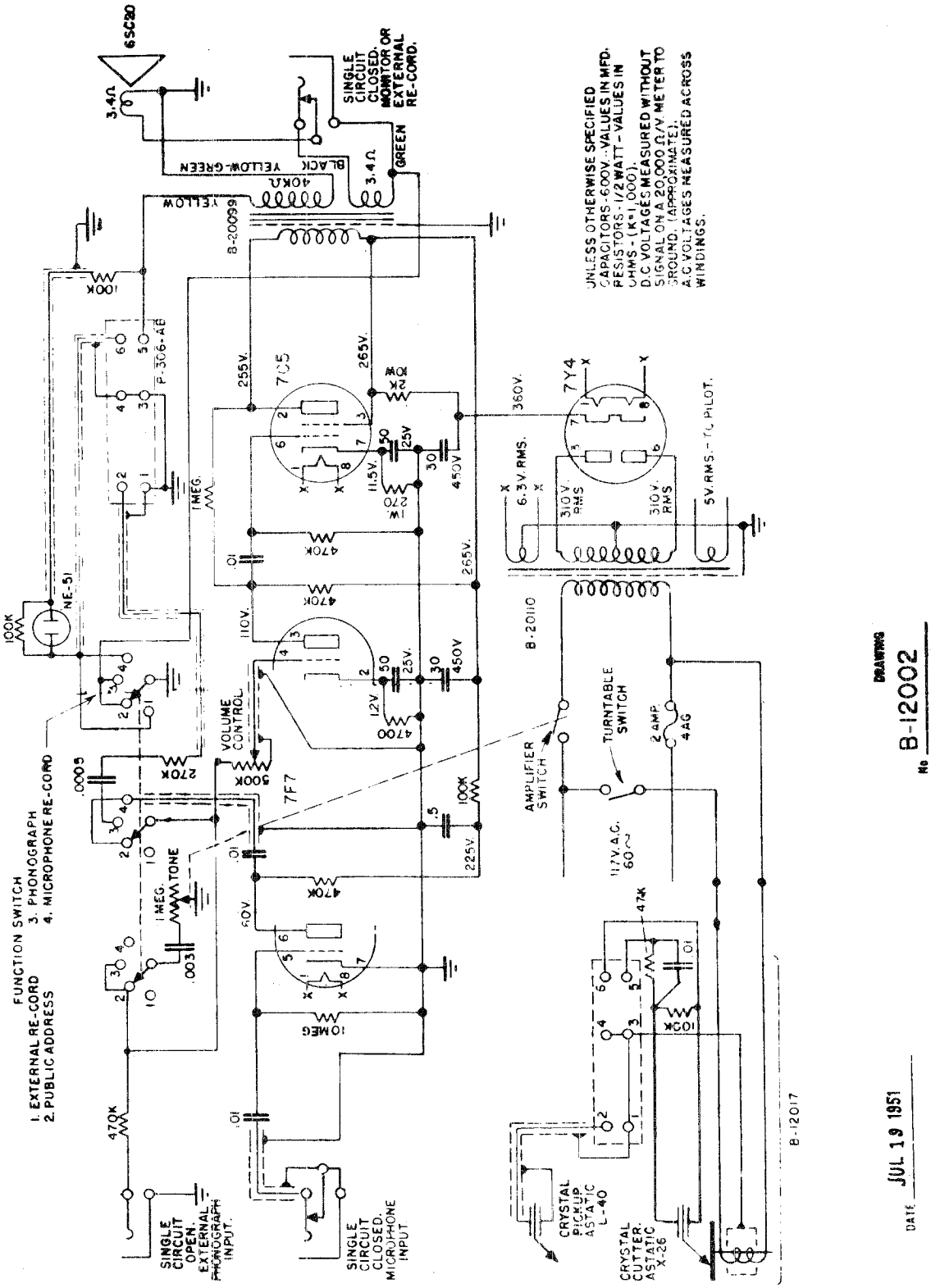
Repair - General

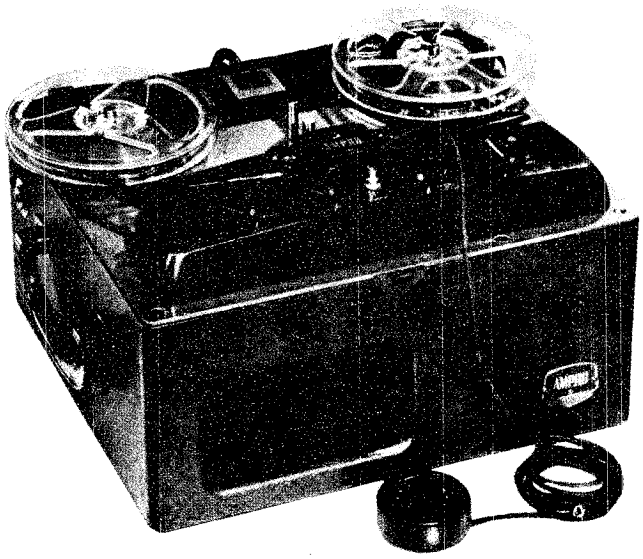
1 - Inspect visually.
2.- Check tubes - replace bad or doubtful ones.
3 - Mike voltage and continuity tests with aid of schematic.
4 - Check all electrolytic condensers on reliable bridge. Check coupling condensers, especially to output tube grid. Replace those bad or doubtful.

Phono Unit

5 - If phono is suspected, check motor speed using stroboscope disc under neon or fluorescent lights. Speeds should be 78 or 33 1/3 r.p.m. and steady. Motor should run quietly. Remove dirt or threads and oil.
6 - To check for defective playback cartridge; While playing record, place finger near end of pickup, press lightly downward and a cross grooves. If crystal is O.K., volume will change only slightly; if broken, volume will change considerably. If no volume, check input to amplifier. Hum will be heard if finger is touched to ungrounded amplifier lead after disconnecting cartridge. Replace cartridge.
7 - To check cutting crystal; If neon light indicates voltage present, cutting needle in the chuck will be felt vibrating. If voltage from amplifier is not available, the leads may be connected to the 115 volt AC supply where again the needle will vibrate. For quality tests, substitute a new cartridge and compare.

MODEL RC-47





INTRODUCTION

Tape Recorders will be delivered to you for servicing for one of three reasons: one, unsatisfactory performance due to operational errors on the part of the user, two, periodic inspection and maintenance, and three, unsatisfactory performance due to wear or failure of components.

Proper operating procedures are described in detail in the operator's instruction book and need not be repeated in this manual. The first section of this manual deals with the routine inspection and protective maintenance of the device. The second section deals with trouble shooting and refers to the applicable material describing the correction of trouble, which constitutes the third section. The fourth section describes the procedures for inspecting and adjusting the device after the repair work has been completed. The final section contains a parts list and information relative to the procurement of parts.

SECTION I

Periodic Inspection and Protective Maintenance

A. CLEANING

Dirt is the cause of many irregularities in performance. Therefore, it is advisable to clean all parts in the path of the tape before attempting to inspect or test the equipment.

1. Remove the control panel using the procedure described in Section III Par. A.

2. Wipe the tape guide stud (95), guides on tape erase lever (98), erase head (67) (surface which contacts the tape), sound head (81), capstan (52), and the pressure roller (74) with a cloth dampened with carbon tetrachloride.

> WARNING: DO NOT USE FIRE EXTINGUISHER FLUID OR OTHER SOLVENTS; SUCH MATERIALS MAY EITHER LEAVE A COATING ON THE PARTS, DAMAGE THE PARTS OR LOOSEN ADHESIVES USED IN ASSEMBLING PARTS.

3. Wipe the pressure pads (78) with a cloth dampened with carbon

tetrachloride. Wipe in the direction of tape travel and be careful not to catch the cloth on the pressure springs or bend the springs.

4. Blow any dust or dirt out of the exposed mechanism. DO NOT DIRECT A STREAM OF AIR AGAINST THE PRESSURE PADS.

B. INSPECTION AND TESTING

1. Check the exposed mechanism for loose screws. Tighten any loose screws EXCEPT DO NOT DISTURB SCREWS ON THE ERASE HEAD ASSEMBLY OR THE SCREW OR NUT WHICH HOLD THE SOUND HEAD IN PLACE.

2. Thread the recorder with tape and make a test recording using procedure described in the operating instructions.

> NOTE: The owner's previously recorded tape may be used to determine what he is complaining about. However, you should make a separate recording in order to make an actual test of the recorder under controlled conditions and assure yourself that his complaint is not traceable to operational errors. Play back the recording which you made and note any irregularities on tape movement, quality of reproduced sound and unusual background noises if present. Also check operation of the controls. If any irregularities in performance are noted, refer to Section II for probable cause and remedy.

C. LUBRICATION

The operator has been instructed not to lubricate this device and has been referred to the service technician for this service which should be on an annual or 500 operating hour basis.

> WARNING: Do not use lubricants other than those specified or in excess of the amounts specified. Excessive lubrication will cause slippage in the drive system. USE A WATCHMAKER'S OIL APPLICATOR OR A BROOMSTRAW - NEVER USE AN OIL CAN.

1. CAPSTAN SHAFT (52) - Apply one drop of Amproil or pure mineral instrument oil to outer end of each bearing. Allow mechanism to run until oil works into the bearing. Then WIPE EXPOSED PORTIONS OF SHAFT TO REMOVE ANY OIL FROM THEM AND CLEAN FLYWHEEL TIRE AND CAPSTAN WITH CARBON TETRACHLORIDE.

2. MOTOR BEARINGS - Apply two drops of Amproil or pure mineral instrument oil to each motor bearing.

> WARNING: The bearings are equipped with wicks, oil the bearings, not the shaft - oil on the shaft will cause slippage. AFTER OILING, WIPE MOTOR SHAFT AND THE FLYWHEEL TIRE WITH A CLOTH DAMPENED WITH CARBON TETRACHLORIDE.

3. TAKEUP SPINDLE (36) - Apply one drop of Amproil or pure mineral instrument oil to the shaft at the end of the bearing adjacent to the pulley—allow mechanism to run and wipe all oil off of pulley and belt.

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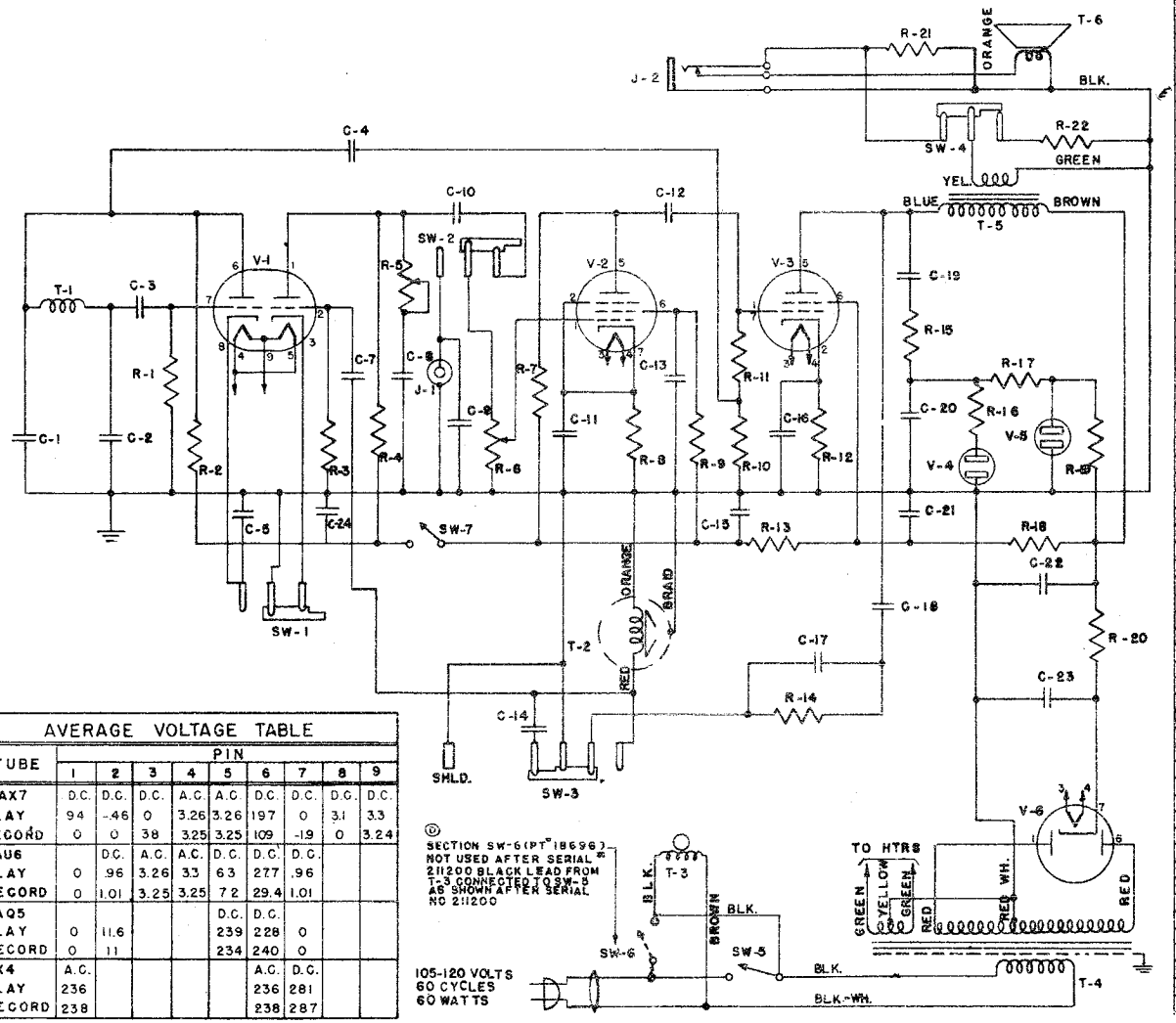

AVERAGE VOLTAGE TABLE

TUBE	PIN								
	1	2	3	4	5	6	7	8	9
12AX7	D.C.	D.C.	D.C.	A.C.	A.C.	D.C.	D.C.	D.C.	D.C.
PLAY	94	-46	0	3.26	3.26	197	0	3.1	3.3
RECORD	0	0	38	3.25	3.25	109	-19	0	3.24
6AU6		D.C.	A.C.	A.C.	D.C.	D.C.	D.C.		
PLAY	0	.96	3.26	3.3	63	277	.96		
RECORD	0	1.01	3.25	3.25	72	29.4	1.01		
6AQ5					D.C.	D.C.			
PLAY	0	11.6			239	228	0		
RECORD	0	11			234	240	0		
6X4	A.C.					A.C.	D.C.		
PLAY	236					236	281		
RECORD	238					238	287		

VOLTAGE AT JUNCTION OF R-20 & C-22:
PLAY: 259
RECORD: 260

NOTE: LINE VOLTAGE 115 VOLTS 60 CY. MEASUREMENT OF ABOVE VOLTAGES MADE WITH 20,000 OHMS PER VOLT METER.

MARK	PART No	DESCRIPTION
C-1	18733	CAPACITOR-.0027MFD. 400V. CERAMIC
C-2	18731	" .02 MFD. 400V. PAPER
C-3,4,9	18689	" .0005MFD. 500V CERAMIC
C-6,13,	18732	" .03MFD. 400V PAPER
C-7	18739	" .007MFD. 200V. PAPER
C-8	17782	" .01 MFD. 400V. PAPER
C-10,12	18687	" .01MFD. 400V. CERAMIC
C-11,16	18716	" 80MFD. 15V. ELECT. BNK. I
C-14	18091	" .001 MFD. 600V. PAPER
C-15,21	18716	" 4MFD. 350V. ELECT. BNK. I
C-17	18773	" .0003MFD. 600V. PAPER
C-19	18688	" .005MFD. 400 V. CERAMIC
C-20,24	18685	" .001MFD. 400 V. CERAMIC
C-22	18715	" 30MFD. 350 V. ELECT. BNK. II
C-23	18715	" 10 MFD. 350V ELECT. BNK. II
C 18	18492	" .033MFD 600V. PAPER
R-1, 17	18474	RESISTOR - 470K. 1/2 WATT CARBON
R- 10,15	18471	" 100 K. " "
R-3	17554	" 10 MEG. " "
R-4,16	17959	" 220K. " "
R-5	18777	CONTROL - TONE 50 K. CARBON
R-6	18709	" - VOLUME 500K. CARBON
R- 7	18467	RESISTOR - 560 K. 1/2 WATT CARBON
R-8	18582	" 2700 OHM " "
R-9	18436	" 1.8 MEG. " "
R-11, 19	18729	" 390K. " "
R-12	18770	" 270 OHM 1 WATT CARBON
R-13	18583	" 22 K. 1/2 WATT CARBON
R-18	18653	" 2700 OHM 1WATT CARBON
R-20	18772	" 390 OHM 2WATT CARBON
R-21	18771	" 33 OHM 1 WATT CARBON
R-22	18718	" 3 OHM 5WATT WIRE WOUND
V-1	18497-S	TUBE - 12AX7 (SELECTED)
V-2	18699	TUBE - 6AU6
V-3	18701	TUBE - 6AQ5
V-4,5	16915-1	LAMP - INDICATOR NE-51 (SEASONED)
V-6	18700	TUBE - 6X4
SW-1	18786	SWITCH, RECORD-LISTEN (PART OF BNK. I)
SW-2	18786	" " " "
SW-3	18786	" " " "
SW-4	18786	" " " "
SW-5		SWITCH, AMPLIFIER (PART OF R-6)
SW-6	18696	SWITCH, MOTOR
SW-7	18696	" "
T-1	18784	COIL, OSCILLATOR
T-2	18737	HEAD, TAPE RECORDER
T-3	18787	MOTOR
T-4	18728	TRANSFORMER, POWER
T-5	18782	TRANSFORMER, OUTPUT
T-6	18775	SPEAKER, TAPE RECORDER
J-1	18708	JACK - PHONO. - MIC
J-2	18769	JACK - EXT SPEAKER

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4. PRESSURE ROLLER SHAFT (pt. of assem. #74) - Wash with carbon tetrachloride then dry thoroughly and apply one drop of Amproil and rotate roller to work into the bearing. Wipe surplus oil off of roller and bracket.

5. ACTUATING COLLARS (16 & 63) - Use a toothpick to apply a thin film of " Lubriplate" or light graphite grease to those surfaces where sliding action occurs.

6. CONTACT SURFACE BETWEEN PRESSURE PAD BRACKET (78) AND PRESSURE ROLLER BRACKET (74) - Use a toothpick to apply a thin film of " Lubriplate" or light graphite grease to the working surfaces.

SECTION II

Trouble Shooting

In this recorder, like any other electro-mechanical device, many things could happen which would affect performance. The purpose of the following table is to group the troubles which may be encountered in as few groups as possible and indicate the probable cause and corrective action to be taken.

TROUBLE AND REMEDY TABLE

Trouble	Probable Cause	Remedy
1. Low pitch	Tape speed is below 3 3/4" sec.	Check Drive (Sec III C-4) Check pressure pads (Sec III C-3) Check Capstan Follower Check Feed Spindle
2. No high frequencies and distortion	Tape not in contact with sound head. Improper Azmuth adjustment Amplifier trouble Improper Guiding Pressure roller actuator has slipped	Damaged head Worn Pressure pad See Sec. IV A Check Amp. (Sec III C-1)

Trouble	Probable Cause	Remedy
3. Varying pitch (Wows)	Feed reel jerks Worn or loose feed guide Worn Capstan bearings Worn or improperly adjusted pressure pads Bent or worn erase lever Eccentric Capstan or Flywheel Tire Bent motor shaft Sound head loose in shield Dirty or worn takeup mechanism Improper guiding Worn takeup drive belt Rewind lever engaged Worn guide surfaces in soundhead	Check felt feed spindle disc Rotate or replace, or tighten (Sec. III C-4) Replace Replace (Sec. III C-3) Replace or repair Replace or exchange (Sec. III C-4) Replace motor (Sec. III C-4) Tighten Clean or replace (Sec. III C-4) Check tape for weaving Replace (Sec. III C-4) See operating instructions Replace
4. Takeup doesn't operate	Dirty or worn friction washer Takeup drive belt off pulleys Takeup drive belt broken or worn out	Clean or replace spindle (Sec. III C-4) Replace Replace
5. Can't thread recorder	Loose pressure roller actuator collar Bent pressure pad springs	Adjust or tighten (Sec. III C-3) Adjust
6. No sound on playback	Loose erase lever actuator collar Amplifier trouble	Adjust and tighten (Sec. III C-3) Plug in mike, switch to "Record" position, turn on motor switch if feedback occurs, check T-2 and input section of V-1. If no feedback, check SW-4, "B" supply & SW-2.
7. Playback OK-won't record	Damaged mike, cable or receptacle Failure of SW-1, 2, 3, or 7 Oscillator section of V-1 not functioning C-4, 17 or 18 open V-4 damaged	Repair Repair or replace (Sec. III C-1) Check and repair Check Replace BOTH V-4 and 5 (Matched set)

Trouble	Probable Cause	Remedy
8. Excessively noisey recordings	C-18 leaking Worn erase pad Recording level too low Weak oscillator or C-4 off value Loose connections in amplifier Damaged mike or mike receptacles Noisey switches Erase head not properly adjusted	Replace Replace (Sec. III C-3) Check V-4 (Replace V-4 & 5 Matched set) Check Check all connections Check Check switch contacts Adjust (Sec. III C-2)
9. Excessive 120 cycle hum	Open filter capacitor Hum shield not bearing on sound head	Check C-15, 21, 22, 23 Check spring
10. Excessive 60 cycle hum	Damaged tube Hum shield not bearing on sound head	Check tubes for heater to cathode leakage Check springs
11. Low gain and distortion	C-18 leaking Damaged 6AQ5 Damaged coupling or decoupling capacitors Poor contact in switches Incorrect recording bias Open cathode bypass capacitor Damaged output transformer Erase head requires adjustment	Replace Check tubes Check Clean or replace Check recording bias Check capacitors Replace Adjust (Sec. III C-2)
12. Microphonics	Sustained (defective 12AX7 or 6AU6)	Replace with selected tube
13. Oscillation	Damaged 12AX7 C-11 or C-16 open	Replace Replace

SECTION III

Service Procedures

A. EXPOSURE OF WORKING COMPONENTS

1. Removal of control panel - loosen the setscrews and lift off the four control knobs (9), then take out the three panel retaining screws (11) and lift off the control panel (10).

2. Removal of recorder from case.

   a. Take out the six screws which hold the tape reel panel (7) in place.

   b. Take out the six retaining screws (8).

   c. Lift recorder assembly out of case.

   d. Remove hex nut, "External Speaker" nameplate, and speaker jack (24).

   e. Remove the four hex nuts, lockwashers and burr washers and lift out the speaker (2).

3. Removal of Amplifier Cover.

   a. Take out the seven cover screws (13) and remove the amplifier cover (12).

B. REMOVAL OF THE MAJOR UNITS

1. Removal of Amplifier Assembly

   a. Complete procedure A.

   b. Loosen setscrew (17) and remove erase lever actuator collar assembly (16) and spring (18).

   c. Place recorder on its side (controls down).

   d. Unsolder recording head cable from the two terminals on the "Play - Record" switch. Mark the terminals.

   e. Remove the three nuts and washers from the amplifier stop screws.

   f. Remove the four screws (26) and grommets (25) which hold the amplifier to the mechanism plate.

   g. Pull the amplifier back away from the mechanism plate and disconnect the amplifier leads from the terminals of the motor control switch.

   h. Disconnect the two motor leads from the amplifier (one was connected to SW-6 in the initial run).

   i. Disconnect the ground wire from the upper flywheel bracket.

2. REMOVAL OF TAPE RECORDER DRIVE ASSEMBLY

   a. Complete procedures A-1, A-2, and A-3.

   b. Remove the motor lock shaft stud (5), lock key (4) and spring.

   c. Remove hex nut (31) and washer (30) then remove the motor plate actuator assembly (27).

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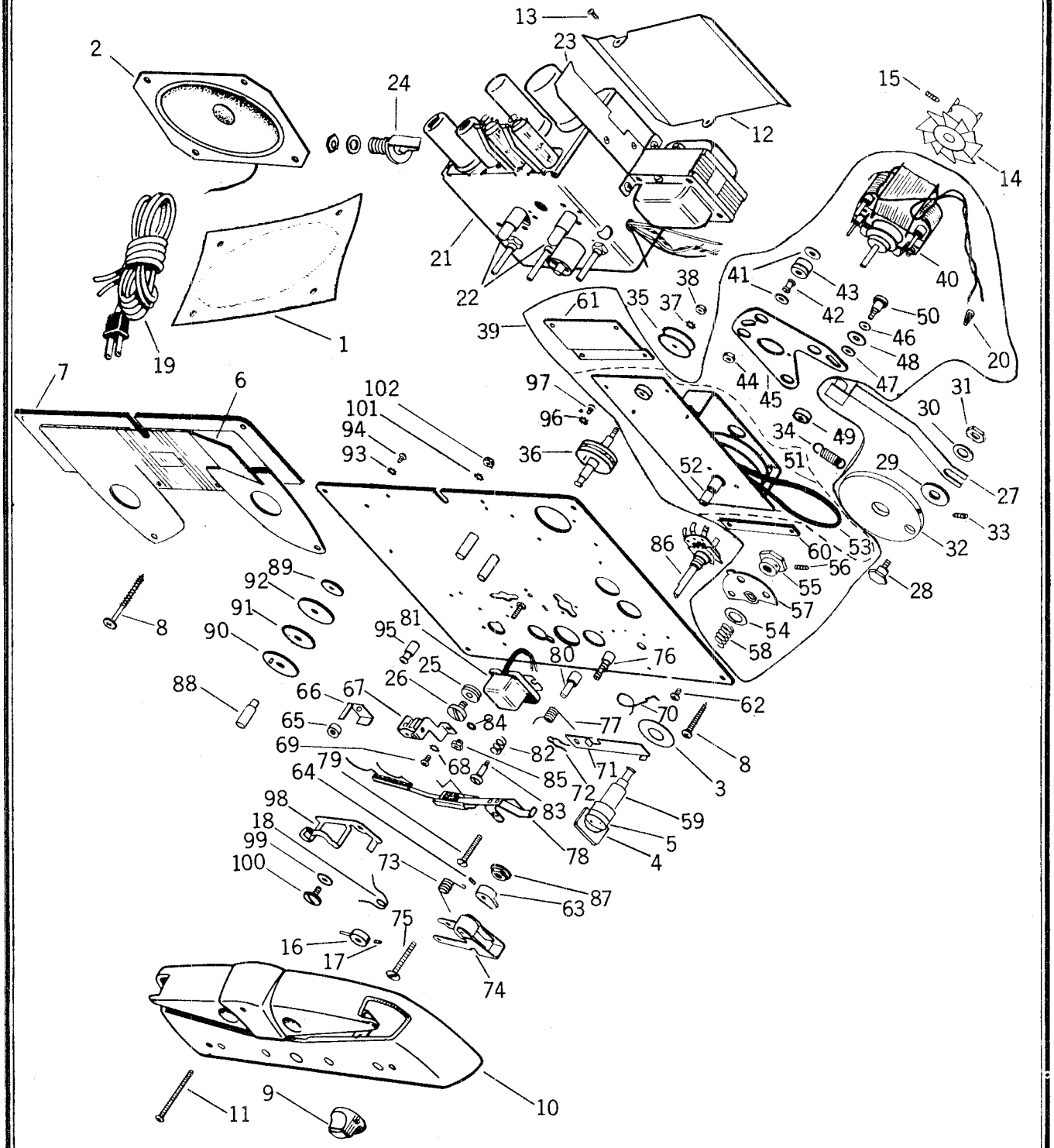

d. Disconnect the motor leads from the amplifier (one lead was connected to SW-6 in the initial run).

e. Disconnect the ground lead from the upper flywheel bracket.

f. Remove the three screws (62) which hold the drive assembly (39) to the mechanism plate.

g. Lift off the drive unit.

C. SERVICING THE MAJOR UNITS

WARNING: NEVER APPLY DIRECT CURRENT TO THE RECORDING HEAD.

1. Servicing the Amplifier and Recording Head.

a. D.C. Voltage Checks - Check all socket voltages—if voltages vary by more than 10% from those indicated on schematic diagram, check tubes (preferably by substitution) and check associated capacitors and resistors. Bear in mind that a leaking filter capacitor may upset voltages on several stages and that a leaking coupling capacitor will upset voltages on the following stage.

b. Bias Current Check - Disconnect the grounded lead from the recording head at the "Play - Record" switch, switch to "Record" position. Insert a D.C. microameter and check for current, if current exceeds 1 microampere, replace C-18. Measure the bias current by inserting a 20 ohm non-inductive (or carbon) resistor between the recording head lead and the switch terminal from which it was disconnected and connect a VT voltmeter across the resistor. The bias current will produce .015 volts ± 10%. Voltages are also subject to the same tolerance as the specific resistor being used in the test circuit. If the current is not within the limits specified, check the oscillator and associated resistors and capacitors. If component values are correct, then push plate and grid leads of 6AQ5 together to reduce current or separate them to increase current.

c. Recording Current Check - Disconnect either lead from the oscillator coil, thereby stopping the oscillator. Connect an audio oscillator to the input jack. Place the "Play-Record" switch in the "Mic" position and turn the "Volume-Control" to the maximum clockwise position. Set the audio oscillator for 400 cycles/sec and adjust the output so that V-4 flashes faintly (NOT A SUSTAINED GLOW). A VT voltmeter and a 20 ohm resistor (when connected as described in Par. b.) will indicate .001-.002 volts (plus or minus tolerance on resistor). The wave form (when viewed on an oscillascope connected across R-22) will be free from distortion. If the current is not correct, change V-4 and V-5 (supplied as a matched and aged set) and recheck. If current is low, increase oscillator level to produce proper current and check wave form. If wave is free from distortion, check all resistors and condensers in the neon lamp circuits. If wave is distorted, in-

dicator lamp circuit can be assumed to be correct and recording head or associated supply network is at fault

d. Gain and Distortion Check - Restore recording head circuit to normal—leave oscillator circuit open. Load the output of an audio oscillator with a non-inductive resistor of the proper value and connect the ground terminal of the oscillator output to the amplifier chassis. Connect a 20,000 ohm carbon resistor between the "hot" terminal on the oscillator output and the ungrounded lead from the recording head (resistor and connecting lead should be shielded and shield should be grounded). Turn "Volume" control to maximum clockwise position, and "Play-Record" control to "Play" position. Turn "Motor" switch "ON". Adjust oscillator to 400 cycles/sec and .01 volts (measured across oscillator load resistor). An output meter connected across the speaker terminals should read 2. to 3.5 volts and the output wave form should be free from visible distortion. If distortion is present or output is low, first check the tubes (substituting one at a time) then starting at the output stage, check the wave form at each plate and grid in order to locate the stage in which the distortion is occuring. When the bad stage is located, check all associated resistors, condensers, and connections. If switches are a part of the circuit be sure to check them.

e. Noise Check - Tap each tube with a pencil or other small object and check for microphonics. Any tubes which produce a sustained ringing or crashing noise should be replaced. Operate all switches and check for crashing noises which continue after switch movement has stopped (caused by dirty or worn contacts).

2. Servicing the Erase Mechanism

The erase head consists of a permanent magnet and magnet shield held in place on the mounting bracket by a socket head setscrew and a binder head screw. The proper adjustment of the magnet and shield requires special equipment which is not usually available in a service shop. Therefore, we do not recommend disturbing the two screws referred to. If positioning of the head and erase lever as described herein does not produce satisfactory erasure, or if recordings are noisy and distorted and the cause of the trouble is not traceable to other sources, then a fair adjustment can be made by using the procedures described in paragraph c. The factory service department and certain Authorized Service Stations are equipped to make precision adjustments.

a. Positioning Erase Head - Turn "Play - Record" control to either "Record" or "Mic" position, thereby moving tape erase lever (98) away from the erase pad. Loosen the two screws (69) which hold the erase head to the panel. Rotate the "Motor Control" knob slowly and check to be sure that the erase pad bears evenly on the face of the head. If it does not, rotate the head slightly to correct the condition. Tighten the two screws. Make sure that the tape is pressed firmly against both the magnet and the guard.

b. Positioning the Erase Lever - Turn the "Play - Record" control to the " Play" position. Loosen the setscrew (17) which holds the erase lever actuator collar assembly (16) to the control shaft. Turn the collar clockwise until a straight-edge placed across the erase lever fingers is 1/8" to 3/16" in front of the magnet poles. Move the collar up or down as required so that the actuating arm bears fully upon the ear on the erase lever, then tighten the setscrew. Be sure that the erase lever spring (18) is not pinched between the collar and control bushing. Drop the control panel in place and make sure that the ends of the erase lever fingers are covered by the panel when the control is in the " Play" position and the threading track is clear.

c. Adjusting the Erase Head - The erase head must perform two functions, one, completely remove all previously recorded material, and two, leave the tape in a demagnetized state. Erasure is accomplished by passing the tape thru a strong magnetic field (note that the tape from the supply reel actually is in contact with the leading pole of the permanent magnet). Demagnetization is accomplished by passing the tape through a weaker field of reversed polarity (note that the tape is separated from the trailing pole of the magnet by means of an adjustable non-magnetic guard). If the guard is moved in against the pole of the magnet, the tape passes through a very strong magnetic field which will neutralize the charge placed upon the magnetic coating by the leading pole of the magnet and probably will set up a charge of opposite polarity (this charge will produce excessive tape noise in the recording and also introduce even order harmonic distortion). If the guard is moved as far as possible away from the pole, then the charge placed upon the tape by the erase pole will not be completely neutralized and the remaining charge will again cause excessive tape noise and even order harmonic distortion. Therefore, the placement of the erase guard governs the degree of demagnetization of the tape and proper adjustment will result in the tape leaving the erase head in the desired condition.

1. Adjustment by noise level method (Emergency procedure) - Connect an output meter across the voicecoil of the speaker. Run the recorder and adjust the volume control to produce a low reading on the meter (this will be the system noise for the particular setting of the control). Thread the recorder with a loop of new brown oxide tape which has neither been used for recording or erased. Switch to the " Play" position. Loosen the setscrew (17) and release the erase lever actuator collar (16). Run the recorder and note the output meter reading and listen to the noise.
   Loosen the screw which holds the magnet guard in place and move the guard about .005" in either direction. Note the meter reading and apparent increase or decrease in noise. If the latest reading is less than the previous reading, repeat the process after moving the guard a little farther in the same direction. If the reading is more than

the previous reading, move the guard in the opposite direction. When the position is found at which the output meter gives the lowest reading and the listening test indicates the lowest level, this will be the best adjustment attainable by this procedure. Due to the changing nature of the noise, a trained ear may note a more definite minimum noise level than is indicated by the output meter.

2. Adjustment by Harmonic Distortion Method (Preferred Procedure) - This procedure requires the following test equipment:

   Audio frequency oscillator producing 400 C.P.S. free from second harmonic distortion or equipped with filter to attentuate 800 C.P.S. harmonic by at least 75 D. B.

   Matching transformer or network to couple oscillator to input of recorder.

   Distortion meter (harmonic)

   Check the audio oscillator with the distortion meter to be sure that the 400 C.P.S. tone is free from harmonic distortion. Use a filter if necessary. Match the oscillator to the input of the recorder. Connect the distortion meter to the output of the recorder using the procedure recommended by the manufacturer for connecting to a 3.75 ohm source.

   Turn on the recorder, switch to "Phono - Radio" position and adjust the volume control to produce a faint flash from the recording lamp. Check the output of the recorder to be sure that the level being used produces negligible harmonic distortion. If the output is distorted, service the amplifier before attempting to adjust the erase head.

   Thread the recorder with brown oxide tape and record about 5' of tape. Rewind the tape, switch to "Play" position and measure the harmonic distortion.

   Loosen the screw which holds the magnet guard in place and move the guard about .005" in either direction. Repeat the recording and playback operation and again measure the distortion. If the distortion has decreased, continue moving the guard in the same direction and repeating the test until a position which produces minimum distortion has been located. As the point of minimum distortion is approached, move the guard approximately .001" per step (this can be accomplished by only loosening the retaining screw slightly and tapping the guard with a light tool).

   If a considerable number of recorders are to be serviced, the process can be speeded up by placing a second recorder (known to be in good condition) along side of the one being adjusted and using it as a continuous playback unit to monitor a loop of tape upon which a recording is

being made continuously by the unit being adjusted. Slack should be left in the tape as it passes between the two recorders. This produces an additional lag in the record-reproduce process but prevents spurious readings which might be caused if the tape was under abnormal tension in the monitor unit.

Special test equipment can be built for this specific purpose, however, the volume of work to be done will seldom justify the cost of assembling a test device which can only be used for one type of operation.

3. SERVICING THE PRESSURE PADS, PRESSURE ROLLER AND ACTUATING MECHANISM

a. Pressure Pads - If the pressure pads are worn down to a thickness of less than 1/16", lift the end of the pressure pad spring (77) over the end of the "Motor Control" shaft. Take out the screw (79) which holds the pressure pad bracket assembly (78) in place and lift off the assembly and the pressure pad bracket stud (80). Use Petroleum Naptha (140-210F.) as a solvent to remove the old pad. Use Minnesota Mining & Mfg. Co. Cement #EC-104 to cement the new pad in place (Be sure that the edges of the pads are parallel to the edges of the springs and that the ends of the pads are flush with the ends of the springs). Reassemble and install the pressure pad bracket assembly, place the end of the pressure pad spring below the pressure roller actuator (63) and turn the motor control knob slowly. Check to be sure that the pressure pads enter the slots in the sound and erase heads and bear firmly on the proper surfaces of the heads. Turn the "Motor Control" to the "On" position. Loosen the setscrews (64) which hold the pressure roller actuator (63) in place. Turn the "Motor Control" switch to "Off", then turn the actuator collar in a counter clockwise direction until the sound head pressure pad clears the sound head by at least 1/8". Tighten the setscrews and place a speck of "Lubriplate" on the side of the actuator which comes in contact with the end of the pressure pad bracket.

b. Pressure Roller Assembly (74) - Rotate the capstan pressure roller and check for binding. If the roller does not revolve freely, immerse it in carbon tetrachloride and rotate the roller until free. Dry the parts and apply 1 drop of Amproil to the edge of the roller and work it into the bearing. Wipe off any surplus oil.

Check the clearance between the heel of the pressure roller bracket and the body of the pressure pad bracket when the "Motor Control" is "ON". If the clearance is less than .005" file the surfaces to increase the clearance.

4. SERVICING THE RECORDER DRIVE ASSEMBLY

a. Concentricity of Capstan and Flywheel Tire - Use an indicator to check these parts for runout. If the runout exceeds 0.0002" full indicator reading, or the bearings are loose, an

objectionable wow will be produced. If the runout exceeds 0.0002", remove the motor (40) as per sub-paragraph b of this paragraph and replace the flywheel and capstan (52) and the bearings if required (See sub-paragraph d). Organizations not equipped to work to close tolerances may find it to their advantage to send the drive sub-assembly (51) to the factory for replacement with a factory rebuilt unit.

b. Separation of Motor Unit from the Capstan and Takeup As-

1. Remove drive assembly from mechanism plate as per procedure B-2.

2. Loosen setscrew and remove fan.

3. Unhook motor pressure spring (34).

4. Remove the three motor mounting shoulder screws (50), felt washer (48), plain washers (46 & 47) and spacers (49).

5. Lift off the motor unit.

WARNING: When placing the motor on the bench, do not allow the shaft to strike the bench (this might spring the shaft).

c. Servicing the Motor

1. If the motor does not drive the capstan at the proper speed, take off the three nuts (44), and plain washers (41) and remove the motor from the mounting plate (45). Disassemble the motor and clean and relubricate the bearings. Use 3 speaker cone shims as spacers to center the rotor when re-assembling.

2. Concentricity of motor shaft. Use an indicator to check the part of the motor shaft which drives the flywheel. If the runout exceeds 0.0005" full indicator reading, replace the motor.

d. Servicing Capstan and Takeup Assembly

1. Replacing the takeup drive belt (53).

(a) Remove the four screws and lockwashers, the reinforcing strip (60) and plate (61).

(b) Pull off the flywheel lower bracket assembly.

(c) Install the new belt and reassemble the unit. If the Capstan shaft does not revolve freely, tap the two frame members lightly with a screw driver handle in order to line up the bearings.

2. Repair of Flywheel and Capstan

If the runout of either the capstan or flywheel tire exceeds

the tolerance indicated in paragraph 4 a, the flywheel assembly will require replacement. Disassemble as per sub-paragraph 1 and install a new flywheel and bearings if required. Warning! When removing the rivets which hold the bearing retainers in place, be careful not to distort the aluminum frame members.

3. Servicing the takeup spindle assembly

   If takeup jerks or fails to operate, proceed in the following manner:

   (a) Remove drive belt (53) from the takeup pulley (35).

   (b) Remove hex nut (38), lockwasher (37) and spindle pulley (35).

   (c) Remove takeup spindle (36) from the bearing.

   (d) Immerse spindle in carbon tetrachloride and spin reel drive disc to wash dirt out of felt washer.

   (e) Allow carbon tetrachloride to evaporate, then soak the felt washer with Amproil. Gently press the drive disc against the washer to squeeze out the surplus oil. Place the spindle on a blotter and allow it to stand for 20-30 minutes, then wipe excess oil off of shaft and reassemble.

4. Servicing the motor lock - It will seldem be necessary to remove these parts. Should it be necessary to remove them, proceed in the following manner:

   (a) Loosen the setscrew (56) and slide the cam (55) and detent (57) off of the end of the shaft.

   (b) Remove the lock shaft (59), spring (58), and washer (54).

   (c) When reassembling the parts, make the final timing adjustment after the motor assembly and the drive are installed in the recorder. Turn on the motor switch and turn the lock to "Run". Loosen the setscrew (56) and rotate the cam so that the motor shaft is in contact with the flywheel tire and the working side of the cam is not bearing against the motor mounting plate. Tighten the setscrew and turn to "Lock" and check to be sure that the motor shaft is lifted off of the flywheel tire.

SECTION IV

Final Adjustments and Testing

A. MECHANICAL

1. Check operation of felt pressure pads and be sure that they are clean.

2. Check operation of the erase lever and actuating mechanism.

3. Check the feed tension.—Tension should be just great enough to cause tape to follow groove in tape guide at start of 7" reel. If excessive tension is noted, clean or replace friction disc.

4. Check takeup tension—Tension should be great enough to wind tape evenly on the takeup reel, (Watch out for warped reels.) but not great enough to pull tape through the capstan.

5. Check rewind time—5" reel of tape should rewind in 3 minutes.

6. Check tape velocity—Unwind about 10' of tape from start of reel, place a mark on the light or glossy side of the tape, then measure 36 3/4" and place another mark on the tape. Measure an additional $1\frac{1}{2}$" and place a third mark on the tape. Thread the tape in the recorder. Hold a watch (type with sweep second hand preferred) near the tape guide with the face of the watch vertical. Start the recorder and note the position of the second hand on the watch, when the first mark passes over the guide. If the second mark on the tape reaches the guide within 10 seconds and the third mark does not pass the guide, the speed of the recorder is acceptable. If the speed is low the drive is slipping, pressure on pressure pads is too great, or feed tension is too high. If the speed is high, the flywheel tire is worn.

7. Check the tape passage—Look for weaving of the tape or creeping on the capstan (caused by worn or misaligned pads, tape not guiding properly in head, drive unit loose on mechanism plate, or worn pressure roller).

8. Azmuth adjustment—Thread the recorder with Azmuth adjustment tape, connect an output meter across the speaker voicecoil and rotate the hex nut (85) until maximum output is obtained. Two peaks may be encountered. Adjust for the stronger one.

B. AMPLIFIER

1. Gain Test - Disconnect bias oscillator, connect an audio oscillator to the input jack and adjust the oscillator output to .06 volts at 400 cycles/sec. Connect an output meter and oscillascope across the speaker voice coil. Place the "Play - Record" control in the "Record" position and advance the "Volume" control to a point just below where the wave appears to distort. The output voltage should be at least 2 volts. Restore bias oscillator circuit.

C. FREQUENCY RESPONSE

1. Connections - Connect an audio oscillator to the input jack of the recorder. Connect a VT Voltmeter across the oscillator output. Connect a 3 ohm 5 watt resistor in place of the speaker and connect an output meter across the resistor. Turn tone control to "Treble" position.

2. Tests - Set oscillator to 1000 C.P.S. and set recorder volume control at normal recording position. Adjust oscillator output so that recording indicator flashes very faintly. Record about 10' of tape. Change oscillator frequency to 200 C.P.S. and adjust oscillator output to the same level used at 1000 C.P.S. Record about 10' of tape. Change oscillator frequency to 3000 C.P.S. and adjust oscillator output to 1000 cycle level. Record about 10' of tape. Switch recorder to "Play" position and rewind tape. Start the recorder and adjust volume control to suitable level (not in excess of 2 volts). The output at 200 C.P.S. will usually be within 3DB of the level (maximum permissable variation 7DB), the 3000 cycle will normally be within 3DB of the 1000 cycle level (maximum permissable variation $8\frac{1}{2}$DB).

SECTION V

Assembly Parts List

Ampro Magnetic Tape Recorder

Model 731

Item	Part Number	Quantity Required	NOMENCLATURE 1 2 3 4 5 6 7 8 9
	16929	1	Carton, Recorder Shipping
	A-731	1	Book, Instruction
	20444	1	Recorder Assembly, Magnetic Tape
	111	1	Reel, Tape Recorder
	14112	1	Nut, Wing #10-24
	102	1	Microphone Assembly
	106	1	Cable Assembly, Radio Speaker
1	18779	1	Grille, Speaker
2	18775	1	Speaker, Tape Recorder (T-6)
	1462	4	Washer, Burr
	1679	4	Washer, Lock #8 Ext.
	14975	4	Screw, Rosette Hd. #8-32 x 1" Stl. F-110
	1453	4	Nut, Hex #8-32 Stl. N. P.
	18785	1	Button, Plug
	18698	1	Nameplate, Recorder Case
	14140	2	Screwnail, #15 x 3/8
	18788	1	Nameplate, External Speaker
	18778	1	Case Assembly, Tape Recorder
8	14102	6	Screw, Wood Phillips Oval Hd. #6 x 1-1/4
3	18842	1	Nameplate, Motor Lock
	13465	1	Spring, Motor Lock Key
4	13464	1	Key, Motor Lock
5	12888	1	Stud, Motor Lock Shaft
6	16952	1	Cover, Compartment
	13876	1	Spring, Compartment Cover Retaining
	14141	2	Nut, Speed
	18776	1	Nameplate, Tape Recorder (available only upon certification of loss and serial # of unit)
	14106	2	Rivet, Tub. Oval Hd. .051 x 9/64
7	16951	1	Panel, Tape Reel
8	14102	2	Screw, Wood Phillips Oval Hd. #6 x 1-1/4
	14109	1	Washer, Plain
	14991	4	Screw, Phillips Bd. Hd. #6-32 x 1/4
	13462	1	Bracket, Tape Reel Panel
	14199	1	Screw, Wood Phillips Rd. Hd. #6 x 3/8
9	16926	4	Knob, Control
10	16950	1	Panel, Control
	14107	1	Screw, Phillips Oval Hd. #6-32 x 1-1/2
11	14136	2	Screw, Phillips Oval Hd. #6-32 x 1-3/8
12	13839	1	Cover, Recorder Amplifier
13	14996	6	Screw, Sheet Metal Phillips Bd. Hd. #4 x 1/4 Type Z
14	20446	1	Fan Assembly, Recorder
15	14780	1	Screw, Hdlss. Socket Set #6-32 x 1/8 Cup Pt.

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Item	Part Number	Quantity Required	NOMENCLATURE 1 2 3 4 5 6 7 8 9
16	20414	1	Collar Assembly Erase Lever Actuator
17	14999	1	Screw, Hdlss. Socket Set #4-40 x 3/16
18	15032	1	Spring, Tape Erase Lever
19	18774	1	Cord, Recorder Line, 8 Ft. long
20	18671	2	Connector, Wire
	18697	1	Shield, Motor Switch
21	20445	1	Amplifier Assembly, Tape Recorder
22	16915-1	2	Lamp, Neon (seasoned) (V-4,5)
	18714	1	Shield, Tube Cover
	18497-S	1	Tube, 12AX7 (selected) (V-1)
	18699	1	Tube, 6AU6 (V-2)
	18700	1	Tube, 6X4 (V-6)
	18701	1	Tube, 6AQ5 (V-3)
23	13873	1	Shield, Motor
	14658	1	Screw, Sheet Metal Phillips Rd. Hd. #8 x 3/8 Type Z
	16984	1	Clamp, Cable
	14972	1	Washer, Lock #6 Ext.
	14100	1	Screw, Phillips Bd. Hd. #6-32 x 5/16
	1452	1	Nut, Hex #6-32
	17782	1	Capacitor, .01 mfd. 400 V Paper (C-8)
	18091	1	Capacitor, .001 mfd. 600 V Paper (C-14)
	18485	2	Capacitor, .001 mfd. 400 V Ceramic (C-20, 24)
	18487	2	Capacitor, .01 mfd. 400 V Ceramic (C-10, 12)
	18488	1	Capacitor, .005 mfd. 400 V Ceramic (C-19)
	18489	3	Capacitor, .0005 mfd. 500 V Ceramic (C-3, 4, 9)
	18492	1	Capacitor, .003 mfd. 600 V Paper (C-18)
	18715	1	Capacitor, 10-30 mfd. Elect. (C-22, 23)
	18716	1	Capacitor, 4-4-80-80 mfd. Elect. (C-15, 21, 11, 16)
	18731	1	Capacitor, .02 mfd. 400 V Paper (C-2)
	18732	2	Capacitor, .03 mfd. 400 V Paper (C-5, 13)
	18733	1	Capacitor, .0027 mfd. 400 V Ceramic (C-1)
	18739	1	Capacitor, .007 mfd. 200 V Paper (C-7)
	18773	1	Capacitor, .0003 mfd. 600 V Paper (C-17)
	17554	1	Resistor, 10 megohms, 1/2 watt carbon (R-3)
	17959	4	Resistor, 220 K ohms, 1/2 watt carbon (R-4, 14, 16, 2)
	18436	1	Resistor, 1.8 megohms, 1/2 watt carbon (R-9)
	18467	1	Resistor, 560 K ohms, 1/2 watt carbon (R-7)
	18471	2	Resistor, 100 K ohms, 1/2 watt carbon (R-10, 15)
	18474	2	Resistor, 470 K ohms, 1/2 watt carbon (R-1, 17)

Item	Part Number	Quantity Required	1 2 3 4 5 6 7 8 9
	18582	1	Resistor, 2700 ohms, 1/2 watt carbon (R-8)
	18583	1	Resistor, 22 K ohms, 1/2 watt carbon (R-13)
	18653	1	Resistor, 2700 ohms, 1 watt carbon (R-18)
	18718	1	Resistor, 3 ohms, 5 watt wire wound (R-22)
	18729	2	Resistor, 390 K ohms, 1/2 watt carbon (R-11, 19)
	18770	1	Resistor, 270 ohm, 1 watt carbon (R-12)
	18771	1	Resistor, 33 ohm, 2 watt carbon (R-21)
	18772	1	Resistor, 390 ohm, 2 watt carbon (R-20)
24	18769	1	Jack - External Speaker (J-2)
	18707	1	Board, Terminal
	18773	2	Screw, Sheet Metal Phillips Bd. Hd. #6 x 1/4 Type Z
	18722	1	Socket, Miniature Tube (9-pin)
	18706	1	Base, Miniature Socket Shield
	1466	2	Rivet, Tub. Oval Hd. .085 x 7/32
	18525	1	Clamp, Tube
	18721	1	Socket, Miniature Tube (7-pin)
	14871	1	Rivet, Tub. Oval Hd. .085 x 3/16
	14908	1	Rivet, Tub. Oval Hd. .088 x 1/4
	18720	2	Socket, Miniature Tube (7-pin)
	18524	2	Clamp, Tube
	14871	2	Rivet, Tub. Oval Hd. .085 x 3/16
	14908	2	Rivet, Tub. Oval Hd. .088 x 1/4
	13845	2	Bracket, Resistor Board Mtg.
	14773	2	Screw, Sheet Metal Ph. Bd. Hd. #6 x 1/4 Type Z
	18702	1	Terminal, Locking #4 Double
	1474	1	Rivet, Tub. Oval Hd. 1/8 x 1/8
	13840	1	Platform, Recorder Amplifier Tube
	12540	3	Spacer (Tube Plateform)
	14729	3	Washer, Plain
	14992	3	Screw, Phillips Bd. Hd. #4-40 x 3/8
	18708	1	Connector, Female (J-1)
	12832	1	Base, Microphone Jack
	14993	2	Screw, Phillips Fil. Hd. #4-40 x 1-1/8
	18728	1	Transformer, Power (T-4)
	14994	4	Screw, Phillips Bd. Hd. #8-32 x 1/4 (Sems Unit)
	18782	1	Transformer, Output (T-5)
	14117	2	Nut, Speed #6-32 Type U
	14991	2	Screw, Phillips Bd. Hd. #6-32 1/4
	18784	1	Coil, Oscillator (self-fastening) (T-1)
	18709	1	Control, Volume (R-6)
	14854	1	Nut, Hex. 3/8-32 Washer Type
	18777	1	Control, Tone (R-5)
	16523	1	Washer, Lock 3/8 Int.
	14854	1	Nut, Hex. 3/8-32 Washer Type
	18786	1	Switch, Record-Listen (SW-1, 2, 3, 4)
	14773	2	Screw, Sheet Metal Phillips Bd. Hd. #6 x 1/4 Type Z
	17593	3	Grommet, Rubber
	16910	2	Socket, Neon Lamp
	1474	4	Rivet, Tub. Oval Hd. 1/8 x 1/8
	12886	3	Spacer, Amp. Shock Control
	1698	3	Washer, Plain

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Item	Part Number	Quantity Required	1 2 3 4 5 6 7 8 9
	14972	3	Washer, Lock #6 Ext.
	14153	3	Screw, Phillips Bd. Hd. #6-32 x 1/2
	18702	1	Terminal Locking, #4 Double
	1474	1	Rivet, Tub. Oval Hd. 1/8 x 1/8
	1767	1	Eyelet, Brass
	16824	1	Eyelet, Brass
	1475	11	Rivet, Tub. Truss Hd. .085 x 1/8
25	18794	2	Shock-Mount, Rubber (orange)
	18795	2	Shock-Mount, Rubber (blue)
26	12783	4	Screw, Shoulder, Amplifier Mtg.
	13825	3	Washer, Plain
	14972	3	Washer, Lock #6 Ext.
	1452	3	Nut, Hex #6-32
27	20436	1	Actuator Assembly, Motor Plate
28	12859	1	Screw, Shoulder, Motor Plate Actuator
29	1693	1	Washer, Plain
30	13020	1	Washer, Plain
31	14916	1	Nut, Hex #6-32
32	12858	1	Collar, Motor Plate Actuator
33	14135	1	Screw, Hdlss. Socket Set #8-32 x 7/16 Cup Pt.
	14171	1	Screw, Hdlss. Set Hex Socket #8-32 x 3/8 Cone Pt.
34	15036	1	Spring, Motor Pressure
35	12824	1	Pulley, Takeup
36	20409	1	Spindle Assembly, Takeup
	13827	1	Lever, Tape Rewind
	14130	1	Washer, Plain
37	14972	1	Washer, Lock #6 Ext.
38	1452	1	Nut, Hex. #6-32
39	20447-1	1	Drive Assembly, Tape Recorder
40	18787	1	Motor Assembly, Tape Recorder (T-3)
41	14131	5	Washer, Plain
	1693	1	Washer, Plain
42	12834	3	Sleeve, Motor Mtg.
43	16904	3	Grommet, Rubber
44	14916	3	Nut, Hex #6-32 Brass, N. P.
45	13872	1	Plate, Motor Mtg.
46	1313-10	3	Washer, Plain
47	13940	3	Washer, Plain
48	16923	3	Washer, Felt
49	12838	3	Washer, Motor Mtg. Spacing
50	12837	3	Screw, Shoulder, Motor Mtg.
51	6002	1	Drive Sub Assembly, Tape Recorder
	20406-1	1	Bracket Assembly, Flywheel Upper
	16905-1	1	Bearing, Flywheel
	16906	1	Washer, Felt, Flywheel Brg. Oil
	13846	1	Retainer, Flywheel Bearing
	14105	3	Rivet, Tub. Truss Hd. .098 x 7/64
	20416-1	1	Bracket Sub Assembly, Flywheel Upper
52	20434	1	Shaft & Flywheel Assembly Recorder
53	16912	1	Belt, Takeup Drive
	20407	1	Bracket Assembly, Flywheel Lower
	16905-1	1	Bearing, Flywheel
	16906	1	Washer, Felt, Flywheel Brg. Oil
	13846	1	Retainer, Flywheel Bearing
	14108	3	Rivet, Tub. Truss Hd. .098 x 9/64
	18593	1	Lug, Solder
	14972	3	Washer, Lock #6 Ext.
	14100	4	Screw, Phillips Bd. Hd. #6-32 x 5/16

Item	Part Number	Quantity Required	1 2 3 4 5 6 7 8 9
54	14104	2	Washer, Plain
55	12887	1	Cam, Motor Lock
56	14935	2	Screw, Hdlss Set Hex Socket #8-32 x 1/4 Cup Pt.
57	13463	1	Detent, Motor Lock
	14838	1	Washer, Plain
58	15097	1	Spring, Motor Lock Shaft
59	12889	1	Shaft, Motor Lock
60	13897	1	Strip, Drive Assembly Reinforcing
61	13898	1	Plate, Drive Assembly Reinforcing
	14972	3	Washer, Lock #6 Ext.
62	14153	3	Screw, Phillips Bd. Hd. #6-32 x 1/2
63	12847	1	Actuator, Pressure Roller
64	14780	2	Screw, Hdlss. Socket Set #6-32 x 1/8
65	16871	1	Damper, Tape Erase Pressure Spring
66	13891	1	Stop, Tape Erase Lever
67	20401	1	Magnet Assembly, Tape Erase (adjust after installation)
68	14972	2	Washer, Lock #6 Ext.
69	14991	2	Screw, Phillips Bd. Hd. #6-32 x 1/4
70	15068	1	Spring, Foot Control Lever
71	13877	1	Lever, Pressure Roller Retractor
72	15043	1	Retainer, Pressure Roller Retractor
73	15034	1	Spring, Pressure Roller
74	20404	1	Bracket Assembly, Pressure Roller
75	14101	1	Screw, Phillips Truss Hd. #6-32 x 1"
76	12830	1	Stud, Pressure Roller Bracket
77	15033	1	Spring, Pressure Pad Assembly
78	20439	1	Bracket Assembly Pressure Pad
	16903	1	Pad, Sound Head Pressure
	16920	1	Pad, Tape Erase Pressure
79	14101	1	Screw, Phillips Truss Hd. #6-32 x 1"
80	12823	1	Stud, Pressure Pad Bracket
81	20424	1	Head Assembly, Tape Recorder
82	15035	1	Spring, Recording Head Adjustment
83	12842	1	Screw, Shoulder, Recording Head
84	13208	1	Washer, Plain
85	14103	1	Nut, Lock #6-40
	14109	1	Washer, Plain
86	18696	1	Switch, Rotary (SW-6, 7)
87	14854	1	Nut, Hex 3/8-32 Washer Type
88	12820	1	Stud, Feed Reel
89	13822	1	Spacer, Feed Reel
90	13821	1	Disc, Reel Drive
91	16909	1	Washer, Felt, Reel Spindle
92	13820	1	Disc, Tape Feed Reel Friction
93	14972	1	Washer, Lock #7 Ext.
94	14991	1	Screw, Phillips Bd. Hd. #6-32 x 1/4
95	12821	1	Stud, Tape Guide
96	14972	1	Washer, Lock #6 Ext.
97	14100	1	Screw, Phillips Bd. Hd. #6-32 x 5/16
98	13823	1	Lever, Tape Erase
99	13825	1	Washer, Plain
100	12822	1	Screw, Shoulder, Tape Erase Lever
101	14972	1	Washer, Lock #6 Ext.
102	1452	1	Nut, Hex #6-32
	14313	1	Pin, Grooved, 3/32 x 5/16
	12851	2	Stud, Tape Rewind Guide
	12836	1	Stud, Recording Head Adjustment
	13871	1	Plate, Tape Recorder Mechanism

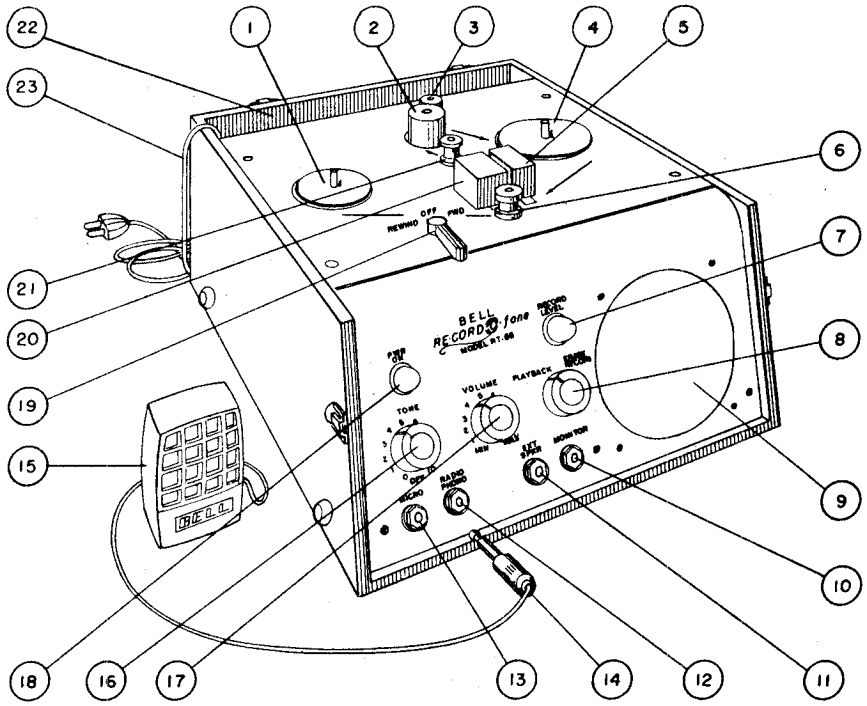


DIAGRAM SHOWING NAME AND LOCATION OF PARTS.

1. Supply Reel Platform
2. Capstan
3. Pressure Roller
4. Take-up Reel Platform
5. Pressure Pads
6. Idler Roller & Tape Guide
7. Recording Level Indicator
8. Erase Record-Playback Control
9. Speaker
10. Headphone Monitoring Jack
11. External Speaker Jack
12. Radio or Phono Jack
13. Microphone Jack
14. Microphone Plug
15. Microphone
16. Tone Control & Master Power Switch
17. Volume Control
18. Pilot Light
19. Direction Control - 3 Position Rewind-Off-Forward
20. Erase-Record-Playback Head
21. Tape Guide Post
22. Storage Compartment for Power Cord, Reels and Microphone
23. Power Cord

SPECIFICATIONS

POWER SUPPLY:	115 Volts 60 Cycles A. C.
POWER COMSUMPTION:	90 Watts maximum - 1.1 Amp.
TAPE SPEED:	7 1/2 inches per second
RECORDING TRACK WIDTH:	3/32 inch - dual track

MODEL RT-65

RECORDING MEDIUM:	Plastic or Paper tape - Red or black oxide, (Plastic red oxide preferred.)
RECORDING TIME:	5 inch reel; 15 minutes each track, 30 minutes total. 7 inch reel; 30 minutes each track, one hour total.
FREQUENCY RESPONSE:	70 to 8,000 c.p.s.
REWIND SPEED:	6 to 1 ratio, 5" reel 2 1/2 minutes; 7" reel 4 minutes
TYPE OF ERASE AND BIAS:	High Frequency A. C. 48 K.C.
RECORDING LEVEL INDICATOR:	Neon Lamp NE-51
POWER OUTPUT:	3.5 Watts - 6V6GT output tube.
AMPLIFIER:	4 stages with inverse feedback - volume and tone controls - high and low frequency compensation in record and playback.
SPEAKER:	6 inch heavy duty, 8 watt capacity
INPUTS:	Microphone 75 db gain - Phono or Radio 40 db gain. Play back gain 85 db.
OUTPUTS:	External speaker 3.2 ohm - Monitor for headphones or meter 500 ohm source with voltage divider.

NOTE: (1) Internal speaker disconnects when external speaker jack is used.
(2) 500 ohm output is available by shorting out 10,000 ohm resistor inside amplifier.
(3) A power amplifier may be driven from either external speaker or monitor jack. If external speaker jack is used a 3 ohm 5 watt resistor should be shunted across the connecting plug or amplifier input, to provide load on recorder amplifier.

FUSE: 2 Amp solder-in type GJV located underneath chassis.

HOW TO REMOVE TOP PLATE MECHANICAL ASSEMBLY FROM CABINET

This is necessary to gain access to tubes, controls, etc.

CAUTION - - USE EXTREME CARE IN REMOVING THIS ASSEMBLY TO PREVENT DAMAGE TO FAN.

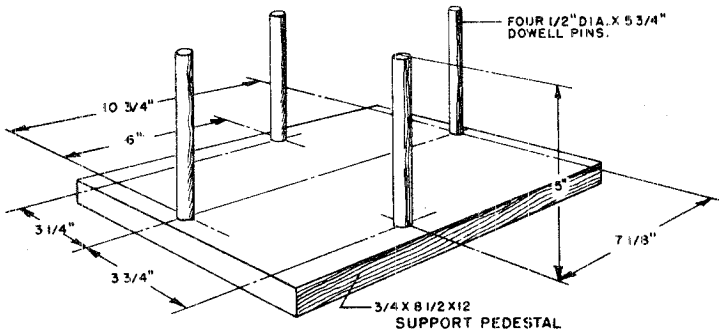
1. Remove four 10-32 large truss head screws along right and left edges of panel.
2. Lift plate up at right side by grasping take-up reel with left hand. Now, grasp right front corner of plate with right hand and left rear corner with left hand. Pull plate to the right enough for the casting to clear brackets on left side of cabinet and lift up. Top plate is now free except for head wires and 5 prong plug.
3. Push plate to extreme rear of cabinet and rest back of plate on vent grille. Prop front up with piece of wood or carboard box while unsoldering four head leads. Remove 5 prong plug and mechanical assembly is now free.

NOTE: A. In some earlier models of recorders using a shorter motor, lift top plate up at front and pull forward until casting clears cabinet bracket on right side. Now move plate to right to clear left hand cabinet bracket, lift up and assembly is free except for head wires and plugs. See paragraph 3 above.

B. If in some models there is difficulty in removing top plate without striking fan, remove chassis and front panel by taking out 3 Phillips oval head screws from bottom of case and 2 on each side (7 total).

CAUTION: DO NOT SET THIS ASSEMBLY DOWN ON FAN BLADE.

4. See sketch below for details of a pedestal for supporting top plate assembly while making examination or repairs.



HOW TO REMOVE AMPLIFIER FROM CABINET

1. First it is advisable to remove top plate assembly (see above).
2. Remove 3 Phillips oval head screws and finish washers from bottom of case, remove 4 same type screws and washers from cabinet sides.
3. Push chassis toward front of cabinet while supporting front panel.
4. Unwind power cord if coiled up and push under cabinet vent partition. Remove cable clamp.
5. Unsolder 4 head connections located on slide switch, if not already detached, remove 5 prong plug. Amplifier is now free.

REMOVING TOP PLATE FROM MECHANICAL ASSEMBLY

1. If possible, rest unit on pedestal as described earlier - if this is not available remove fan blade and rest unit on motor shaft.
2. Remove pointer knob from control shaft. Remove four Phillips oval head 10-32 machine screws recessed in panel.
3. Top panel will now lift off of mechanical assembly. It is best to disconnect two wires to blade switch otherwise top panel must be placed to one side while working on either mechanical unit or top plate mechanism.

TOP PLATE MECHANICAL INSPECTION
(See Drawing Fig. 2)

1. With top plate removed from mechanical assembly check the parts located on underneath side of top plate as follows:

Push bell crank (14) toward front edge of top plate, as far as possible, release slowly and note sliding parts. These should not bind or stick in any position. If they do, remove and check for burrs or rough places. Parts should be well lubricated with Sta-Put #18-H grease. See paragraph describing lubrication of recorder. To check roller slide assembly (10) alone, push bell crank forward and while holding against spring, move roller slide assembly and check for sticking friction. To check pressure pad slide assembly (7) alone, push roller slide assembly (10) toward rear of top plate and move bell crank in both directions. Check bell crank (14) to see that it works free and does not strike rubber grommet (17). Bend away slightly if necessary.

2. Install top plate to mechanical assembly and check the following:

Rotate control knob to forward position. The pressure pad slide assembly (7) must be against its full travel stops when control is in the forward position and indexed. Check as follows:

(a) If pad slide assembly moves still further (is not against the stop) when control knob is pushed beyond the index point, the bell crank flange should be bent toward the cam which acuates the bell crank.

(b) If pad slide assembly hits its stops before the control is forward in the index position it is necessary to bend the bell crank flange slightly away from the cam.

3. Check the blade switch (18), which is operated by the cam and bell crank (14), and make sure that it is closed in the forward position only. If the switch closes in off or rewind position, bend the angle bracket which mounts switch, by lessening the 90 degree angle.

MODEL R T-65

MECHANICAL ASSEMBLY INSPECTION AND TESTS

(See Drawing Fig. 3)

1. Driving Surfaces:

All driving surfaces and surfaces which touch the tape must be free of oil or grease. These includes:

(a) Motor Shaft (53).
(b) Idler wheel, rubber surface (34).
(c) Supply or rewind drum, tapered driven surface (44).
(d) Capstan drum, driven surface (8).
(e) Take-up drum, driven surface (1D).
(f) Belt (13).
(g) Capstan rubber drive (8).
(h) Capstan pressure roller (10C-Fig. 2)
(i) Tape guide rollers (2) (12-Fig. 2)
(j) Recording head surface (2- Fig. 2)
(k) Felt pressure pads (2) (7D - Fig. 2)
(l) Motor pulley groove (28 - Fig. 3)
(m) Belt pulley groove (17)

Wipe off any oil or grease with a clean dry cloth. Carbon tetrachloride may be used but must be wiped off any rubber surface immediately or unit will not have good drive for several hours after application. Use sparingly.

2. Drive Tests:

With motor power off:

(a) With control knob in forward position, manually turn capstan clockwise. The idler should cause motor shaft to rotate, which will in turn rotate take-up drum. Oil or grease on idler, motor shaft, belt, belt pulleys, or take-up drum driven surface will cause a failure of this test. In off position, clearance between idler rubber surface and motor shaft should not be more than .031 inches. This clearance can be reduced by taking up clearance in 4 motor mounting bolts and 3 motor mounting plate screws, in the direction toward the idler. The idler cam part #2043 can cause too much clearance also. Replace cam or bend small stop (1/16" high) toward center hole.

(b) 1. AFTER MACHINE HAS BEEN RUNNING IN THE CABINET FOR FIVE MINUTES OR MORE AND CLUTCHES HAVE BEEN SLIPPING (Normal forward operation), CHECK AS FOLLOWS:

Place a full 5" plastic reel of tape on the take-up drum - hook a gram or ounce scale to end of tape and throw control to forward position. The pull should be 1-1/2 to 2 ounces (40-55 grams). Wipe oil off clutch if above this amount. Add a few drops of STA-PUT #360 if below this amount.

2. Place a full 5" plastic reel of tape on the rewind drum and hook scale to tape end as before. Motor control should be in off position. Measure pull necessary to unwind tape from reel, this should be 1/2 to 3/4 ounce (15 to 20 grams). Remove or apply lubricant as described in preceeding paragraph. NOTE: - Addition of oil increases tension and pull of either clutch.

Clearances:

(a) Idler roller to motor shaft 1/32" maximum, 1/64" minimum, control in "off" position.
(b) Brake (24 Fig. 3) to take-up drum (1D) 1/32" minimum, control "rewind" position.
(c) Idler roller edge to motor frame 1/32" minimum, control "off" position. "Forward" position same, 1/32" minimum. There must be a minimum of end play in idler shaft, idler lever assembly and idler pulley, so that idler does not rub motor, idler lever or motor pulley.
(d) Belt to take-up drum, control "off" position, 1/32" minimum with motor running.
(e) End play - take-up, capstan and rewind drums must have some end play but not to exceed 3/64". Motor shaft should also have slight end play.

4. Timing Tests:

(a) Motor running, turn control knob slowly toward "forward" position. Capstan should start to rotate before take-up drum.
(b) Motor running, turn control knob slowly from "rewind" to "off" At same time spin take-up drum manually. Brake should stop take-up drum before rewind drum stops rotating.
(c) The speed of the tape thru the recorder can be checked with Minnesota Mining #43 Leader and Timing Tape. An 18.75 foot length of tape should run 30 seconds plus or minus .5 second. Unit should be tested after it has warmed up.

5. Miscellaneous Tests:

(a) Motor running, control in off position, check belt position in large pulley groove. The belt should not climb or rotate about the center of a cross section. To remedy change pulley #2081 or take up all excess play in lever assembly #2080. Replace belt.

INSTRUCTIONS FOR LUBRICATION

DO NOT LUBRICATE THIS INSTRUMENT UNTIL YOU READ THESE INSTRUCTIONS AND OBTAIN THE CORRECT LUBRICANTS.

(1) All the wiping surfaces of mechanical linkages should be free of dirt and foreign material and be lubricated lightly with STA-PUT #18-H grease. This lubricant should be at point of friction only and wiped clean from other surfaces.
(2) The felt clutch washers on TAKE-UP AND REWIND drums should be lubricated ONLY after tests indicate the necessity. Use a small amount of STA-PUT oil #360 and make tension tests as outlined under "Mechanical Assembly Inspection and Tests." Wipe off excess oil from all surfaces including felts.
NOTE: IF tension tests cannot be met with addition of small amount of oil, the felts are worn and should be replaced.
(3) For all other bearings and shafts, use a light spindle oil such as Kensington #9. Clean surface to be lubricated first, then apply only two to three drops.
NOTE: The above lubricants can be obtained from the E.F.Houghton & Co. Pipe cleaners are excellent for applying either oil or grease.

AMPLIFIER TESTS AND REPAIRS

See paragraph on "How To Remove Amplifier From Cabinet."

1. See schematic wiring diagram (Fig.4) for all voltages.

2. Check all tubes, inspect wiring and slide switch for poor or open connections.

3. If indicated, test volume control for open or poor connections.

4. Always check head surface for dirt and clean thoroughly. Test for continuity if suspected of being open. Erase winding 11 ohms playback-record winding 170 ohms. Demagnetize head by operating in record position for short time.

5. Test jacks for open or shorted circuits. Microphone jack must be insulated from front panel.

6. Test bias oscillator as follows: Throw switch to record position. Connect A.C. vacuum tube voltmeter capable of measuring 50 K.C. across erase winding at slide switch. Close blade switch (18, Fig. 2) on top panel by hand. Voltage should be 40 volts or more. Check frequency with signal generator and scope. This should be 48 K.C. plus or minus 3 K.C.

7. Hum test in record position - this can be measured across monitor jack. Turn volume and tone control full on, insert dummy shielded open-circuited plug in microphone jack. Amplifier must have bottom shield plate in place and line cord in proper polarity. Voltage should be less than 3 volts. Be sure bias is off. For playback test it will be necessary to listen to the hum in the speaker as the minimum audible hum and minimum voltage reading are not the same.

The power transformer is mounted so that it can be rotated on its axis to cancel hum picked up by the head. THIS HAS BEEN ADJUSTED AT THE FACTORY FOR MINIMUM HUM AND SHOULD NOT HAVE TO BE READJUSTED UNLESS MAJOR REPAIRS ARE MADE SUCH AS REPLACEMENT OF POWER TRANSFORMER, ETC.

To do this it is necessary to remove both the top plate and chassis from the cabinet. The chassis must rest on a sheet of metal similar to the bottom plate in cabinet to be shielded properly. The top plate must be placed in exactly the same position as when installed in cabinet, i. e., the top plate must be level with top of front panel of chassis. It must also have about 1/8" space between flange of top plate and flange of front panel. It may be rested on cardboard boxes or pieces of wood. Loosen four transformer mounting screws, rotate transformer for minimum audible hum (volume control turned on full). Tighten screws. NOTE: There are two null points 180 degrees apart. One will have much lower audible hum than the other. Do not rotate transformer too far or leads may be broken underneath chassis.

MODEL RT-65

INSPECTION AND TEST OF COMPLETE RECORDER

The testing of the complete recorder can be accomplished by making recordings with microphone, record player, radio, etc., but if instruments are available a more accurate test can be made.

(1) VISUAL TESTS

First, visually inspect the recorder for mechanical defects which can be detected by eye. Check for dirt pile up on record-playback and erase poles of head, clean with cloth slightly dampened in carbon tetrachloride. Check tape guide rollers for easy turning, the outside surfaces should be free of oil and dirt. Check capstan and pressure roller surfaces, clean if necessary with carbon tetrachloride but wipe off immediately so that roller will not soften.

Turn control to rewind and forward positions. Control should index in both positions smoothly. In forward position, both felts should be against head, and roller against capstan.

In off position roller should move away from capstan and allow enough room for feeding tape between roller and capstan. This should be a gap of 1/16" or more. Also, felt pads should move away from head to allow threading of tape between pads and head. The gap should be 1/8" or more. CAUTION: Do not bend springs to meet this dimension. See (2) below.

Check controls on front panel, tone control and power switch and Erase-Record-Playback Switch. These should operate smoothly without binding. If Erase-Record-Playback knob does not operate properly, remove top plate and check slide switch mechanism and shaft rear bearing. Be sure slide switch throws to full extent each position. It may be necessary to position rear bearing on a slight angle to cause this action. Check the position of the shaft arm located on the bearing shaft. To change position of this shaft arm it will be necessary to remove amplifier unit and loosen set screw with screwdriver inserted from undernearth chassis thru hole provided. NOTE: - When checking switch, chassis must either be bolted in cabinet or on flat surface.

(2) HEAD TESTS AND ADJUSTMENT

To properly check head alignment it is necessary to have a roll of pre-recorded head alignment tape of one mil wave length, or 7500 cycles (3M head alignment tape #119). Play this back through recorder with A.C. vacuum tube voltmeter connected to monitor jack. Volume control full on. CAUTION: Be sure switch is in PLAYBACK position so as not to erase tape. The meter should read 15 volts or higher. Three things can cause low meter readings, (provided amplifier and tubes are okay). (1) wrong head alignment angle, (2) dirty head or (3) improper pressure of felts. Remove right hand cover which protects the felts and springs. Check head and be sure there is no dirt on poles or bakelite. Dirt holds the tape away from the poles and lowers output. If dirty, clean with carbon tetrachloride and allow to dry. Start the recorder and turn volume full on. With one finger push the felt (farthest from front) toward head. This will increase pressure and indicate whether there was sufficient pressure. If the voltage increases more than one or two db (2 or 3 volts) check the pressure of the felts with a gram or ounce scale gauge. This may be two ounces (55 grams) but NO MORE.

To do this, turn off power switch but throw control to forward. Connect the gauge to the top of the felt and spring. Pull at right angles enough to just lift the felt off the head. Read gauge. If pressure is under 2 ounces, the springs can be bent forward by carefully applying pressure at bottom or by tightening set screws. The set screw adjustment is very critical, so caution must be used if screws are tightened.

NOTE: - Too much pressure will wear the head unnecessarily, cause dirt to accumulate too fast, cause tape to slow down and possibly cause wow. It may also cause tape to squeak and vibrate as it enters head.

(3) HEAD ALIGNMENT

If head is clean and felts have proper tension check the tightening of screws on both sides of head cover. If both are tight, loosen first one slightly, then tighten and loosen other slightly while watching meter. If meter reading goes up when either screw is loosened, make sure other screw is tight and adjust this one for a maximum of voltage, using 7500 cycle head alignment tape.

(4) FREQUENCY TESTS

To make overall frequency response and gain test, proceed as follows:

Connect a signal generator to phono input and adjust and hold the input voltage to .03 volts. Install a reel of 3M plastic tape (red oxide) and record the following frequencies: 70, 125, 250, 500, 1000, 2000, 4000 and 8000. Rewind and playback measuring the voltage

in the monitor jack with a 3.2 ohm (5 to 10 watt) load plugged in the external speaker jack. The output voltage should be approximately 5-7 volts at 1000 cycles. The various frequencies should be within a total of plus or minus 3 to 4 db. Use a good A.C. V.T.V.M. for all voltage readings at all frequencies.

If the unit does not record and play back within these limits it will be necessary to check the complete amplifier unit and make tests as outlined under "Head Tests." NOTE: Before condemning either amplifier or head adjustments be sure tests were made exactly as outlined above. Be sure V.T.V.M. has flat frequency response.

(5) ELECTRICAL TESTS

Amplifier Unit only:

(a) Distortion Test - Connect signal generator to phono input and load resistor of exactly 3.2 ohms (5 watts or more) to external speaker output. At 1000 cycles it should be possible to obtain at least 3.35 volts at less than 8% distortion across load as measured on a "total distortion" type analyzer.This is 3.5 watts of power.

(b) Gain Test - The voltage at the phono input should be within 2 db. of .145 volt to obtain 3.5 watts output at 1000 c.p.s. as outlined in (a).

(c) Frequency Response - Connect signal generator to phono input and use 50, 100, 1000 and 10,000 cycles for test. Use .03 R.M.S. volts input (hold constant). Using 1000 c.p.s. reference 100 cycles should be plus 7 db when measured at monitor jack with 3.2 ohm plugged in internal speaker jack. 50 c.p.s. up 4.25 db, 10,000 c.p.s. up 5 db. These should be within plus or minus 1 db.

(d) Tone control should drop response 27 db plus or minus 2 db at 10,000 c.p.s. when turned to minimum position and 10 db plus or minus 1 db at 1000 c.p.s.

(e) See schematic wiring diagram (Fig. 4) for voltages of various parts of circuit both A.C. and D.C.

SOME COMMON FAILURES AND THEIR REMEDIES

The most common causes of failure are dirt on head (which should be cleaned regularly), defective tubes and oil on driving surfaces (see "Mechanical Assembly Inspection and Tests").

1. Will Not Record: (Neon Lamp Flickers)	A. Open record-playback head winding or leads. B. Output transformer open or shorted 500 ohm winding. C. Open 150 K resistor (R-19) in series with head. D. Open or short section of slide switch.
2. Will Not Play Back:	A. Amplifier inoperative. See "Amplifier Tests and Repairs." B. Open or short section of slide switch. C. Open or shorted speaker coil or external speaker jack.
3. Tubes Will Not Light Up: (Inoperative)	A. Fuse open. Replace with 2 Amp Littelfuse Type GJV. B. Defect in line cord or attachment cap. C. Open power transformer winding. D. Open A.C. switch on volume control.
4. Will Not Erase:	A. Open erase winding in head. Replace head. B. Open or short in slide switch. C. Bias Oscillator not working properly. See "Amp tests and repairs."
5. Does Not Record or Play Back Properly: (Distorts)	A. Dirt covering either or both poles of head. Clean head. B. Bias oscillator weak or wrong frequency. C. Amplifier defective. See "Amplifier Tests and Repair." D. Check contact closure of bias switch under control lever in forward position.
6. Piano and Sustained Notes Have Flutter or Wow.	A. Wow or waver. Check idler, capstan, belt, take-up drum and felt pressure disc for wow. These parts should not have flat spots or be oily or greasy with the exception of the felt disc. To find which part is at fault make a mark with chalk or crayon which can be seen while unit is running. Record a constant note of 400 to 1000 c.p.s. Play

MODEL RT-65

back the recording and listen to wow while watching mark as it rotates. Correlate the rate of any severe fluctuation with the rotating speed of the mark. If the wow and mark are exactly synchronized, replace the part which is marked. NOTE: Slight fluctuations may be found on any recorder but these will not interfere with music as the constant note test is a severe one.

B. Flutter. The cause of flutter, which is a very rapid wow, is more difficult to locate. (1) If the roller nearest front panel is bakelite, replace with an aluminum type, available from the factory, for a trial recording. (2) Check pressure pad tension against the tape. This must not exceed 55 grams (2 ounces) to start pulling pad away from tape. (3) Check motor for undue amount of vibration. Check for slightly bent shaft. Check shock mounts of motor mounting plate, these should be free vertically but must be firm against rubber sideways. Check spacing of idler wheel, check belt for abnormal vibration due to uneveness. Check fan blades and straighten if necessary.

AMPLIFIER PARTS LIST

Major Items

Resistors		Capacitors	
R3	470,000 ½W 10%	C1	.02 mfd. 600 Volt Tubular
R4	270,000 " "	C2	.01 " 450 " Ceramic
R13	" " "	C4	" " " " "
R14	" " "	C3	.05 " 200 " Tubular
R23	" " "	C5	.05 " 600 " "
R6	3300 " "	C10	" " " " "
R7	130,000 " 5%	C11	" " " " "
R12	" " "	C21	" " " " "
R8	22,000 " "	C6	200mmfd. 500 " Mica 5%
R9	2700 " 10%	C7	.01 mfd. 300 " " "
R10	100,000 " "	C8	" " " " " "
R16	" " "	C9	.015 " 600 " Tubular 5%
R26	" " "	C12	.005 " 500 " Mica 5%
R35	" " "	C13	.001 " 600 " Tubular
R11	39,000 " "	C14	.002 " " " "
R15	360 1W 5%	C16	200 mfd. 500 " Mica
R17	10,000 ½W 10%	C17	20-20-20 mfd. 450-450-25 Volt Electrolytic
R18	" " "	C18	20-20-20-mfd. 450-450-25 Volt Electrolytic
R19	150,000 " "	C19	40 mfd. 450 Volt Electrolytic
R20	6800 1W "	C20	470 mmfd. 500 Volt Mica
R21	4700 1W "		
R24	3 5W		
R25	27,000 ½W		
R28	500,000 Control Audio Taper		
R29	500,000 " w/sw. Audio Taper		
R31	150 ½W. 10%		
R32	" " "		
R33	10 Meg. " "		
R34	10,000 2W "		
R35	100,000 ½W "		
R36	82,000 ½W "		

Miscellaneous	Bell Part No.
Power Transformer	B-20203
Output Transformer	B-20204
Oscillator Transformer (High frequency erase and bias)	B-13793
Slide Switch	B-13053P4
Blade Switch (on top panel)	A-13055
Fuse - 2 Amp. Solder in Type GJV - Littelfuse	
Pilot Lamp Socket	B-20045P18
Level Indicator Socket	B-20045P19
Loudspeaker - 6" P.M.	B-20111P17
Recording-Erase-Playback Head-Shure TR-5	B-13828

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35		3	6-32X5/16 BHMS-STL-Z.P.	
34		1	6-32X7/8 BHMS-STL-B.P.	
33		2	6-32X1/16 BHMS-STL-Z.P.	
32		3	6-32X7/16 BHMS-STL-N.P.	
31		3	6-32X5/16 BHMS-STL-N.P.	
30		4	6-32X1/4 BHMS-STL-N.P.	
29		1	6-32X5/8 FHMS-STL-N.P.	
28	2012	2	FELT WASHER	
27		2	4-40X3/8 RHMS-STL-Z.P.	
26		2	4-40X5/8 RHMS-STL-Z.P.	
25		17	1204 LOCKWASHER-STL-Z.P.	
24		2	1204 LOCKWASHER-STL-Z.P.	
23	B6008P17	1	FLAT WASHER-STL CD.P.	
22		7	6-32 ST.HEX.NUT-STL.Z.P.	
21		4	4-40 ST.HEX.NUT-STL.Z.P.	
20		1	SHELL (6P FOOT)	
19		1	PLUG (18-511)	
18	A-13055	1	SWITCH	
17	B-6008P20	1	RUBBER GROMMET	
16	A-13817	3	IDLER CAP	
15	A-13824	1	BELLCRANK SHAFT	
14B	A-13823	1	BEARING	
14A	B-13848	1	BELLCRANK	
14	A-13849	1	BELLCRANK ASSEMBLY	
13	B-13839	2	IDLER ROLLER SHAFT	
12	B-13855	2	TAPE IDLER ROLLER	
11	B-9065P6	1	TENSION SPRING	
10C		1	ROLLER (#P13861)	
10B	A-13820	1	ROLLER SHAFT	
10A	B-13812	1	ROLLER SLIDE	
10	A-13846	1	ROLLER SLIDE ASSEMBLY	
9	A-13810	4	SLIDE BEARING	
8	B-8015P5	1	TENSION SPRING	
7D	B-8016P5	2	FELT PAD	
7C	A-13813	2	PAD SPRING	
7B	A-13811P3	1	ACTUATING PIN	
7G	A-13811P2	1	BRACKET	
7F	A-13811P1	1	BRACKET	
7H	A-13809	1	SLIDE	
7A	A-13844	1	PAD SLIDE WELD ASSEM.	
7	B-13845	1	PAD SLIDE ASSEMBLY	
6	B-13876	2	HEAD COVER	
5	A-13829	2	.043 CMS SHIM	
4	A-13830	2	HEAD LOCATING PIN	
3		2	VINYLITE SLEEVE .312 LONG	
2	B-13828	1	SHURE RECORDING HEAD	
1C	A-13763	1	SW MTG. BRACKET	
1A	A-13790	1	SPRING SUPPORT BRACKET	
1	C-13788	1	TOP PLATE WELD ASSEMBLY	
SYMB.	DWG. No.	QTY.	DESCRIPTION	

TOP PLATE, MECHANICAL ASSEMBLY

MODEL RT-65 RECORDER

SHEET 1 OF 1 DWG. No. D-13807

RED
ORANGE } RECORD WINDING
BLUE
YELLOW } ERASE WINDING

TWIST & TIN 3/8" LEADS.

RED LEAD & SHIELD CONNECTED
YELLOW LEAD & SHIELD CONNECTED.

SECTION A-A.

SECTION B-B.

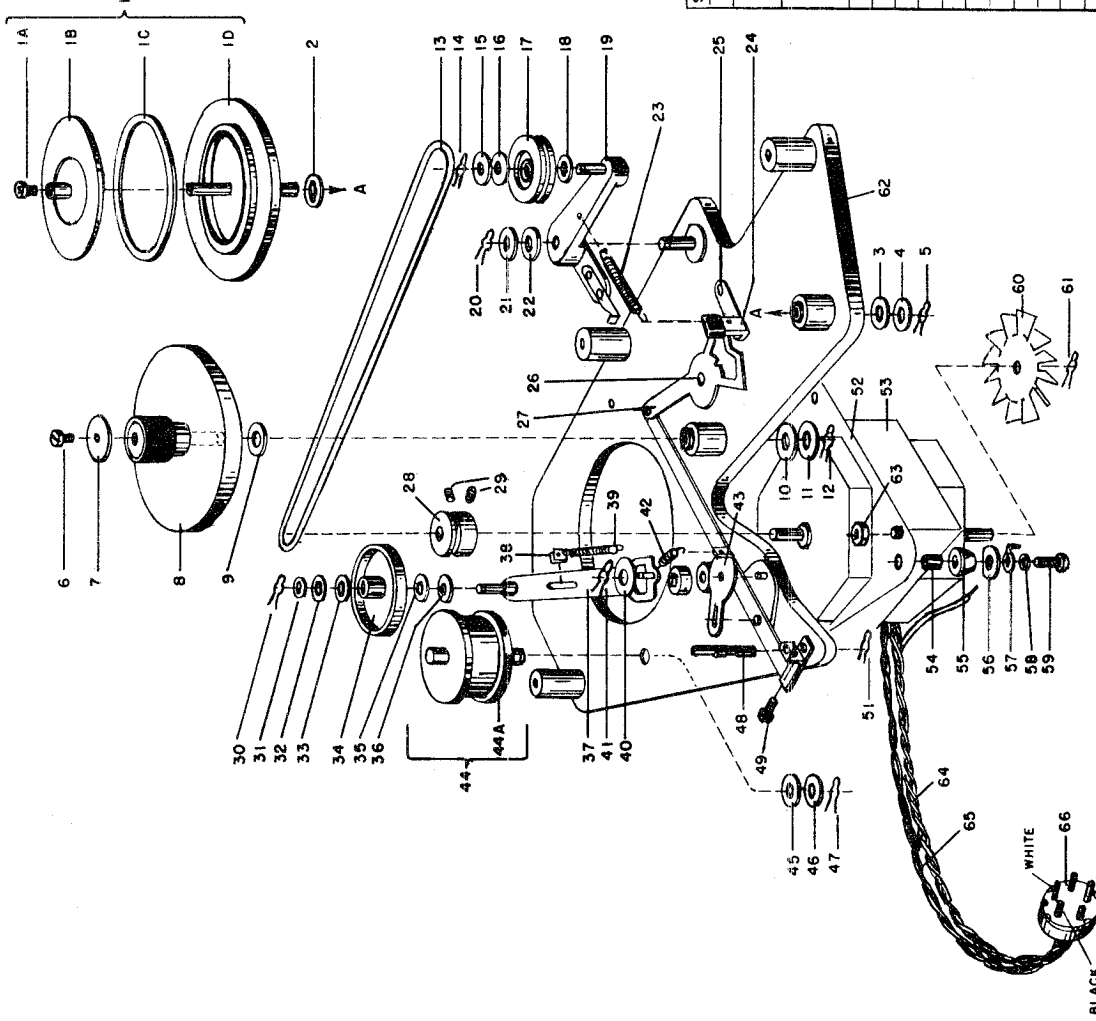
TO SOLDER LUG ON MOTOR BASE PLATE

FIG. 2.

MODEL RT-65

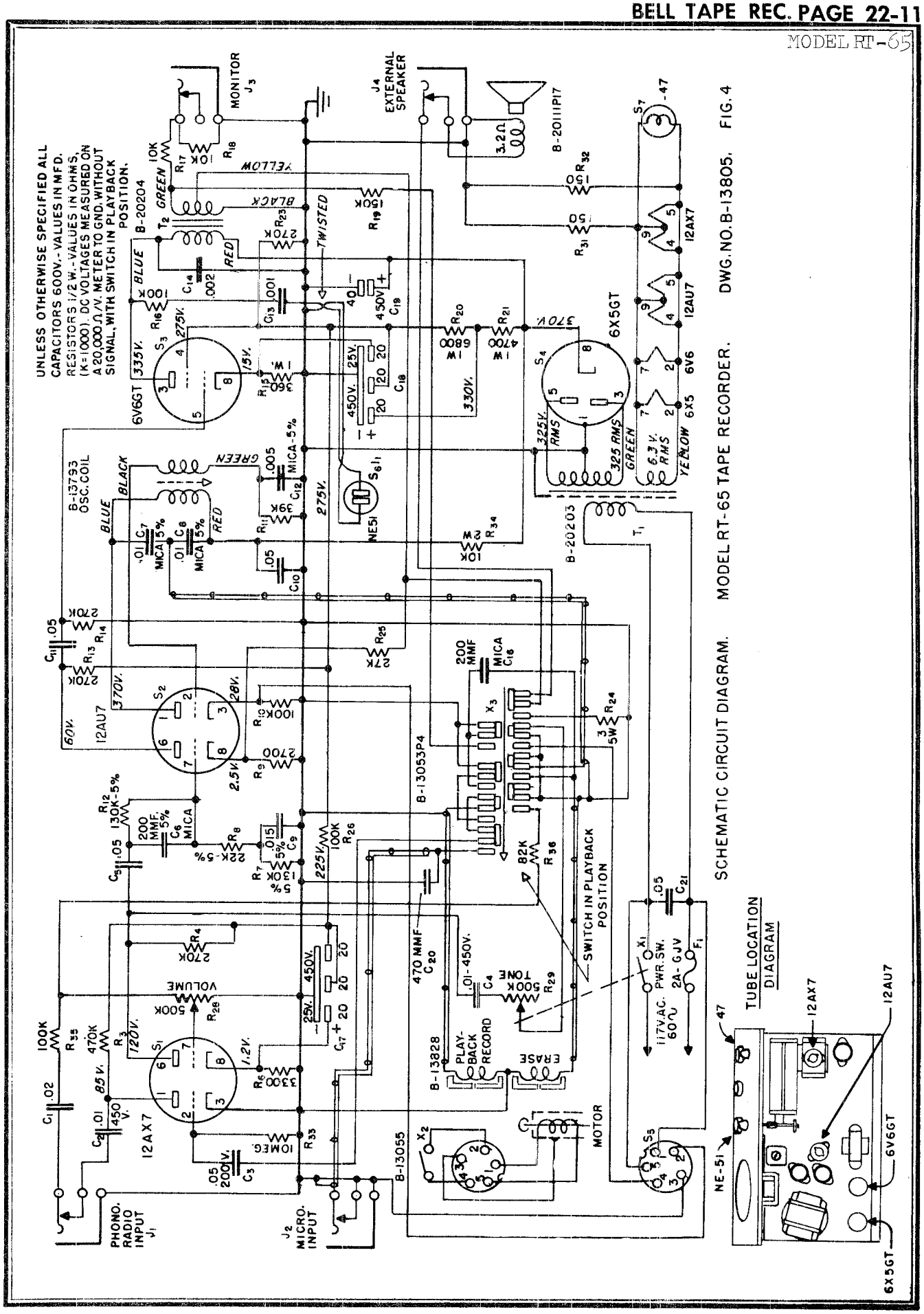
49		1	8-32 BHMS - STL.
48	A-13804	1	CONTROL SHAFT
47	2073	1	SPRING RETAINER
46	2011	1	BAKELITE WASHER
45	2070	1	FELT WASHER
44A	2060	1	FELT WASHER
44	2082	1	REWIND DRUM ASSEMBLY.
43	2043	1	IDLER CAM
42	2039	1	IDLER CAM SPRING
41	2071	1	SPRING RETAINER
40	2031	1	RETAINING WASHER
39	2038	1	IDLER LEVER SPRING
38	2042	1	IDLER LEVER SPRING CLIP
37	2089	1	IDLER LEVER ASSEMBLY
36	2044	1	BAKELITE WASHER
35	2065	1	FISHPAPER WASHER
34	2003	1	IDLER WHEEL
33	2065	1	FISHPAPER WASHER
32	2044	1	BAKELITE WASHER
31	2030	1	FELT WASHER
30	2073	1	SPRING RETAINER
29		2	6-32 ALLEN SET SCREW
28	2033	1	MOTOR BELT PULLEY
27	2091	1	CONTROL LINK ASSEMBLY
26	2021	1	RIVET
25	2021	1	RIVET
24	2094	1	BRAKE ASSEMBLY
23	B20191P4	1	BRAKE SPRING
22	2012	1	FELT WASHER
21	WAS-496	1	BAKELITE WASHER
20	2073	1	SPRING RETAINER
19	2080	1	BELT PULLEY LEVER ASSEM.
18	WAS-496	1	BAKELITE WASHER
17	2081	1	BELT PULLEY ASSEMBLY
16	2012	1	FELT WASHER
15	WAS-496	1	BAKELITE WASHER
14	2072	1	SPRING RETAINER.
13	2002	1	"O"-RING BELT
12	2073	1	SPRING RETAINER
11	2011	1	BAKELITE WASHER
10	2070	1	FELT WASHER
9	2011	1	BAKELITE WASHER
8	2083	1	CAPSTAN ASSEMBLY
7	A-13832	1	CAPSTAN TOP PLATE
6		1	4-40 BHMS-STL-NP
5	2073	1	SPRING RETAINER
4	2011	1	BAKELITE WASHER
3	2070	1	FELT WASHER
2	2011	1	BAKELITE WASHER
1D	2087	1	TAKE-UP DRUM ASSEMBLY
1C	2061	1	FELT WASHER
1B	2079	1	TAPE DISC ASSEMBLY
1A		1	4-40 FH. BHMS-STL.-NP.
1	2077	1	TAPE DISC & TAKE-UP ASSEMBLY

SYMB	DWG.NO	QTY.	DESCRIPTION.
66	M-51	1	PLUG W/SHELL
65		1	16" FLEX. WIRE
		1	16" FLEX. WIRE
64		1	13" FLEX. WIRE - WHITE
		1	13" FLEX. WIRE - BLACK
		1	11" FLEX. WIRE
63		4	10-32 STAN. HEX. NUT.
62	2090	1	BASE & BUSHING ASSEMBLY
61	2073	1	SPRING RETAINER
60	2095	1	FAN
59		3	10-32 RHMS - STL.
58		3	NO. 10 SPLIT LOCKWASHER
57	LUG-175	1	LUG
56	2069	3	SPECIAL WASHER
55	2001	3	GROMMET
54	2006	3	BUSHING
53	2000	1	MOTOR
52	2068	1	MOTOR MTG. PLATE
51	2073	1	SPRING RETAINER

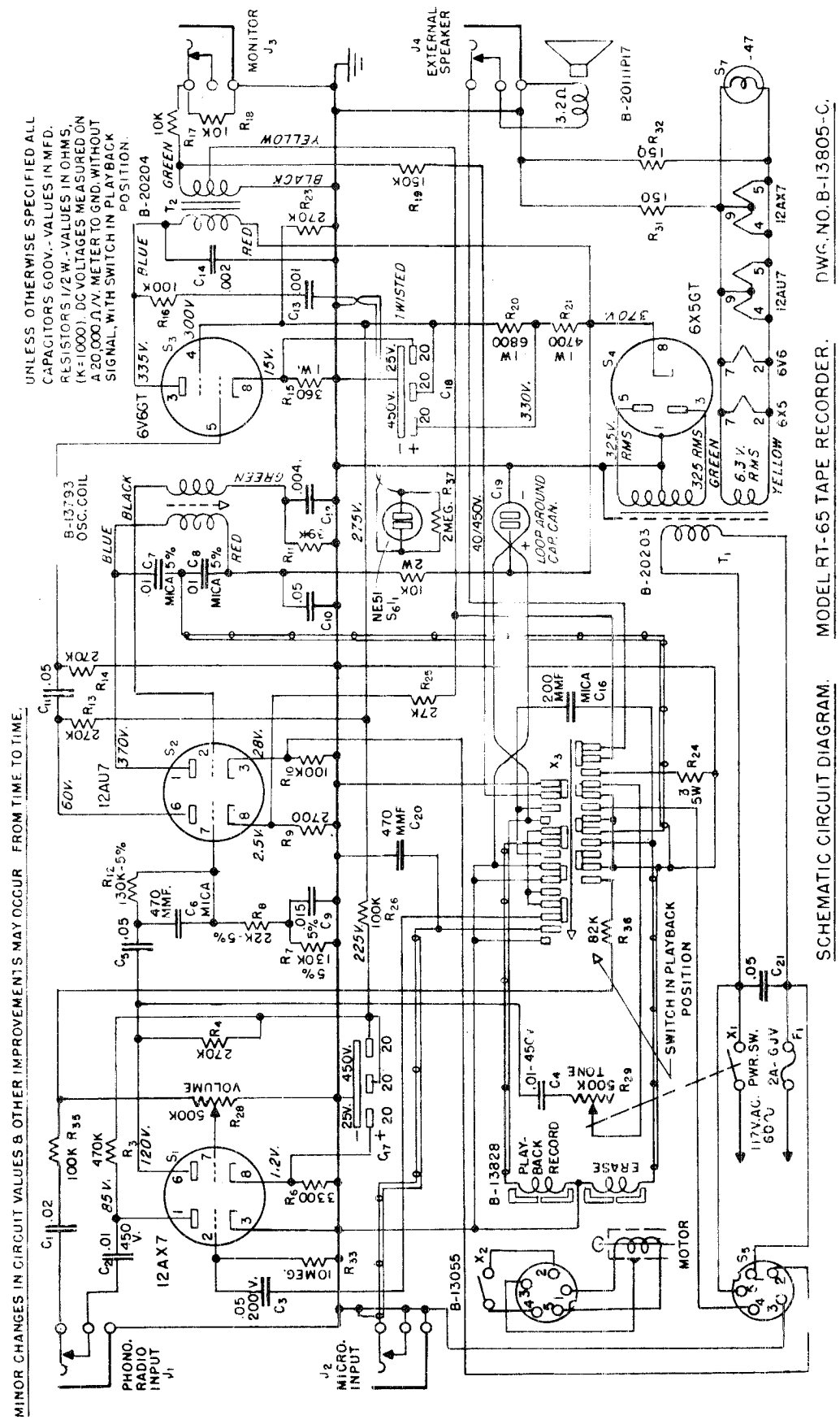


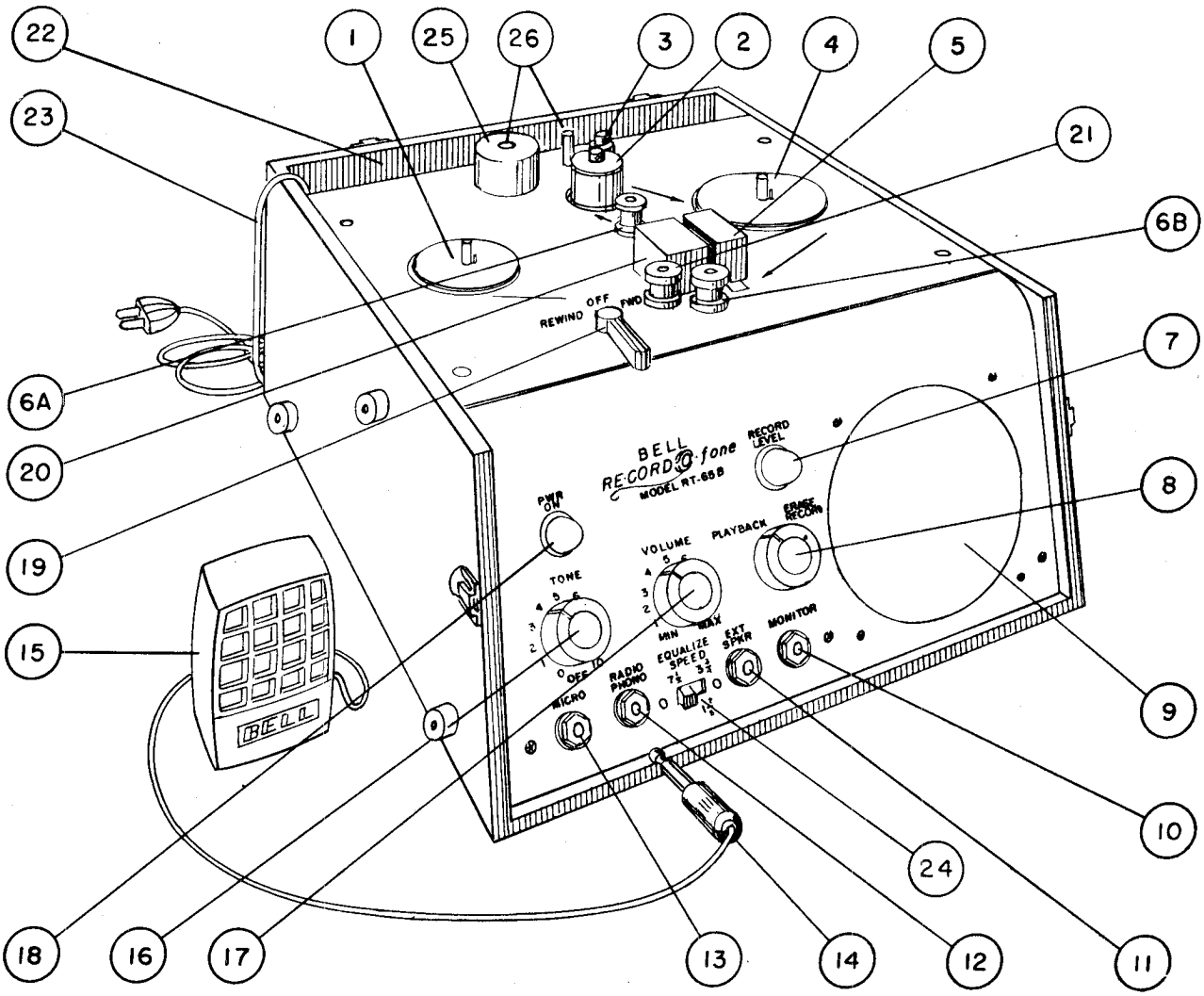
MODEL RT-65 TAPE RECORDER — FIG. 3. MECHANICAL ASSEMBLY.

MODEL RT-65



MODEL RT-65





1. Supply Reel Platform
2. Capstan
3. Pressure Roller
4. Take-Up Reel Platform
5. Pressure Pads
6. A Rear Tape Guide Roller
   B Front Tape Guide Roller
7. Recording Level Indicator
8. Erase Record-Playback Control
9. Speaker
10. Headphone Monitoring Jack
11. External Speaker Jack
12. Radio or Phono Jakc
13. Microphone Jack
14. Microphone Plug
15. Microphone
16. Tone Control & Master Power Switch
17. Volume Control
18. Pilot Light
19. Direction Control - 3 Position Rewind - Off - Forward
20. Erase-Record-Playback Head
21. Tape Idler Roller
22. Storage Compartment for Power Cord, Reels and Microphone
23. Power Cord
24. Switch to Equalize Tape Speeds
25. Spare Pressure Roller for 1-7/8" Speed
26. Spare Pressure Roller Posts for Storing Rollers

MODEL RT-65-B

THREE SPEED DUAL TRACK TAPE RECORDER

7-1/2", 3-3/4" and 1-7/8" per second

INTRODUCTION

This recorder is precision built and with reasonable care it will provide many hours of dependable service and enjoyment. At 7-1/2" tape speed it will give good quality reproduction to 8000 cycles and higher. At 1-7/8" tape speed it will provide two hours recording on a single track, or a total of four hours on a 7" reel. The 1-7/8" speed is recommended for voice and music where the quality of music need not be as good as at 7-1/2". The intermediate speed of 3-3/4" provides twice the recording time of 7-1/2" with some reduction in high frequency response.

These three speeds enable the user to choose between the response he wants versus playing time, all in one recorder. The 7-1/2" speed should be used to obtain the best quality recordings.

When unpacking the recorder carefully examine it for visible damage. If unit is damaged, notify your dealer at once so that claim may be filed with the transportation agency.

NOTE - RECORDERS ARE SHIPPED WITH CAPSTAN AND PRESSURE ROLLERS IN 7-1/2" SPEED POSITION.

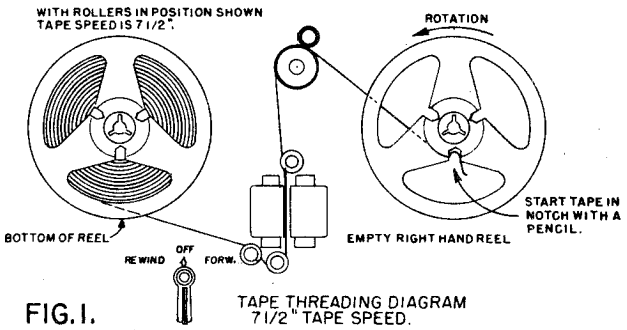


FIG. 1. TAPE THREADING DIAGRAM 7 1/2" TAPE SPEED.

OPERATING INSTRUCTIONS

Place the recorder on a flat surface close to a convenient 110 volt AC outlet. Next, remove the cover and take out power cord and after first checking to see that direction control (#19) is in "Off" position, plug into outlet. Now turn on unit by rotating tone control (#16) to the right until you hear a click and the pilot light is illuminated. Place a full reel of Type "A" tape on supply reel platform (#1). Rotate reel until small pin near center post engages one of the small notches in reel. Grasp end of tape and unwind about two feet, notice that the tape has a dull coating on side nearest center of reel. Recordings are made on this (coated) side. Place empty reel on tape take-up reel platform (#4). Thread tape around idler pulleys (#21) and (#6B), then in slot between Erase-Record-Playback head (#20) and the pressure pads (#5); next, past tape guide roller (#6A) around capstan (#2) and between pressure roller (#3) to empty take-up reel. Now thread free end of tape up into empty reel. Push the tape into one of the notches with a pencil. Holding the tape in the notch, rotate the reel for a few turns in a counter-clockwise direction. Be sure small drive pin is engaged and take up all excess slack in tape. See Figure #1.

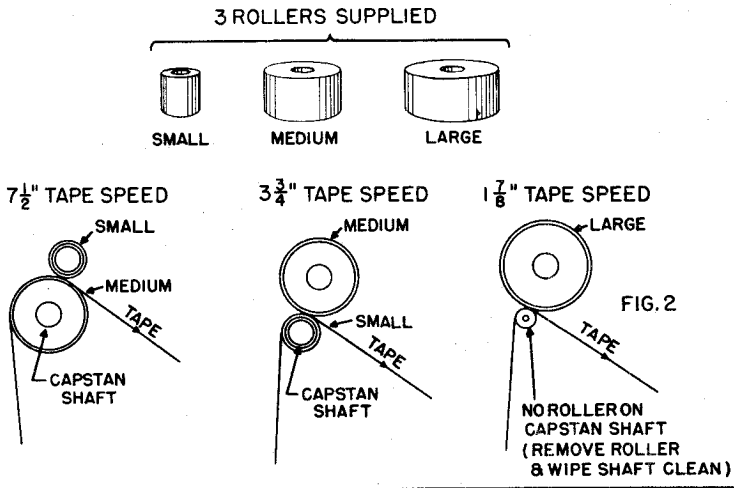


FIG. 2

Method of Changing Tape Speed - The speed at which the tape runs through the recorder depends on the size of the capstan, therefore, to change speed it is necessary to change the diameter of the capstan and the pressure roller. See Fig. 2.

For 7-1/2" per second tape speed, use the medium and the small rollers, as shown.

For 3-3/4" per second tape speed, interchange the small and medium size rollers. (Just reverse of 7-1/2").

For 1-7/8" per second tape speed, remove roller and screws from the capstan shaft, wipe off any oil on the shaft and use the large size roller only. Do not use washer or thumb nut on capstan shaft.

NOTE - When changing capstans and rollers, turn power switch (located on tone control) #16 to "Off" position. Turn direction control #19 to "Forward". This prevents the rollers from turning while loosening and tightening thumb screws. Store spare rollers, washer and thumb nut on posts #26.

Equalize Tape Speed Switch - When using 7-1/2" speed, the equalize switch #24 should be in 7-1/2 position for correct response. For 3-3/4" or 1-7/8" speed the switch should be in the 3-3/4-1-7/8 position. This position has extra high boost with some bass droop.

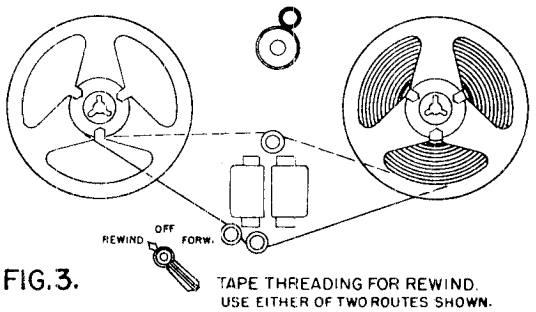


FIG.3. TAPE THREADING FOR REWIND. USE EITHER OF TWO ROUTES SHOWN.

Keep your tape recorder in good condition. The erase head and capstan of the recorder should be cleaned periodically with a soft cloth and carbon tetrachloride to insure maximum performance. Wipe dry before using again. For best results use plastic tape, Type "A" wind.

Recording

Microphone: Insert microphone plug (#14) into microphone jack (#13). Turn Erase-Record Playback control (#8) to Erase-Record position. Now turn volume control (#17) to position #5 and speak into the microphone, holding the microphone about ten inches from your lips. The Record-level indicator (#7) should flicker. If it does not, turn up the volume control until the lamp just flickers occasionally when you speak. Remember, this lamp indicates the instantaneous peaks of volume, it should, therefore, flash only when a loud sound is made. If it flashes too much or lights continuously, it means that the peaks are too loud and serious distortion will result. Excellent recordings can be made with volume reduced just below the flash point where lamp does not flash at all. Use the same method of adjustment when using microphone to record music or any type of pickup.

To set the tape in motion, turn Direction control (#19) to "Forward" position. The recorder is now recording all sounds entering the microphone. Watch the recording level indicator (#7) during recording to avoid overloads but do not continually adjust the volume as this destroys the naturalness of the recording. Keep a uniform distance from microphone for best results.

Stop the tape by turning direction control (#19) to "OFF".

Rewinding

To rewind a full reel or a major portion thereof, turn Record-Playback switch (#8) to playback position. Next, remove tape from around capstan (#2) and from the recording slot (this is the slot between #20 and #5) and run tape straight across from reel to reel. See Fig. 3 above. Now turn Direction Control (#19) to "Rewind" position. For rewinding a small portion of the tape, while desirable, it is not necessary to remove tape from capstan and recording slot. First, turn Record-Playback switch to Playback, then CARE MUST BE EXERCISED TO TURN CONTROL VERY SLOWLY TO REWIND TO PREVENT BREAKING TAPE.

If tape is rewound past head, the volume control (#17) should be turned down to avoid unpleasant high-pitched chatter, However, with a little practice this chatter may be recognized and various sections of recorded speech or music identified during rewind.

The numbered lines to be seen under the left hand or supply reel indicate approximate time elapsed during recording or playback. Each line is approximately three minutes playing time, at 7-1/2" speed, six minutes at 3-3/4" speed and 12 minutes at 1-7/8" speed.

Playback

Thread the recorded tape into the machine the same as for recording and simply turn Direction Control (#19) to forward position, making certain that the Record-Playback Control (#8) is in playback position. To playback a partially recorded tape it is first necessary to rewind your tape to where your recording began. After the tape has been rewound, proceed as described above. Adjust the volume and tone controls for best listening.

CAUTION: Be certain that the Record-Playback Control (#8) is in playback position before starting the tape in motion, at all times, except when recordings are actually being made. This will prevent accidently erasing a tape when PLAYBACK was intended.

MODEL RT-65-B

Erasing

Any previously recorded tape may be erased by running the tape through the machine in the manner as described for "recording" except that the volume control (#17) is turned to zero so that no signal will be recorded. The erase feature is automatic, since when a recording is being made, the tape is erased just ahead of the recording. In this way, any previously recorded material is always removed before the new material is recorded on the tape.

How To Obtain Dual Track

This recorder will record two "tracks" on a single tape, in other words, only one half of the width of the tape is recorded at a time. After recording through an entire reel in one direction, the full reel is inverted and placed on the Supply Reel Platform (#1), the empty reel on the Take-Up Reel Platform (#4), and the entire tape length may be recorded again on the other half of the tape. To facilitate reel change-over, stop tape motion just before the tape unthreads, leaving five or ten turns on the reel. This avoids need for re-threading. With a little practice, change-over can be done in less than fifteen seconds.

Recording Direct from External Radio, Phonograph or Record Player

To record direct from an external radio or phonograph, a single conductor microphone type cord should be equipped with a shielded plug similar to the one on the microphone cable, and plugged into the radio or phono jack (#12). Shield should be connected to sleeve of plug. The other end of this cable should be connected directly to the speaker voice coil terminals of the radio or phono making certain that the shielding connects to the grounded side of the circuit. (Determine by trial and error test.) A radio service man may be called in to make this simple connection and to supply the cable and plug. You may, of course record radio or phonograph programs by simply placing your microphone approximately one to two feet in front of the loudspeaker and following the procedure as outlined under microphone recording. You may also connect a crystal pickup direct to the recorder by connecting the pickup leads to the phono input. Observe polarity as described above.

Use With Radio Tuner

By connecting the output of one of the commercially available FM, or combination AM-FM tuners, direct into the recorder, a complete high quality radio is obtained with both listening and recording features. One word of caution, in recording direct from a radio or phonograph having "Bass boost" type of tone control, it is recommended that no bass boost be used during recording since bass distortion may result when played back.

CAUTION: Recorder will not playback with plug in radio-phono jack. Also microphone cannot be used to record with plug in radio-phono jack.

Use of Monitoring Headphones

For those who desire to make the best recordings of singers, speakers, musical groups, plays, weddings and similar types requiring varied microphone pick-up, investment in a pair of crystal headphones for monitoring purposes is recommended. The headphones should be equipped with a shielded plug and are inserted into the headphone monitoring jack (#10). You will then be able to hear the sounds just as they are being recorded and keep a constant check on the quality of the recorded material.

500 Ohm Output

The output transformer has a 500 Ohm winding and is connected to the monitor jack through a 10,000 Ohm resistor. To obtain 500 Ohm output, short circuit this series resistor. Connect to monitor jack. Observe ground polarity.

Use of an External Speaker for Better Playback Listening

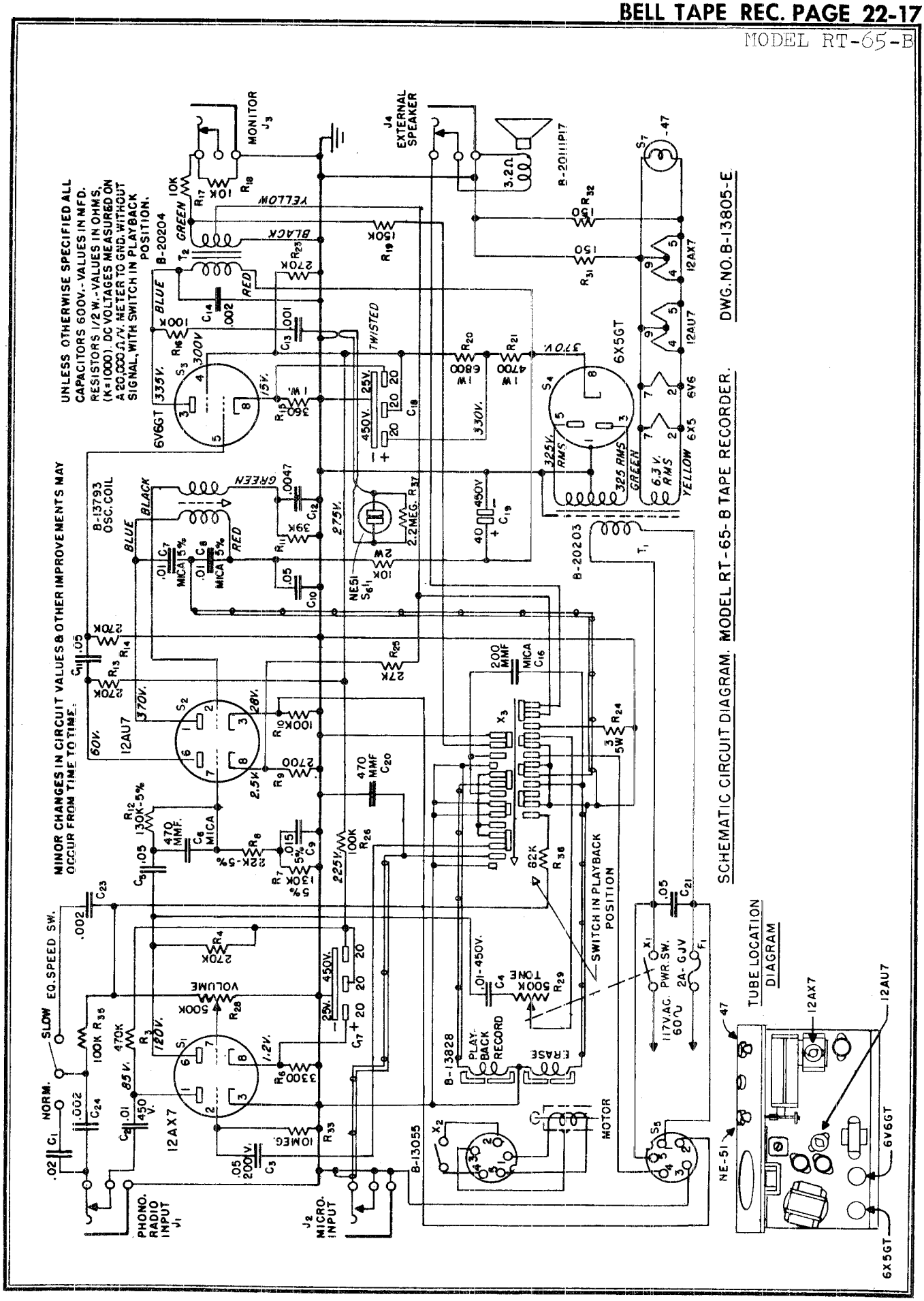
Although the built-in speaker is especially designed to give the best possible sound quality for portable use; it is sometimes desirable to playback to a large audience through a larger, separate loudspeaker, or to use a separate high-fidelity speaker in the home. Leads from the external speaker should be connected to a shielded plug and inserted into the external speaker jack (#11). This output jack has an impedance of 4-6 ohms. Also, when a speaker is plugged into this jack, it automatically disconnects the internal speaker in the unit.

Use of Recorder with an External Amplifier for Recording or Playback

Playback - The output from this recorder may be fed directly into any high impedance phono input of a sound system or amplifier. This is accomplished by connecting the headphone monitoring jack (#10) to the phono input of the amplifier. Connect sleeve of plug to ground connection of amplifier. This permits use of the internal speaker of the recorder to monitor programs being fed to the external amplifier.

You may also feed an external amplifier by connecting the external speaker jack (#11) of the recorder to the phono input of an amplifier. If this is done, it is necessary to add a 3 ohm 5 watt load resistor across your cable between the recorder and amplifier. By this method, the internal speaker of the recorder is silenced and you may monitor your out-going program by use of headphones.

Recording - The output of any sound system or amplifier, if properly terminated by a loudspeaker or equivalent load resistor, may be connected into the Radio-Phono input of the recorder and recordings made. Insert a phone plug into the phono jack of the recorder. Connect the two leads to the speaker or proper resistor load of the amplifier. Observe ground polarity, ground side of amplifier to sleeve of plug.


UNLESS OTHERWISE SPECIFIED ALL CAPACITORS 600V.- VALUES IN MFD. RESISTORS 1/2 W.- VALUES IN OHMS. (K=1000). DC VOLTAGES MEASURED ON A 20,000 Ω/V. METER TO GND. WITHOUT SIGNAL, WITH SWITCH IN PLAYBACK POSITION.
MINOR CHANGES IN CIRCUIT VALUES & OTHER IMPROVEMENTS MAY OCCUR FROM TIME TO TIME.
SCHEMATIC CIRCUIT DIAGRAM. MODEL RT-65-B TAPE RECORDER. DWG. NO. B-13805-E
TUBE LOCATION DIAGRAM
SWITCH IN PLAYBACK POSITION
MONITOR
EXTERNAL SPEAKER
PHONO. RADIO INPUT
MICRO. INPUT
MOTOR
VOLUME
TONE
ERASE
PLAY-BACK RECORD
SLOW
NORM.
EQ. SPEED SW.
PWR. SW.
B-13793 OSC. COIL
B-20204
B-20111P17
B-20203
B-13828
B-13055
6V6GT
12AU7
12AX7
6X5GT
NE-51

MODELS BK-411, BK-414

EQUIPMENT DATA FOR MODELS BK-411 and BK-414 SOUNDMIRROR

1. WEIGHT — BK-411 — 32 lbs. 40 lbs. packed; BK-414 — 38 lbs. 48 lbs. packed
2. DIMENSIONS — BK-411 — unpacked, 17½" wide x 12½" deep x 11¼" high (less feet), feet made of cork ⅜" x 1¼" diameter.
   BK-414 — (unpacked in operating position, lid closed) 17" wide x 20½" deep x 10" high (less feet and catches).
3. POWER REQUIREMENTS — 105-120 volts, 60 cycles, A. C., single phase.
4. WATTS CONSUMED — 85 total.
5. RECORDING MEDIUM — "Magic Ribbon" (magnetically coated paper ribbon).
6. RECORDING TIME — Approximately 30 minutes per 7" reel.
7. CONSTANT RECORDING SPEED — 7.5 inches per second, nominal.
8. DYNAMIC RANGE — Approximately 40 db.
9. FREQUENCY RESPONSE (overall) — Essentially flat from 100 to 5000 cycles. (See Fig. 29)

10. INPUT CONNECTIONS

Input	Impedance	Source	Voltage Limits
Microphone	1 megohm	Crystal microphone	.003 to .2 volts
Radio	1 megohm	any	0.2 to 10.0 volts

11. OUTPUT CONNECTIONS

Output Circuit	Impedance	Power Output	Output Voltage
Internal Speaker	3.2 ohms	1 watt undistorted	1.8
External Speaker (terminal strip E-3 on BK-411 and output jack J-7 on BK-414 permits its use)	3.2 ohms (secondary of output transformer T-2)	1 watt undistorted (when terminated with 3.2 ohm load)	1.8

12. TUBE COMPLEMENT

V-1 — 6J7 or 1620†
V-2 — 6SJ7
V-3 — 6E5
V-4 — 6J5
V-5 — 6SN7 or 6SL7*
V-6 — 6SN7
V-7 — 5Y3

† recommended in cases of extreme microphonics.
* recommended for higher output.

MODELS BK-411,
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MODELS BK-411, BK-414

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MODELS BK-411,
BK-414

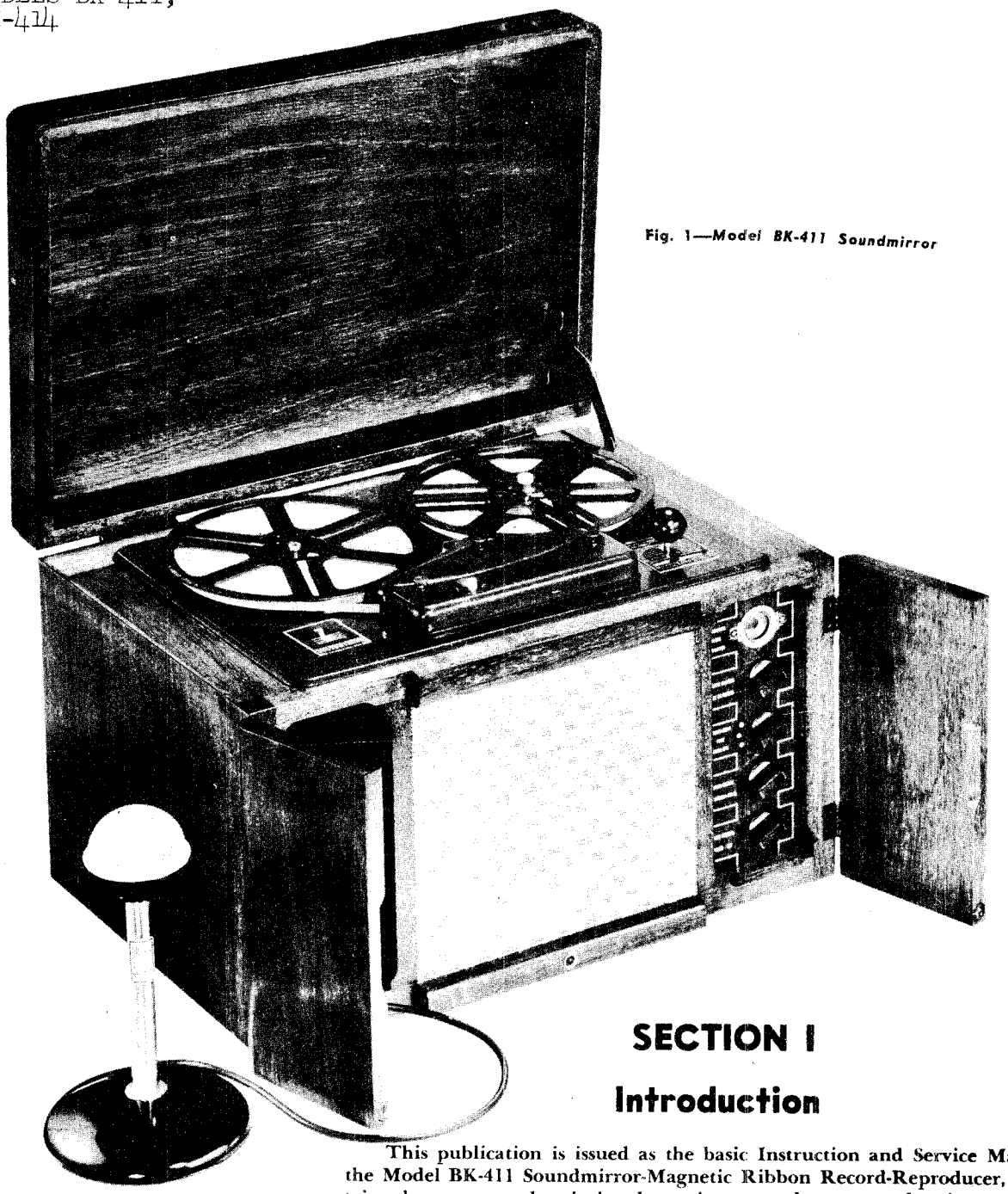

Fig. 1—*Model BK-411 Soundmirror*

SECTION 1

Introduction

This publication is issued as the basic Instruction and Service Manual for the Model BK-411 Soundmirror-Magnetic Ribbon Record-Reproducer, and contains the necessary descriptive data, pictures and necessary drawings, coded and identified for its operation, maintenance, and overhaul.

The Model BK-411 Soundmirror (Fig. 1) is a complete unit designed to record and reproduce audio signals magnetically. The recording medium is a ferromagnetic powder coated paper ribbon, *"Magic Ribbon," wound on reels of appropriate size to supply approximately thirty minutes each of recording or playing time.

The Model BK-411 is a compact unit comparable in size to the average table model combination radio and weighs approximately thirty pounds.

The accessories included with the Model BK-411 Soundmirror are as follows: Microphone complete with cord and phono plug, connected, through a hole in the microphone compartment, to the recorder-amplifier; a removable microphone base to which the microphone may be attached for stationary operation or detached for hand operation; one empty reel and one full reel of *"Magic Ribbon" packed separately alongside the cabinet in the packing carton.

The Model BK-411 Soundmirror operates from a power source of 105 to 120 volts, 60 cycles A. C. and consumes approximately 85 watts.

SECTION II

Detailed Description

POWER REQUIREMENT

The power requirement for the Model BK-411 Soundmirror is 85 watts at 105 to 120 volts 60 cycles, single phase, alternating current. Caution: DO NOT CONNECT TO DIRECT CURRENT.

If direct current is the only source of power available, an inverter must be used to supply 85 watts at 105 to 120 volts 60 cycles A. C. to the Model BK-411 Soundmirror.

Note: When used with other than power source specified above, the inverter, generator, or power source must be well grounded and filtered to eliminate line noise or hum.

REELS AND RIBBON

Two reels 7" in diameter x 7/16" thick are furnished with the BK-411 Soundmirror; one empty and one filled with "Magic Ribbon" (approximately 1225') to supply approximately thirty minutes of recording or playing time. (See Fig. 2).

The reels are made of light weight material and are subject to shape distortion if care is not exercised in handling.

When extra reels of "Magic Ribbon" are not in use they should be stored by standing them on edge (in the carton) in a dry place. If reels are stored in stacked manner they are apt to become bent.

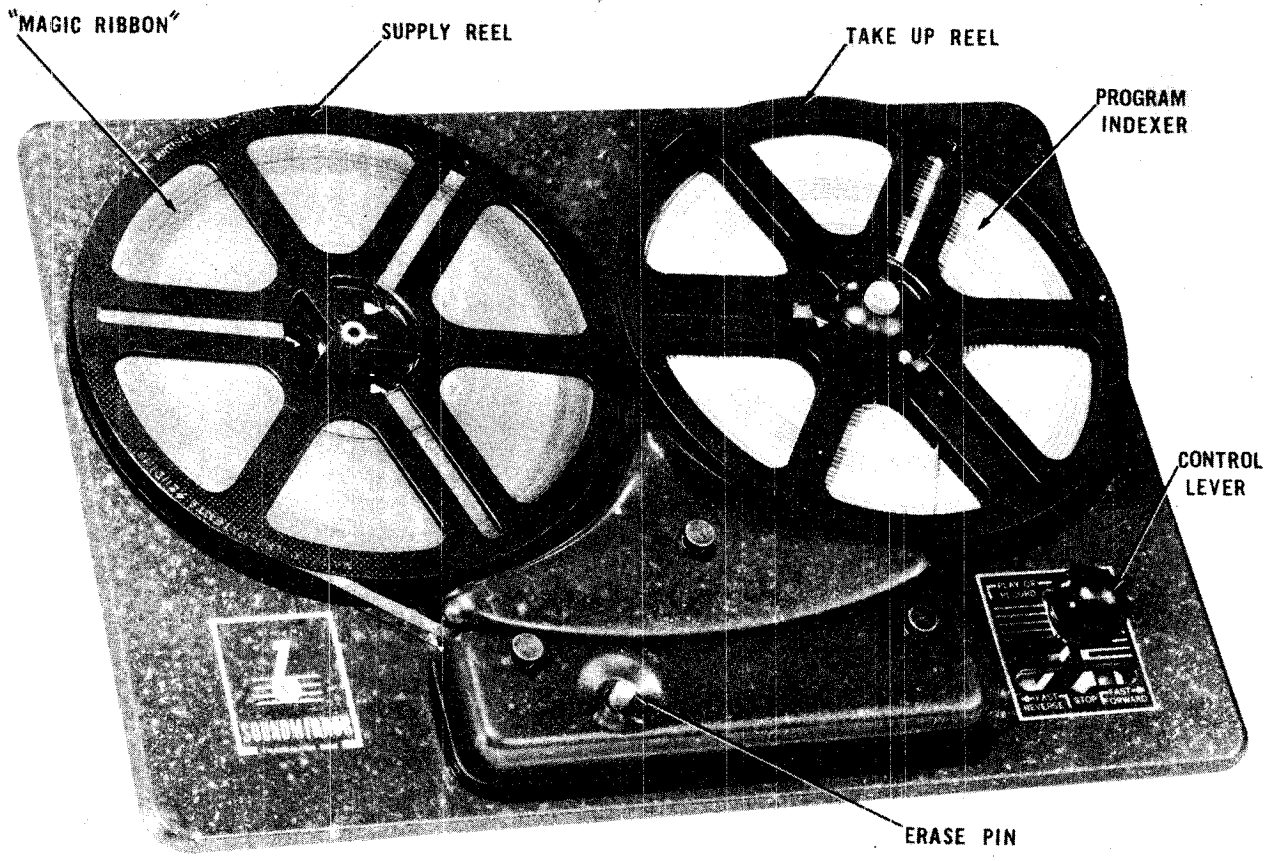

Fig. 2—*Top Panel*

MODELS BK-411,
BK-414

The "Magic Ribbon" furnished with the Model BK-411 is a paper ribbon coated with a magnetic material (black iron-oxide) and has a breaking load of 6 lbs. With proper care in handling, "Magic Ribbon" should last indefinitely.

CABINET

The cabinet for the Model BK-411 Soundmirror is made of solid Mahogany and Mahogany veneer.

With the doors and lid closed, the cabinet measures 17½ inches wide, 12½ inches deep, and 11¼ inches high, less feet. The feet are made of cork ⅜" high and 1¼" in diameter.

To preserve the finish of the cabinet, a suitable furniture wax such as Simonize or Johnsons Wax may be used. After applying wax, rub the finish with a polishing cloth to return luster finish.

Scratches may be removed (before waxing) by applying a thin coat of Mahogany stain to the scratch, allowing it to set a moment, then wiping with a polishing cloth.

PILOT LIGHT JEWEL

The pilot light jewel located at the bottom, center-front of the cabinet is an amber translucent rod made of Lucite material. Light is transmitted through the rod from the pilot lamp located inside the cabinet. Alignment of the pilot lamp with the rear end of the rod determines the brilliancy of the light at the front of cabinet.

MICROPHONE

Furnished with the Model BK-411 is a crystal type microphone.

When not in use the microphone is stored in the compartment provided for this purpose. (See Fig. 3). It mounts on one surface of the compartment by a spring clip (H16) which grips the handle of the microphone. During shipment, a rubber band is wrapped around the handle of the Microphone and around the clip to prevent it from dropping and becoming damaged during shipment.

A base (A-3) is furnished with the Microphone for the purpose of using the microphone for stand operation. The base is also mounted in the compartment during shipment and storage, and when used is assembled to the microphone handle as follows: insert lower end of stand into the hole of the base, fitting the key pin of the stand into the key slot of the base and turn the stand clockwise until it locks. Fig. 1 shows the microphone stand and base assembled. To disassemble, turn the stand counter-clockwise until key pin lines up with the key slot, then pull apart.

The microphone head can also be removed from the stand (by unscrewing it counter-clockwise) for the purpose of replacement.

The microphone plugs into a pin jack (J-1, Fig. 16) connected to the amplifier and may be detached for the purpose of servicing the unit.

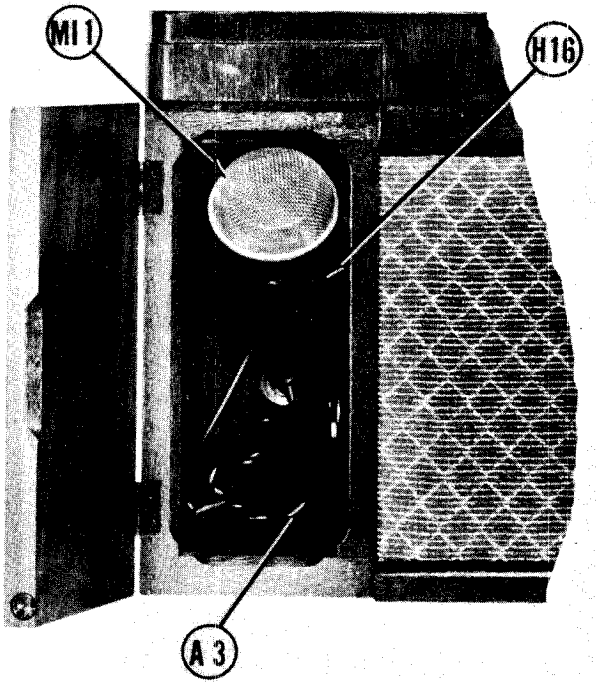

Fig. 3—*Microphone and Compartment*

TRIM COVERS

Three trim covers are used to give a final "dress" finish to the mechanical section of the BK-411 Soundmirror. These covers may be removed for access to various components located on the mechanism chassis. Fig. 4 shows two covers removed from the chassis. Trim cover (A-14) covers the top mechanism chassis. Trim cover (A-10) covers the record-reproduce head and the erase-head, and trim cover (A-12) covers the pressure wheel and the bracket assembly.

When these trim covers are removed for any reason, they should be replaced so they will not interfere with the operation of the erase head bracket or the pressure wheel link at points "A" and "B" respectively of Fig. 4.

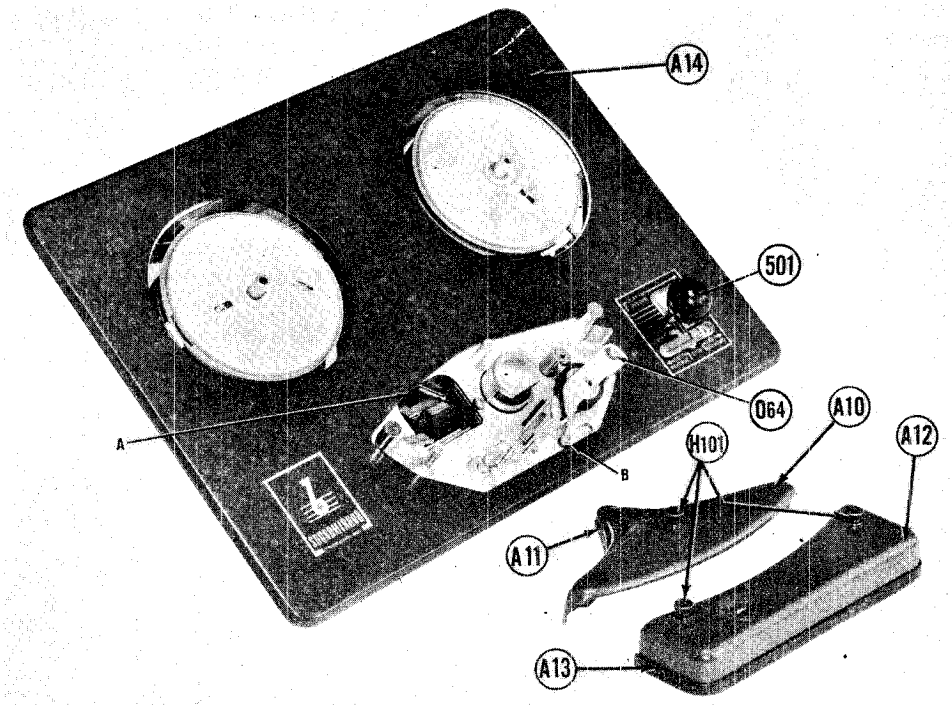

Fig. 4—*Top Panel Trim Covers*

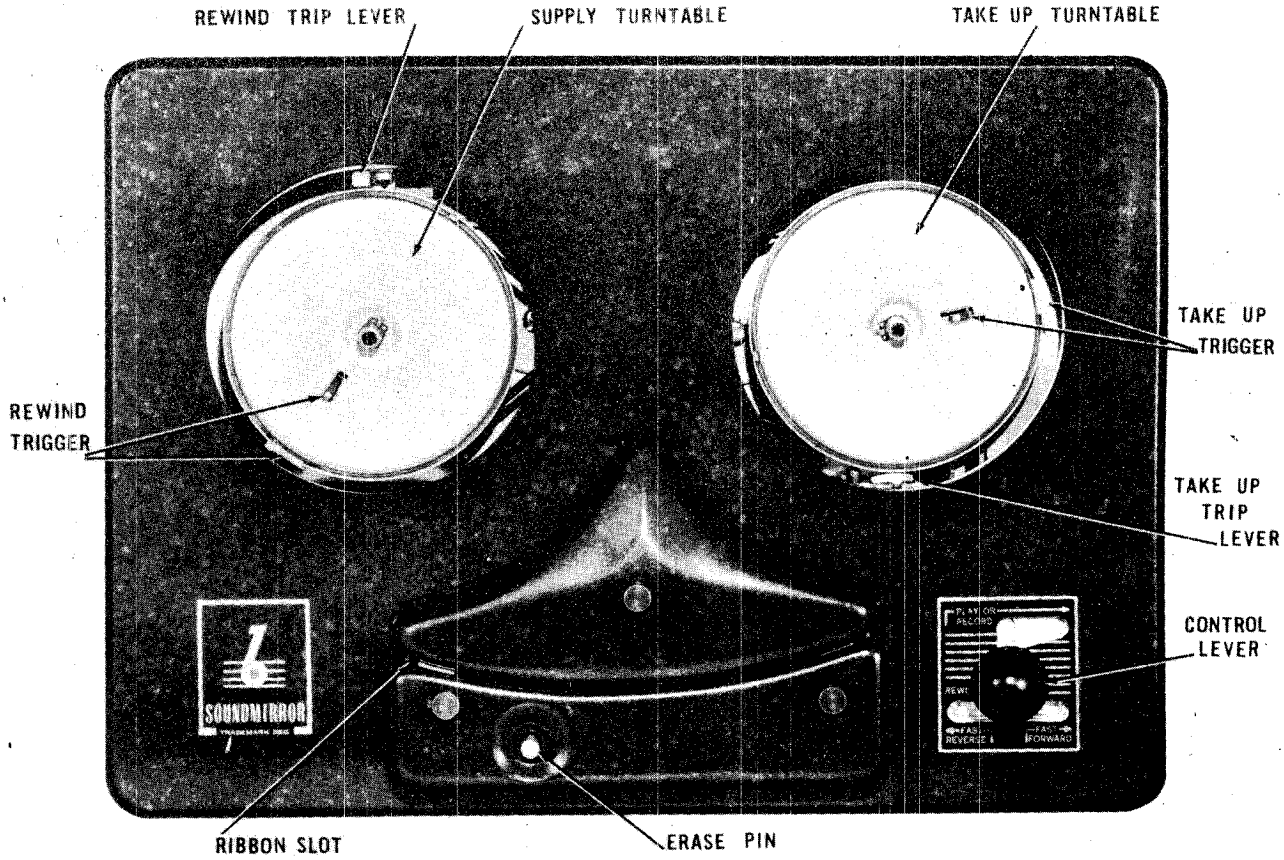

Fig. 5—*Top Panel Controls*

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CONTROLS

Located on the top panel are two manual controls; (See Fig. 5) one control lever for the purpose of shifting the mechanism to its proper position for the following operations: (a) "Play or Record", (b) "Rewind", (c) "Stop", (d) "Fast-Forward", and (e) "Fast-Reverse"; and the "Erase Pin", which, when pressed while shifting the "Control Lever" to the "Record" position, locks the erase head in position against the "Magic Ribbon". The latter control is used only during the recording operation or to erase any previous recording from the ribbon.

Two automatic controls, namely; the Rewind Trip Lever and the Take-Up Trip Lever, are located on the Top Panel; one adjacent to the Rewind clutch and one adjacent to the Take-Up clutch. The Rewind Trip Lever, when triggered, causes the ribbon to rewind from the Take-Up reel onto the Supply reel. The Take-Up Trip Lever, when triggered, causes the reels to stop at the end of the automatic rewind operation.

The amplifier controls are located on the front panel which is concealed by a door on the right front side of the cabinet (See Fig. 6). The controls are as follows, from top to bottom; (a) "Volume Control Play or Record"—This controls the level of sound being recorded on the ribbon during the recording process (viewed by the "Record-Volume Indicator" (VI) immediately above this control). It also controls the play-back volume to the speaker. (b) A Selector Switch—which connects the various sections of the amplifier for the following operations; "Record-Radio," "Play", and "Record-Mic." (c) "Speaker Volume (Recording Only)"—This controls the speaker (monitor) volume while recording from the radio input circuit. To prevent acoustic feedback the Monitor signal is muted while recording from the Microphone input circuit. (d) 'Tone Control" "Power Off—This control is for turning the power on and off as well as controlling the tone of the playback and monitoring signal. It does not effect the signal being recorded on the "Magic Ribbon".

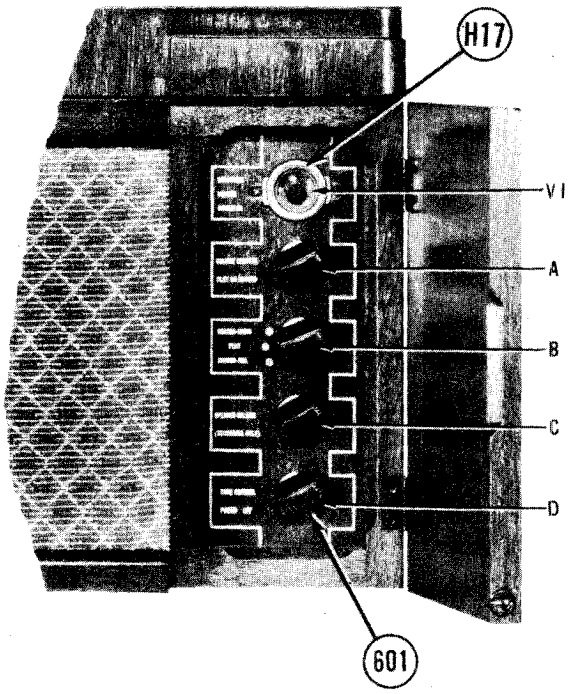

Fig. 6—*Front Panel Controls*

MECHANICAL FUNCTION

Drive Mechanism

The Drive Mechanism includes the following:

1. A single motor (B-1 Fig. 7) which drives both the capstan and the reeling mechanism. It is an induction type motor and is resiliantly mounted on a bracket which can be shifted in its position for the purpose of adjusting the tension of the rubber drive belts. A fan is attached to the drive motor shaft to cool the motor.

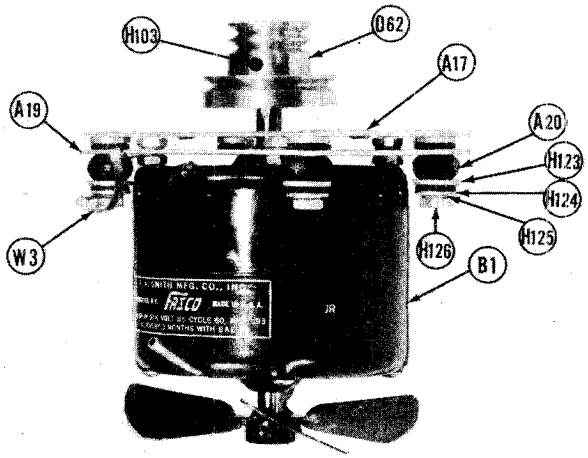

Fig. 7—*Drive Motor*

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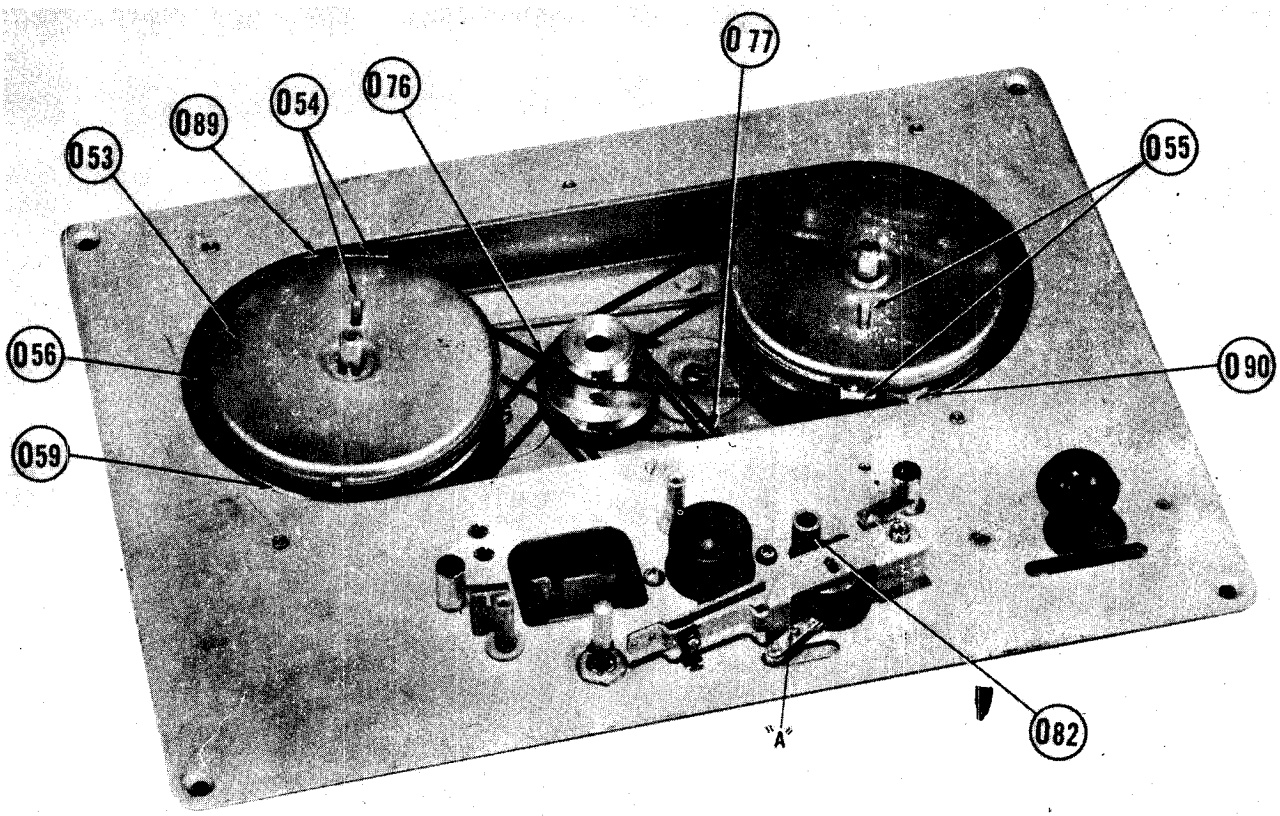

Fig. 8—*Reeling Mechanism—Reels Displaced*

2. Rubber belts (O-76 & O-77 Fig. 8) couple the drive pulley to the capstan assembly and the reeling mechanism. The smaller belt (O-77) drives the capstan and the larger belt (O-76) drives the reels.

3. A small diameter capstan (O-82 Fig. 8) attached to a pulley and a balanced flywheel provide a constant drive speed for the "Magic Ribbon". The capstan revolves in two bearings which are of the "Oilite" type and require very little additional lubrication. The bottom bearing is of the self-aligning type.

4. A pressure wheel (O-84 Fig. 9) and a pressure pad (MS-2) are assembled on a bracket (A-16) (Also see Fig. 10) which is engaged by the control lever (501) to press the ribbon against the capstan (O-82) and the record-play head (E-1) respectively during the record or play operation. The rubber tire pressure wheel has an "Oilite" bearing requiring very little additional lubrication.

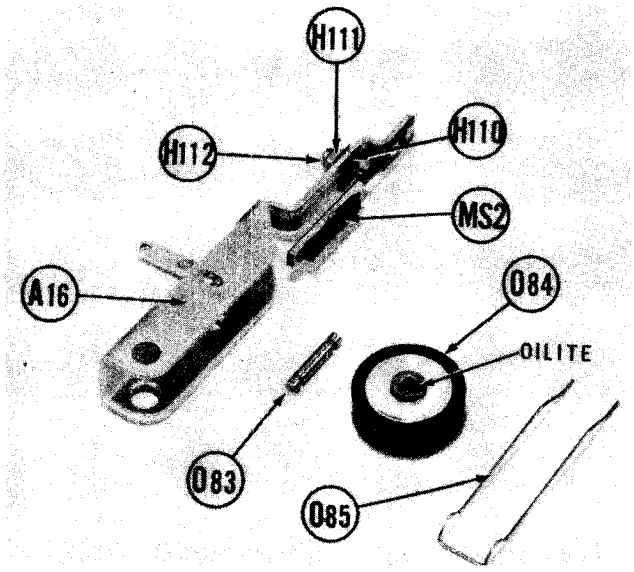

Fig. 9—*Pressure Wheel Assembly*

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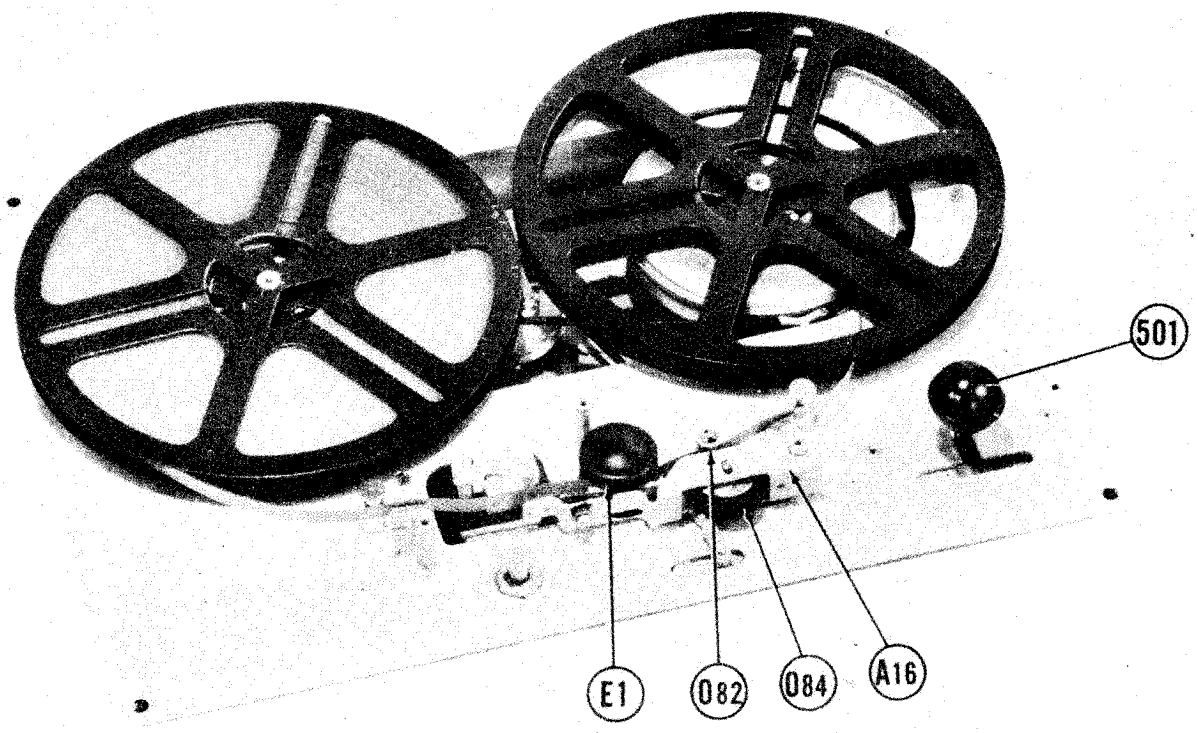

Fig. 10—*Reeling Mechanism—Reels and Ribbon in position*

Reeling Mechanism

(See Fig. 38)

The reeling mechanism consists of two turntables (O-53) and two clutch assemblies (O-56 and O-58) mounted on the two reel shafts (O-57), and two pulleys (O-59) mounted on bearings (O-63), all of which are driven by the motor (B-1) through the rubber drive belt (O-76, Fig 8).

The two turntable assemblies consist of two cups fitted together to serve three purposes:

1. The upper cup (O-53) which supports the reel.
2. The upper and lower cups fitted together to house the rewind trigger (O-54) and the take-up trigger (O-55).
3. The lower cup (O-56) to form the clutch facing which contacts the felt disc (O-58 mounted on the pulley (O-59) when the turntable assembly is lowered.

The clutch assembly, actuated by the clutch raising lever (O-86, Fig. 11) and pin (H-115, Fig. 38) is considered to be engaged when the felt disc contacts the facing of the cup (O-56). While engaged the rewind clutch turns clockwise and the take-up clutch turns counter-clockwise.

The two triggers (O-54 and O-55) are for the purpose of tripping the automatic control levers (O-89 and O-90 Fig. 8) respectively.

The rewind trigger (O-54) which is held in a cocked position by the ribbon on the reel is released when only 20 to 40 turns of ribbon remain on the reel. When released the trigger trips the rewind trip lever (O-89) which actuates the control mechanism to rewind the ribbon automatically.

The take-up trigger (O-55) is held in a cocked position by the first turn of ribbon on the take-up reel, and when the automatic rewinding is completed the ribbon leaves the reel and releases the trigger (O-55). When the trigger is released the centrifugal force causes the trigger to protrude through the opening in the outer edge of the take-up turntable and strike the trip lever (O-90) which actuates the control mechanism to stop the motor.

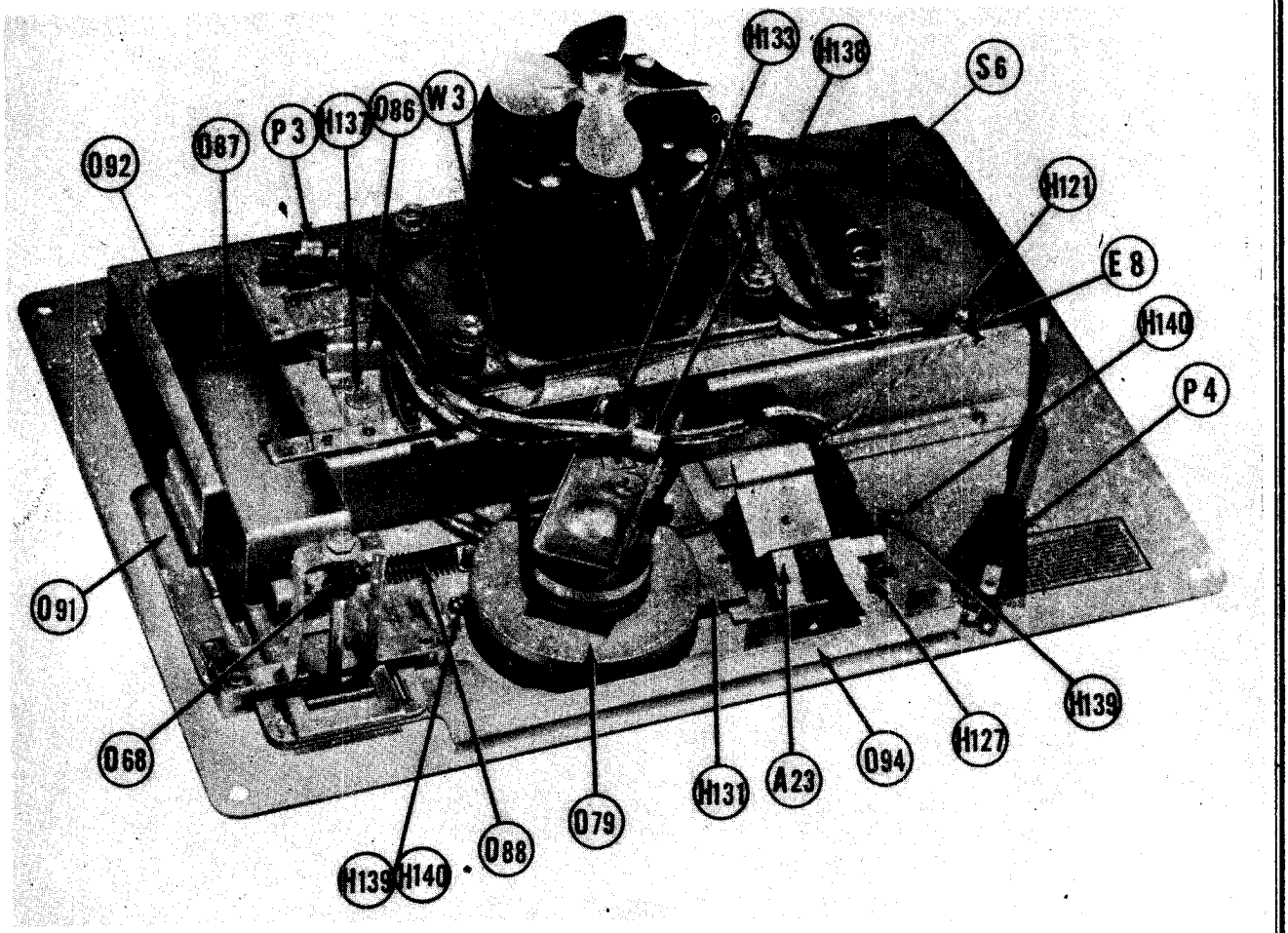

Fig. 11—*Control Mechanism—Bottom View*

Control Mechanism

The control mechanism is actuated by two control levers which are operated manually and two trip levers which are operated automatically by the reeling mechanism triggers. The manual controls are: The "Control Lever" and the "Erase Pin" (See Fig. 5). The control lever moves the corresponding engaging levers to the following positions:

1. "Play or Record" Position

Placing the control lever in this position causes:

(a) The latch cam slide (O-91, Fig. 11) which actuates the trip lever latch (H-141, Fig. 13) and the trip bar (O-99, Fig. 12) to engage and set the take-up trip lever (O-90, Fig. 13) and the rewind trip lever (O-89, Fig. 12).

(b) The head locking slide (O-94, Fig. 11) to lock the erase head in position against the ribbon (when the erase pin is pressed), the pressure wheel (O-84, Fig. 12) to bear against the capstan (O-82, Fig. 12), and the pressure pad (MS-2, Fig. 12) to bear against the record head (E-1, Fig. 12).

(c) The clutch lever (O-92, Fig. 11 & 14) which couples to the raising lever assembly (O-86, Fig. 14) to engage the take-up clutch, disengage the rewind clutch, and close the motor switch contacts (S-6, Fig. 11).

(d) The latching gate (O-93, Fig. 14) to lock the control mechanism in "Play or Record" position until released either manually (by placing control lever in "Rewind" or "Stop" position) or automatically (by action of the rewind trip lever). The latching gate is moved to the locking position by a spring (O-97, Fig. 14). This gate should be lubricated periodically with light oil (SAE-10) to prevent binding.

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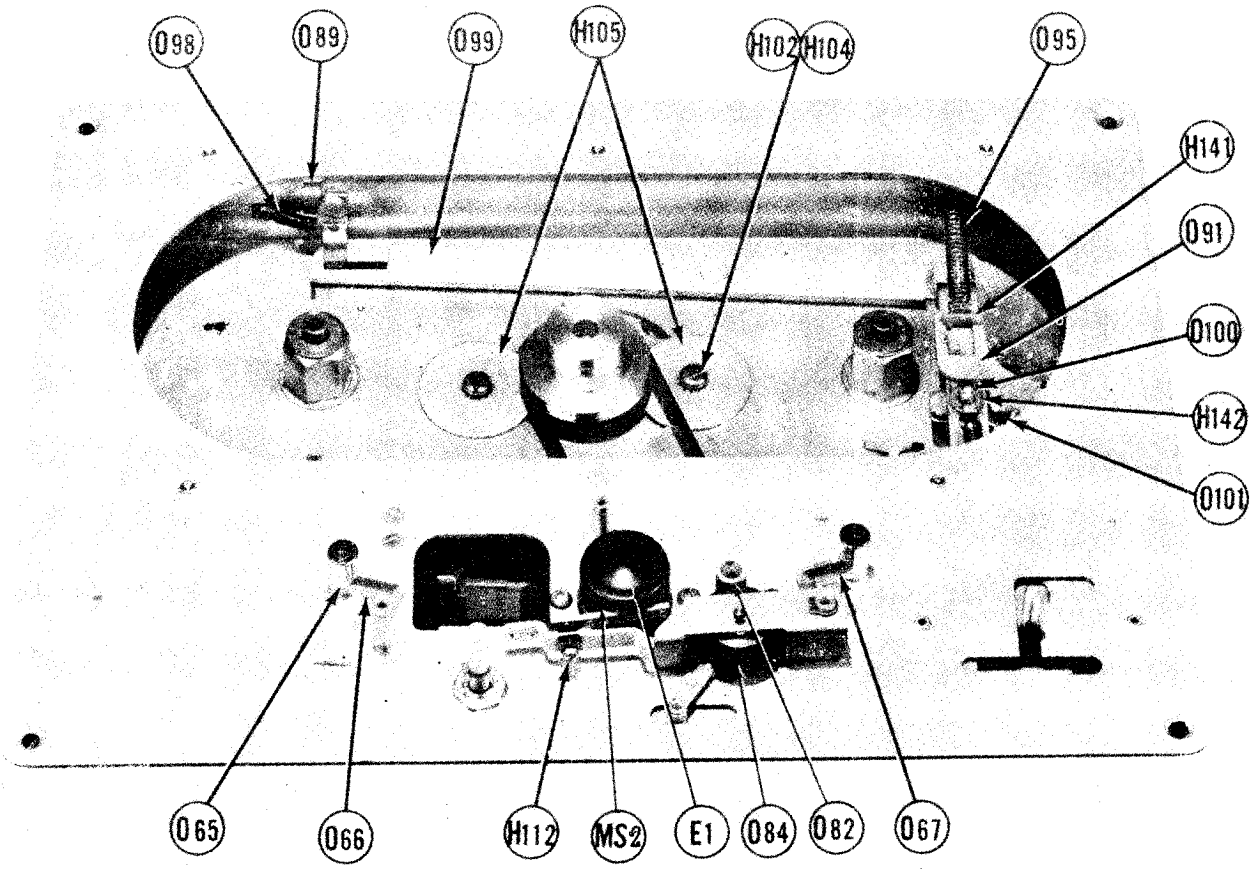

Fig. 12—*Control Mechanism—Rewind Trip Lever View*

2. "Rewind" Position

Placing the control lever (Fig. 2) in the "Rewind" position initiates the following actions:

(a) The latching gate (O-93, Fig. 14) is moved half-way out of its locked position.

(b) The spring (O-87, Fig. 11) then moves the raising lever assembly (O-86, Fig. 11) to its extreme opposite position to disengage the take-up clutch and engage the rewind clutch to cause the reels to turn in the reverse direction and rewind the ribbon from the take-up reel onto the supply reel.

(c) The pressure wheel (O-84, Fig. 10) is moved away from the capstan (O-82) to allow free movement of the ribbon during the rewind operation.

(d) The head locking slide (O-94, Fig. 11) is moved to release and drop the erase head from its engaged position after completion of a recording.

3. "Stop" Position

Placing the control lever in the "Stop" position releases all levers remaining engaged, and opens the motor switch contacts. The raising lever assembly (O-86, Fig. 11) is moved to a position which allows both clutches to engage and produce a friction brake to stop the reels quickly.

4. "Fast-Forward" Position

Placing the control lever in the "Fast-Forward" position causes the take-up clutch to engage, the rewind clutch to disengage, and the motor switch contacts to close and cause the ribbon to wind forward rapidly.

5. "Fast-Reverse" Position

Placing the control lever in the "Fast-Reverse" position causes the rewind clutch to engage, take-up clutch to disengage, and the motor switch contacts to close and cause the ribbon to rewind rapidly.

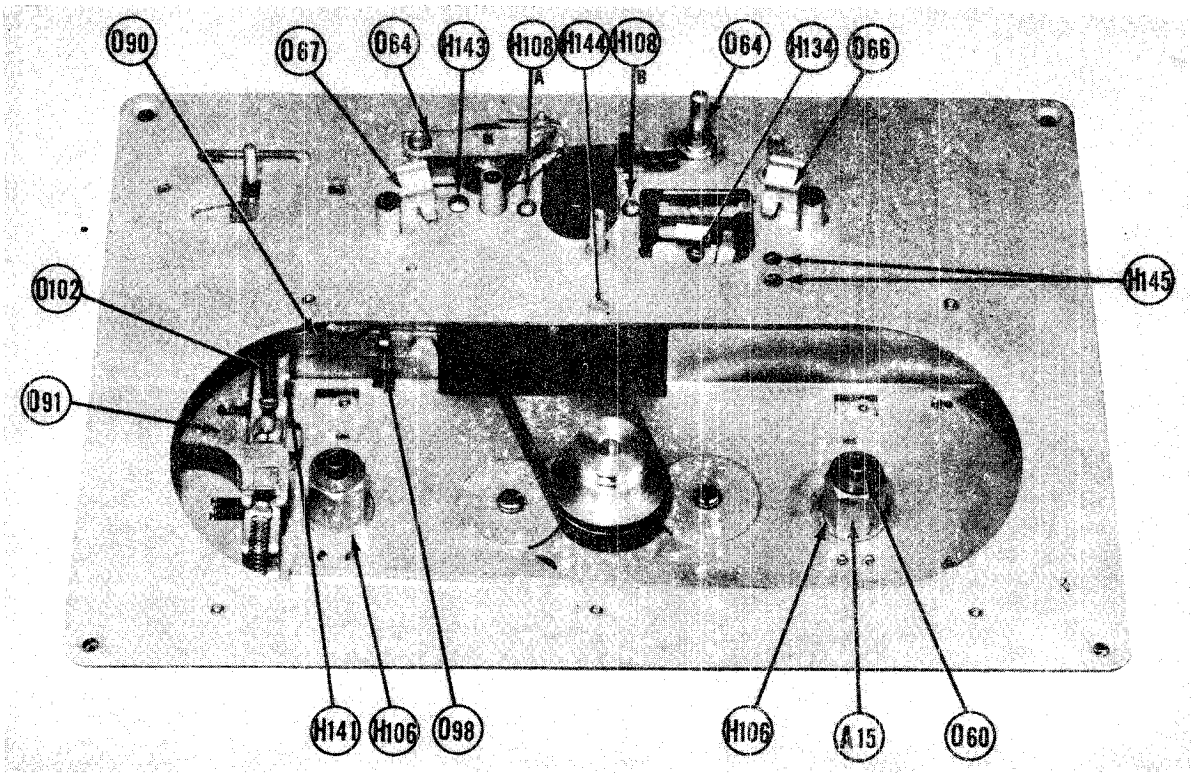

Fig. 13—*Control Mechanism—Take-up Trip Lever View*

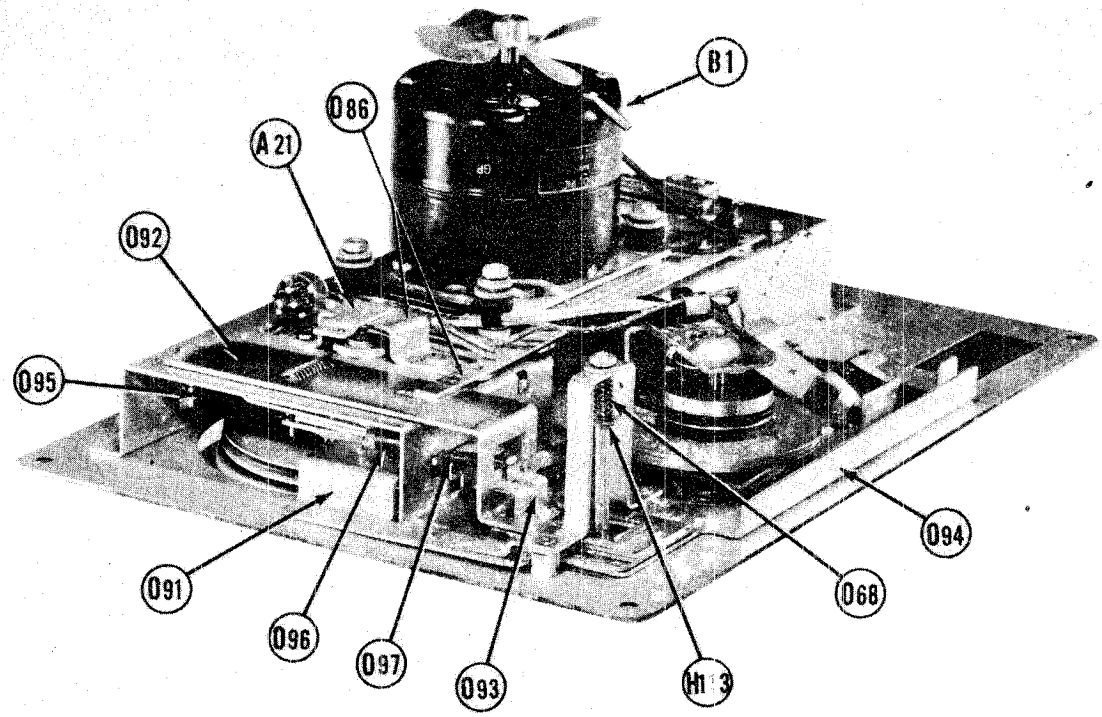

Fig. 14—*Control Mechanism—Spring View*

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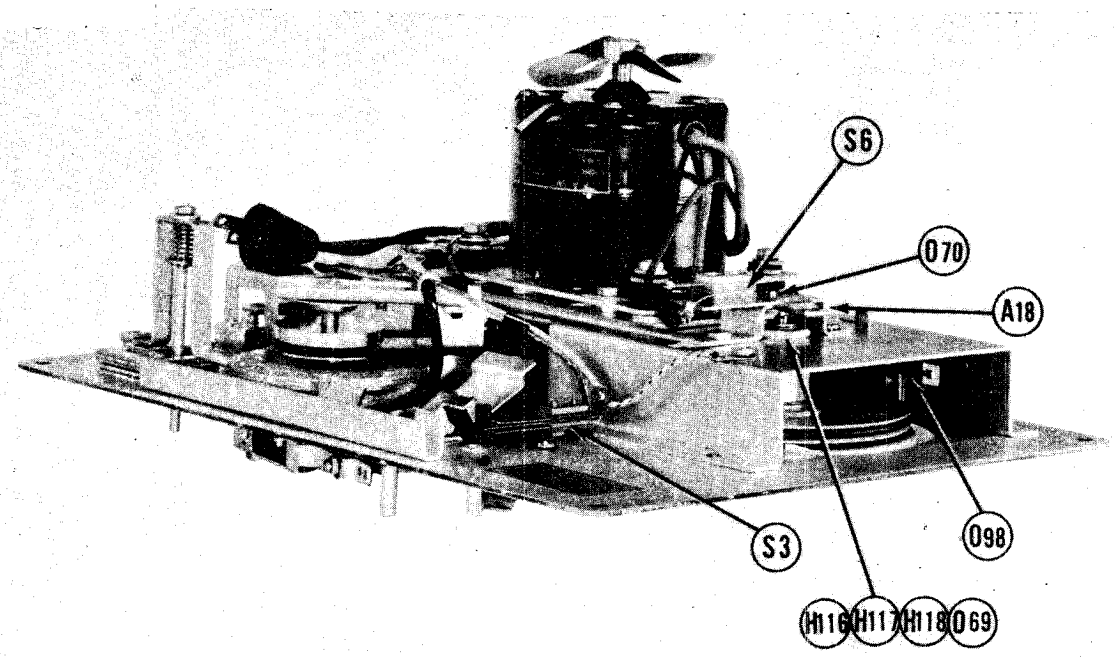

Fig. 15—*Control Mechanism—Switch View*

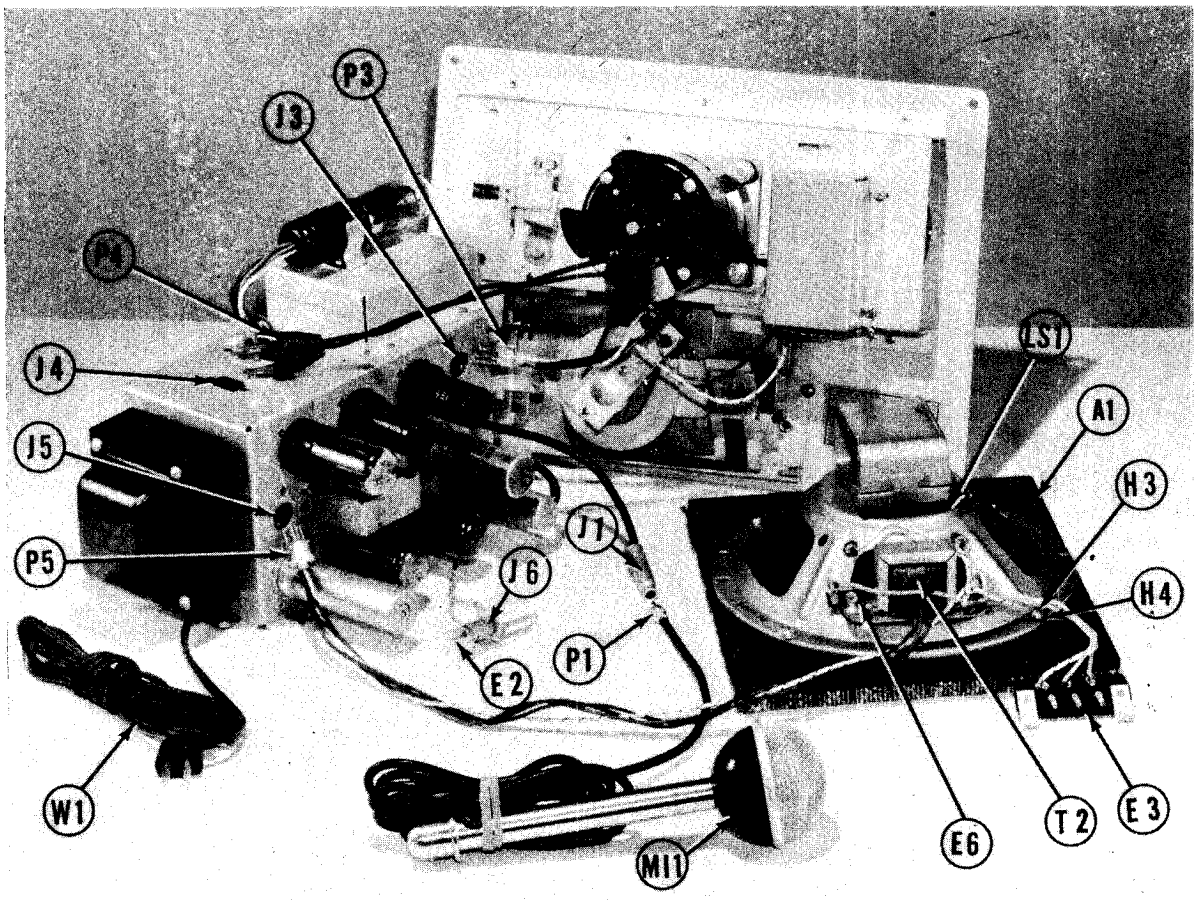

Fig. 16—*Model BK-411—Removed from Cabinet*

MODEL BK-411

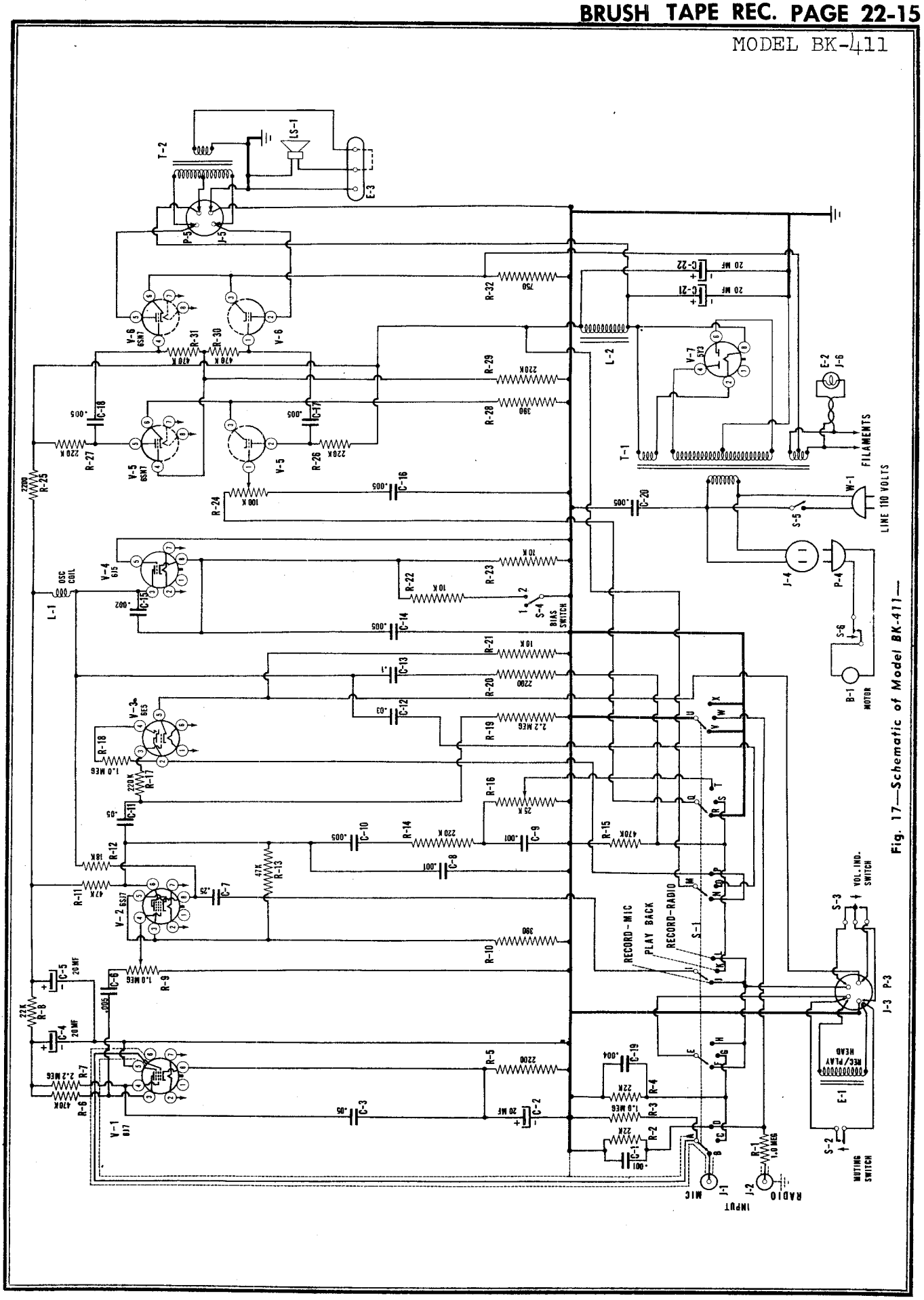

Fig. 17—Schematic of Model BK-411—

VOLTAGE

(D.C. unless otherwise specified)

Tube	Pin No. 1	Pin No. 2	Pin No. 3	Pin No. 4	Pin No. 5	Pin No. 6	Pin No. 7	Pin No. 8	Cap	Notes
V-1	0	12	80	30	0	N. C.	12	1.4	0	
V-2	0	12	3	0	3	115	12	230 A.C. 65		A.C. voltage at 28 K.C.
V-3	12	Rec. 32	—0.75	365	0	12				Pin No. 5 Grounded for measurement to allow 6E5 to be in operating condition.
V-4	0	12	325 A.C. 80	Rec. 26 Play 0	0	Rec. 0 Play —.6	12	Rec. 55 Play 15 A.C. 20		Pin No. 4 —.6 volts on long amplifiers. Pin No. 6 .2 volts on long amplifiers.
V-5	0	35	1.1	0	33	1.1	12	12		
V-6	0	370	12	0	370	12	12	12		
V-7	0	370	365	A.C. 300	335	A.C. 300	0	370		Long Amplifiers have 45 V.D.C. on Pin No 1. N.C. Pin No. 3 and 7.

Tests made with 20K ohms per volt meter. All controls turned counter-clockwise. Bias Switch closed. Line voltage 115V A.C.

RESISTANCE

Tube	Pin No. 1	Pin No. 2	Pin No. 3	Pin No. 4	Pin No. 5	Pin No. 6	Pin No. 7	Pin No. 8	Cap	Notes
V-1	0	750	550K	2.2 Meg.	0	N.C.	750	2200	See note	Cap 1 Meg.-Rec. Mike Position 22K Play Position 22K Rec. Radio Position
V-2	0	750	390	1 Meg.	390	35K	750	58K		
V-3	750	Rec. 45K Play Inf.	2.4 Meg.	Rec. 1 Meg Play Inf.	10K	750	. . .	. . .		
V-4	0	750	45K	10K	0	2.4 Meg.	750	See note		Pin No. 4 2.4 meg. on long amplifiers. Pin No. 6 2.2 meg. Pin No. 8 10K with S-4 open. 5K with S-4 closed.
V-5	See note	26OK	390	220K	260K	390	750	750		Pin No. 1 0 ohms in Rec. Mike position. 470K ohms in Play. 25K ohms in Rec. Radio Position.
V-6	690K	Inf.	750	690K	Inf.	750	750	750		
V-7	0	45K	45K	85	45K	85	2.2 Meg.	45K		Pin No. 1 10K on long amplifiers. No. 3 N.C. No. 5 0. No. 7 N.C.

Measurements made to chassis ground. Head and speaker unplugged. All controls turned clockwise. Tubes in sockets.

Voltage-Resistance Chart

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ELECTRICAL SECTION

(See Schematic Fig. 17)

Operating Power

The line power (105 to 120 volts 60 cycles A.C.) is supplied to the amplifier through the line cord and plug assembly (W-1). The power is turned on by the switch S-5 which is attached to the "Tone" control. The power is then supplied to the drive motor through the inter-connecting plug P-4 and jack J-4 located on the amplifier chassis. (See Fig. 16).

The motor is controlled by a switch (S-6, Fig. 15) which is actuated when a ball (O-70, Fig. 15) is forced against a bakelite bushing mounted on the moving contact of the switch.

During operating positions of the Control Lever the rewind clutch raising lever forces the ball against the bushing to close the contacts of the switch. During the "Stop" position the ball recesses into an indentation in the raising lever and allows the switch contacts to open.

Pilot Lamp

The pilot lamp (E-2, Fig. 16) is of the 6-8 volt, .25 amp. Bayonet Base type—Mazda No. 44. See Pilot Lamp Replacement Page 34.

ELECTRONIC SECTION

The electronic circuit of the BK-411 is shown in the schematic (Fig. 17) and the block diagram (Fig. 18) and is, for discussion purposes, divided into the following circuits, namely: Input Circuits, Record Amplifier Circuit, Record Bias Circuit, Record Volume Indicator Circuit, Monitor Amplifier Circuit, Reproduce Amplifier Circuit, Output Circuit, and Power Supply Circuit. Location of the electronic components is found in Figs. 20 through 26.

Input Circuits

Microphone Input

The microphone input circuit consists of a shielded cable from the Microphone plug (P1 and jack J-1) to the grid of the input tube V-1 through connections "A" and "B" of the selector switch (S-1) (for reference to contacts of S-1 see Fig. 19).

The input impedance of this circuit is approximately one megohm due to the resistance of R-3.

Radio Input

The Radio input connections are made through the plug (P-2) and jack (J-2), through the one

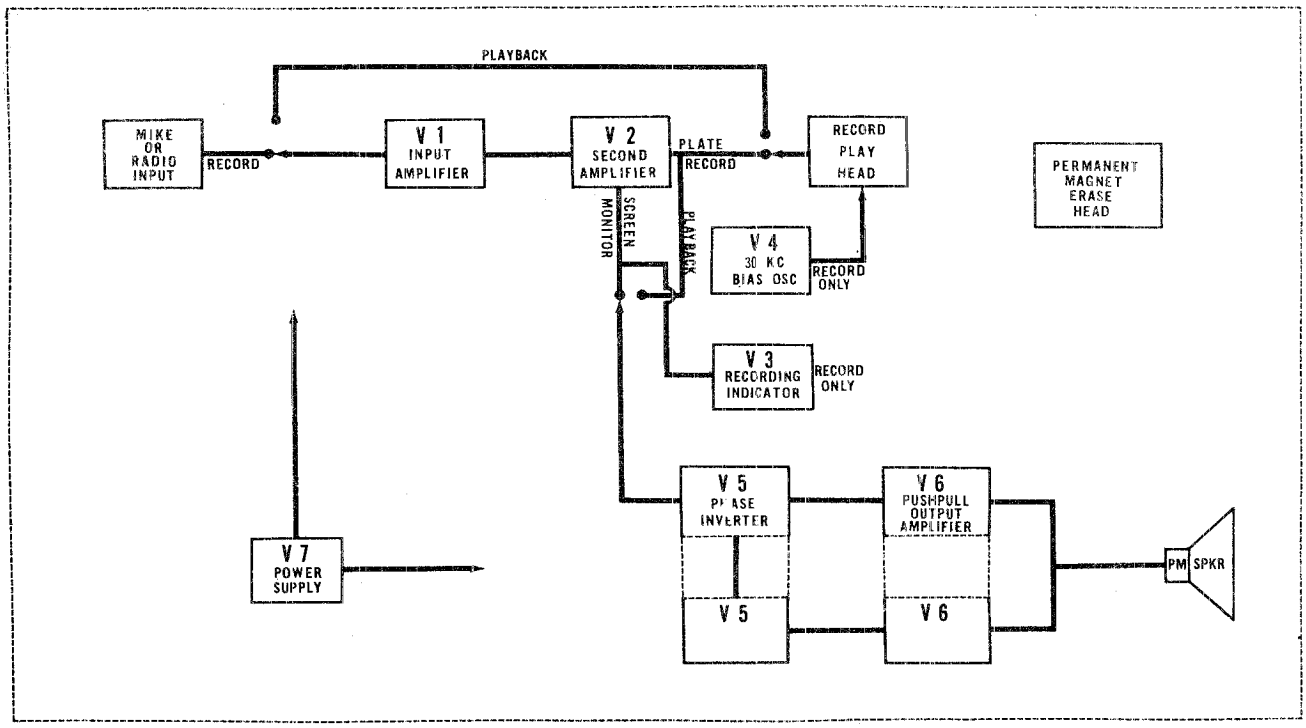

Fig. 18—*Block Diagram of Model BK-411*

megohm resistor R-1, and through contacts "D" and "A" of the selector switch (S-1), at which point a voltage dropping resistor (R-2) is connected with R-1 to drop the radio input voltage (at a ratio of 46 to 1) before applying it to the grid of V-1. No more than 10 volts can be applied at the radio input plug to avoid overloading of the input stage.

The capacitor C-1 bypasses to ground frequencies of approximately 30KC and above. This reduces the feedback in the amplifier caused by the 30KC bias oscillator.

During the Playback process the Radio input circuit is connected to ground through contacts "U" and "W" of the selector switch S-1. This prevents the signal from being amplified (by way of interwiring capacities, etc.) and interfering with the playback signal from the "Magic Ribbon."

Record Amplifier Circuit

First Record Amplifier Stage (V-1)

The first record amplifier stage is a 6J7 tube and has a gain of approximately 120. The grid is connected to contact "A" of the selector switch (S-1) and is switched to contact "B" while recording from the Microphone and to contact "D" while recording from the Radio Input Circuit.

The filter network in the B+ supply circuit to this stage is composed of capacitors C-4 and C-5 and resistor R-8 and is for the purpose of preventing the stage from motor-boating as well as removing any slight hum from the power supply.

The screen and cathode are by-passed to ground in the conventional manner.

The output of this stage provides a flat frequency response at the grid of V-2 (through capacitor C-6 and volume control R-9).

Record Current Converter Stage (V-2)

The 6SJ7 tube (V-2) is a converter tube and functions to convert the voltage from V-1 into a current which flows through the coupling capacitor C-8, through the contacts "I" and "J" or "I" and "L" of the selector switch (S-1) and into the Record Head (E-1).

The proper amont of signal recording current through the record head is 0.8 ma.

During the recording process a 30 KC signal is present at the plate of V-2. It joins the audio signal and is fed to the recording head. It is in amplitude about three times greater than the audio signal, thus in order to operate the Record Volume Indicator (V-3) and the monitor amplifier from this stage the signal is taken from the screen. The

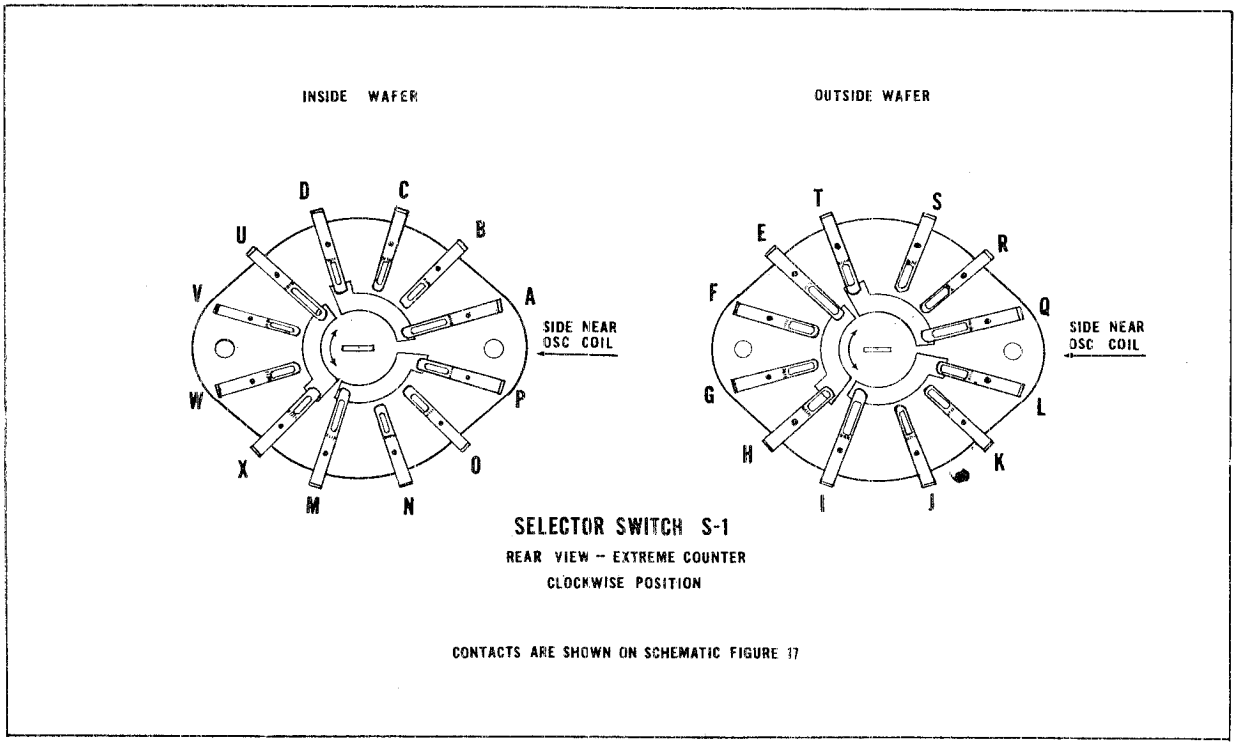

Fig. 19—*Selector Switch S-1 Contacts*

screen is by-passed to ground with a small capacity of C-8 and C-9 (.001 MFD each) to prevent any trace of the 30 KC signal from being applied to the recording indicator.

A resistor (R-13) is connected from the screen to the cathode to reduce the screen degeneration.

The signal from the screen to the monitor amplifier is coupled by means of the network C-10, R-14 and Volume Control R-16.

The signal from the screen to the Record Volume Indicator (V-3) is coupled through the capacitor C-11 and the resistor R-17. The resistor R-17 is for the purpose of preventing the grid current of V-3 from distorting the recording.

Record Volume Indicator (V-3)

The Record Volume Indicator is a 6E5 tube and functions to visually indicate the level of sound being recorded on the 'Magic Ribbon".

It receives a signal from the screen of V-2 through the coupling capacitor C-11 and the resistor R-17.

When the Selector Switch S-1 is in the "Record" position, the Volume Indicator remains closed until the Erase Pin is pressed to close the contacts of switch S-3 (see Fig. 15) which connects the cathode of V-3 to ground.

The resultant action of switch S-3, when the erase pin has not been pressed, is a reminder to the operator to press the erase pin to make a recording, otherwise the signal is shorted to ground by the other half of the switch (S-3) to prevent a recording from being made over a previous recording and ruining either the first, the latter, or both recordings.

The B+ voltage to the plate of V-3 is used only during the recording process and is connected through contacts "M" and "N" of selector switch S-1 while recording from the microphone and through contacts "M" and "P" while recording from the radio input circuit.

Record Bias Circuit

The record bias oscillator tube (V-4) is a 6J5. It supplies the necessary bias current for recording on the "Magic Ribbon".

Various types of recording ribbon are available. Some types require more bias current than others for better quality recordings. For this reason, a switch (S-4) is provided in the cathode circuit of V-4 to change the amount of recording bias current according to the type of ribbon to be used.

Two positions are indicated on this switch as "1" and "2". Number 1 position opens the switch and number 2 position closes the switch. When the switch is open only Resistor R-23 is in the cathode circuit and the output of V-4 supplies a bias current of 2.0 ma. to the record head, and when closed connects R-22 in parallel with R-23 which increases the current to 4.5 ma. in the head.

The bias oscillator frequency is approximately 30KC and is produced by the inductance of L-1 and the capacitance of C-15, which constitute a Colpitts Oscillator circuit.

Monitor Amplifier Circuit

The monitor amplifier circuit consists of the same input circuit as the recording amplifier circuit with the exception that the signal is taken from the screen of the second stage (V-2) and fed to the phase inverter stage (V-5), which is a 6SN7 twin triode tube. A 6SL7 tube may be used in this position to obtain more output volume during the monitor or playback process.

The output of the phase inverter is coupled to the pushpull output stage (V-6) through capacitors C-17 and C-18. The output of V-6 is then fed to the output transformer (T-2) through the interconnecting plug P-5 and jack J-5 and thence to the speaker (LS-1).

The volume of the monitor amplifier is controlled by the potentiometer R-16, and the tone is controlled by the potentiometer R-24.

The Monitor Amplifier is purposely muted while recording from the microphone to prevent acoustic feedback.

Reproduce Amplifier Circuit

The reproduce (Playback) amplifier circuit operates as follows: the signal is picked up from the "Magic Ribbon" by the reproduce head (E-1) and is applied to the grid of V-1, amplified and fed to the next stage (V-2) through the capacitor C-6 and volume control R-9. It is then taken from the plate of V-2 through capacitor C-7 and contacts "I"/"K" and "Q"/"S" of the selector switch S-1 and coupled to the grid of V-5 through the tone control R-24. Tube V-5 is a phaseinverter which supplies the signal to a pushpull output amplifier stage V-6, where it is converted into a power output signal of approximately one watt (undistorted) in the loudspeaker (LS-1). A 6SN7 tube is used in the Phase inverter stage V-5 and may be interchanged with a 6SL7 tube if more output volume is desired. This may increase any microphonics occurring in the first stage (V-1), but this in turn may be improved by the use of a selected 6J7 tube that does not have a tendency to be microphonic, or in cases where microphonics become a problem the 67J tube may be replaced with a type No. 1620 tube which is more expensive but less microphonic.

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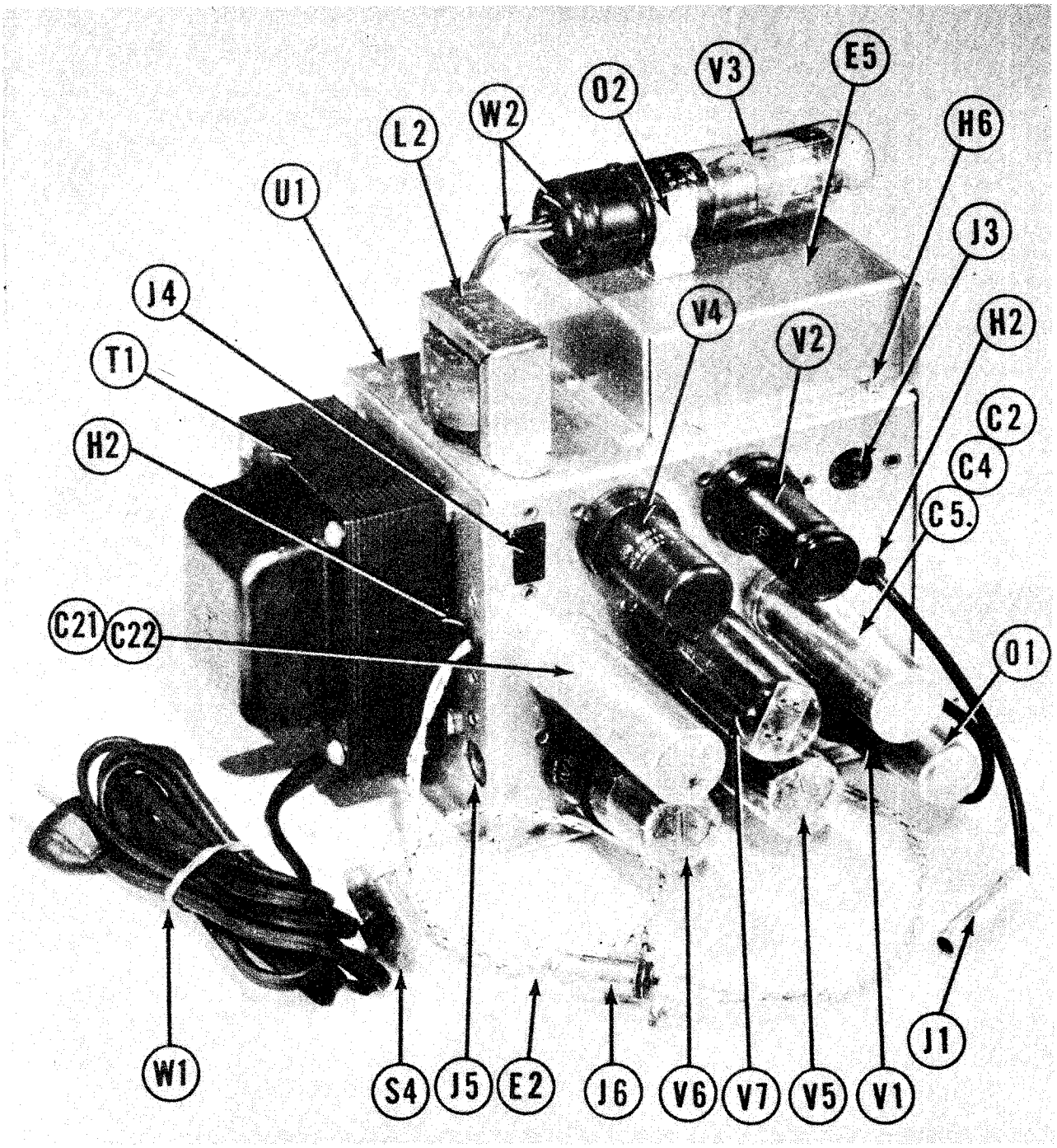

Fig. 20—*Small Amplifier Chassis—Tube View*

During the playback process the 30 KC oscillator circuit becomes inoperative when the oscillator coil L-1 is shunted by a .03 mfd. capacitor (C-12). This shunting takes place when the selector switch S-1 connects the capacitor C-12 to the power supply and thence to ground through the capacitor C-22. The oscillator coil L-1 is grounded through the capacitor C-5, thus a common connection from L-1 to C-12 is made through the ground circuit. The shunting of the inductance coil L-1 with the capacitor C-12 is used in conjunction with the combination of the resistor R-20 and capacitor C-13 to form a frequency compensating network in the output circuit of V-2.

This compensating network provides an overall frequency response necessary to equalize the natural frequency characteristic of the 'Magic Ribbon".

The inductance of L-1 and the capacitance of

C-12 when paralleled form a circuit resonating at 5000 cycles. This boosts the high frequency response, while at middle frequencies (around 1000 cycles) the impedance of this network becomes quite low, and in series with capacitor C-13 and resistor R-20 attenuates these frequencies. At lower frequencies, down to about 100 cycles, the impedance of capacitor C-13 becomes higher causing the network to appear open and permit these lower frequencies to be passed on to the next stage V-5 through capacitor C-7.

A capacitor C-19 is connected across the reproduce head during the playback process to tune the head to the higher frequencies, around 5000 cycles.

The frequency response curve shown in Fig. 29 gives the average overall response of the complete recorder and reproducer amplifier with "Magic Ribbon".

A muting switch S-2 is included in later units to short-circuit the reproduce-head during the automatic rewind process. This prevents the signal from being heard as the ribbon passes the reproduce head in the reverse direction.

This switch S-2 is mounted on the control lever bracket and is actuated by the latching gate (O-93, see Fig. 45) while the unit is in the automatic rewind position.

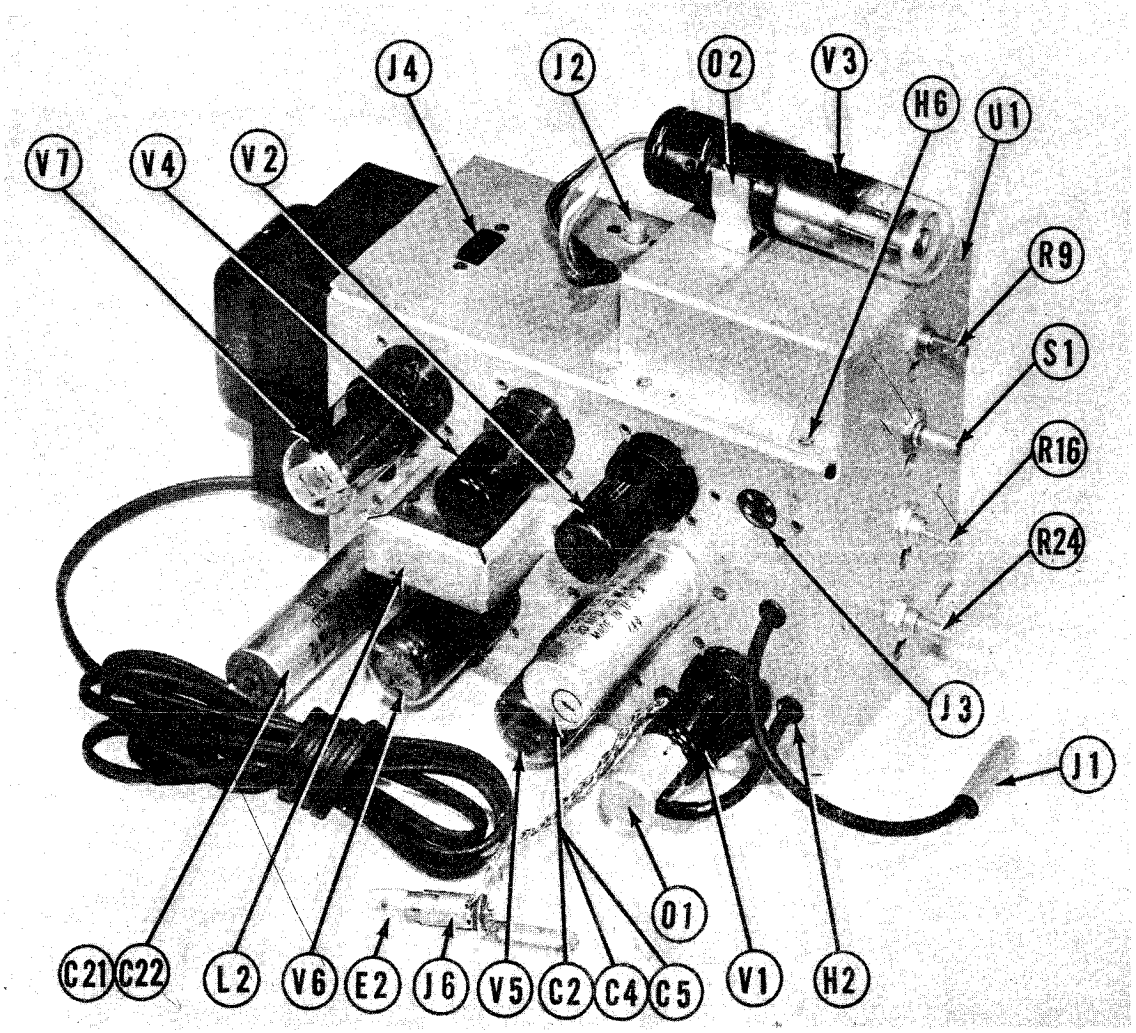

Fig. 21—*Large Amplifier Chassis—Tube View*

Output Circuit

The output circuit consists of the output transformer (T-2), the loudspeaker (LS-1), and a terminal strip (E-3). These components are mounted on the speaker, except the terminal strip, which is mounted on the cabinet near the back.

The purpose of the terminal strip is for connecting the output of the recorder to other speakers, amplifiers, etc.

The secondary impedance of the output transformer is 3.2 ohms when its part number is No. 200923 and 8.0 ohms when its part number is No. 206792. The corresponding speaker in each case is 3.2 ohms when its part number is No. 305975 and 8.0 ohms when its part number is No. 306793. These part numbers are stamped on the individual components.

Power Supply Circuit

The power supply circuit is conventional and uses a 5Y3 tube (V-7) as the rectifier for the high voltage. The rectified voltage is filtered by a capacitor C-21, choke L-2, and capacitor C-22.

The filament center tap is returned to ground through the cathode resistor R-32 of the pushpull output stage (V-6) for the purpose of biasing the filament with a positive potential. This tends to reduce any hum from the first stage V-1, due to heater/cathode leakage.

A receptacle (J-4) is provided in the power supply circuit for the purpose of connecting the top panel motor circuit to the power source (105 to 120 volts 60 cycles a-c).

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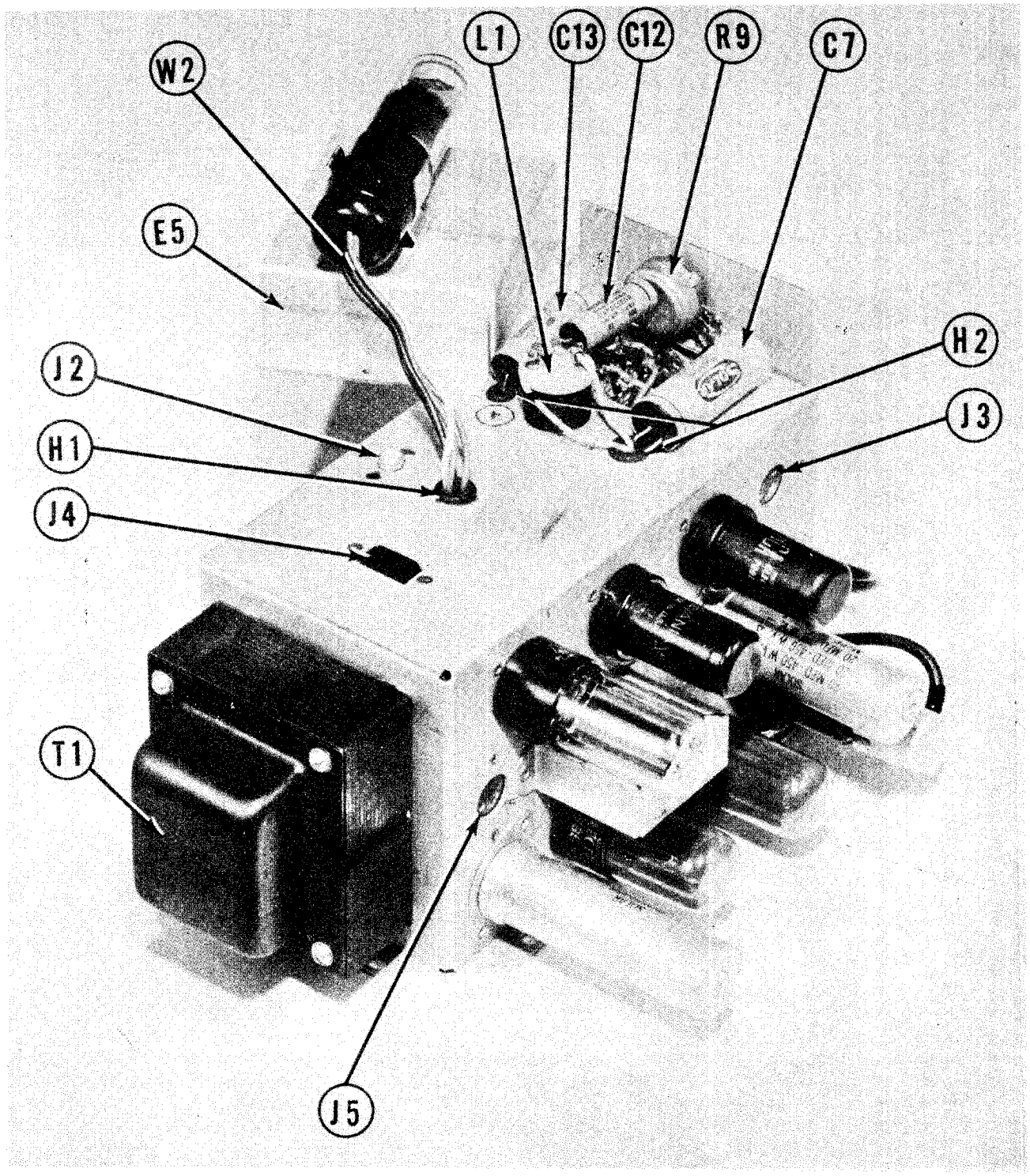

Fig. 22—*Large Amplifier Chassis—Oscillator Components View*

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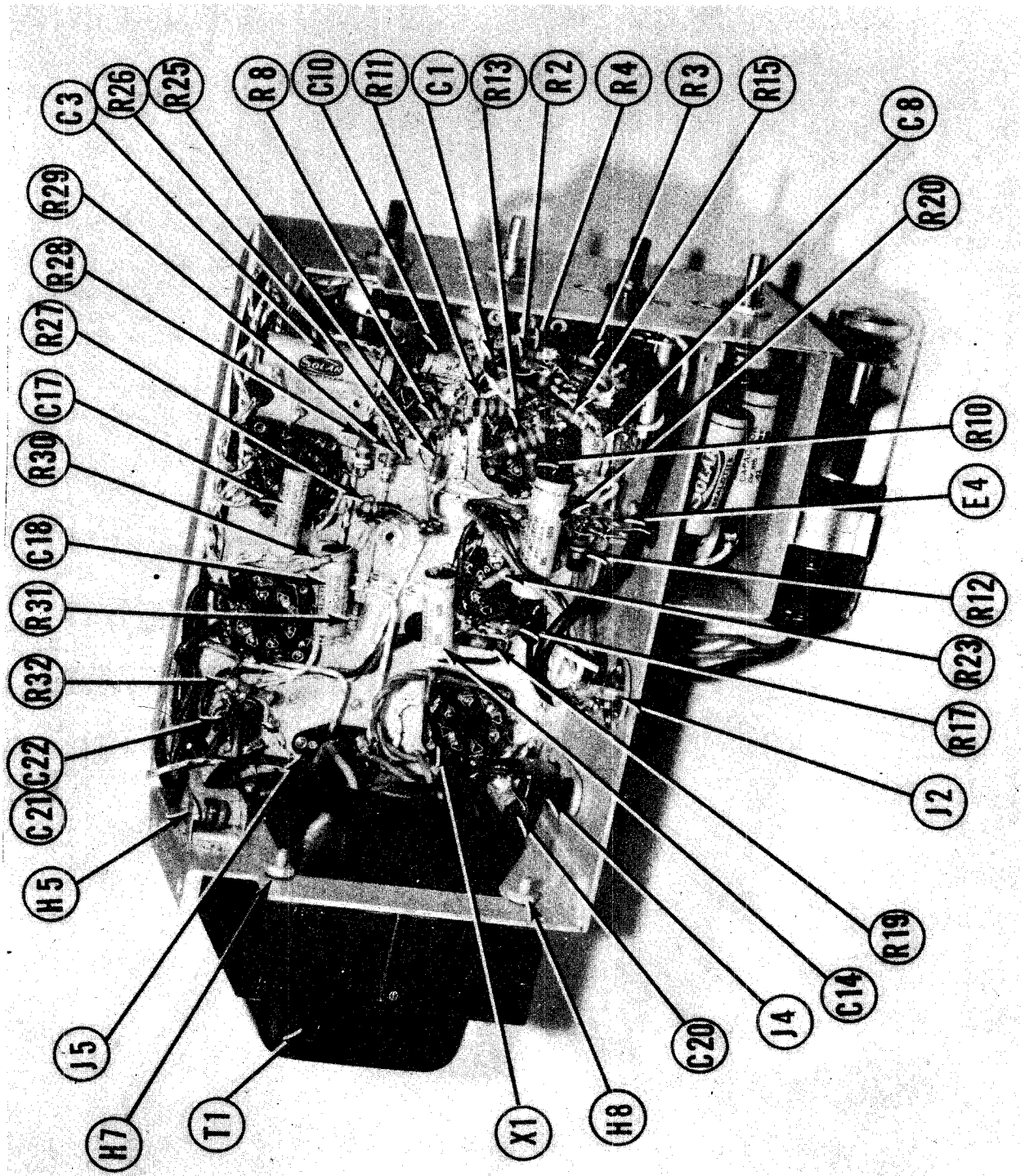

Fig. 23—Large Amplifier Chassis—Bottom View—A

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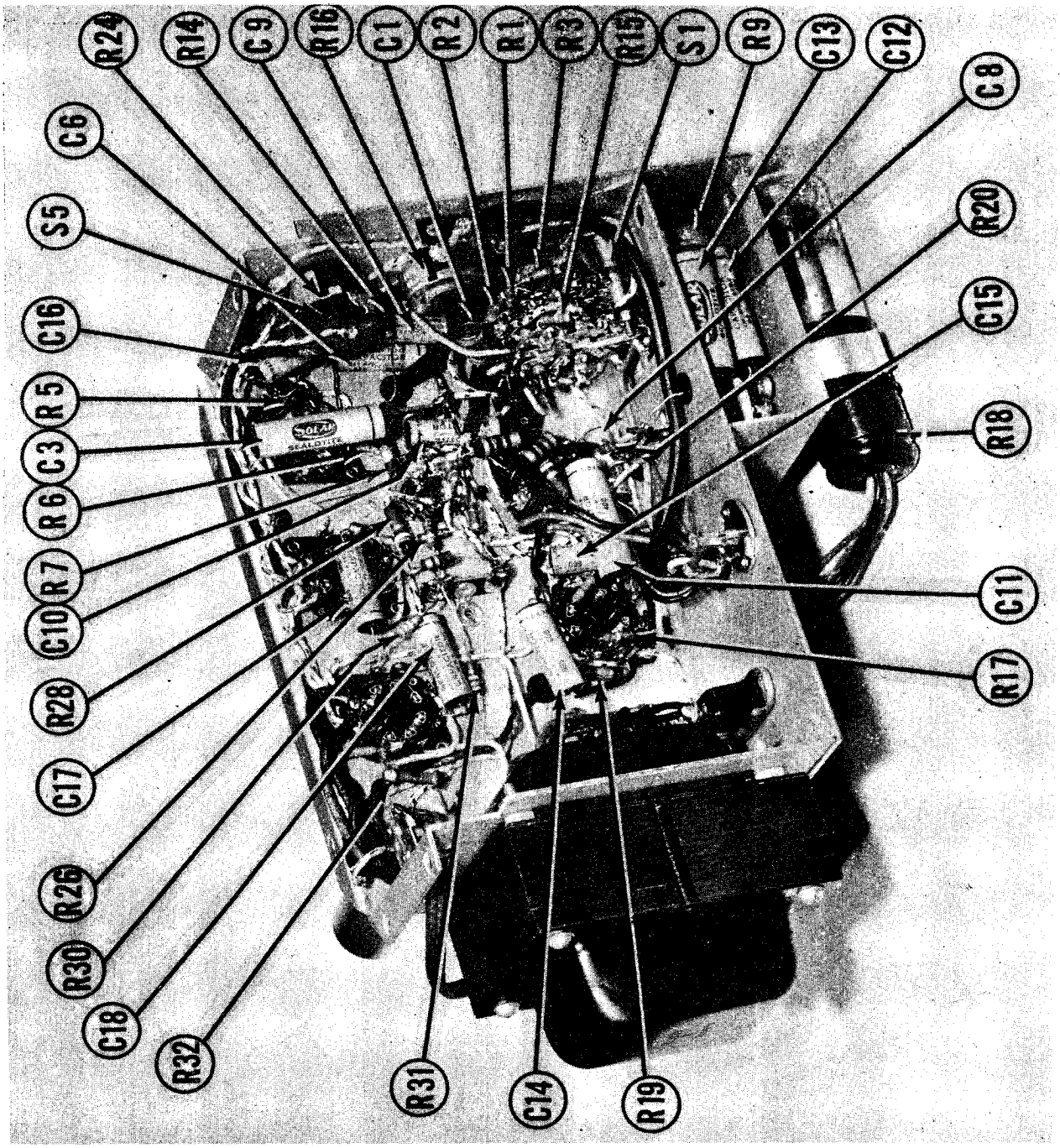

Fig. 24—Large Amplifier Chassis—Bottom View—B

SECTION III
Principles of Operation

INTRODUCTION

Fundamentally the art of magnetic recording is old, dating back from the last century.

Although a detailed explanation of the theory of magnetic recording is probably not in order in this type of instruction book, it nevertheless appears desirable to include a sufficiently extensive investigation of the principles to make clear the relationships between, and the need for, the various elements in the present magnetic recorder.

A magntic recording can be made in any type of material which permits a varying degree of permanent magnetization and which is mechanically stable and physically formed in a fashion permitting it to be handled in a reeling and scanning mechanism. The process of making a magnetic recording is basically one of moving the recording material at a fixed rate of speed through a station which functions to impress upon the material the desired magnetic state. In the reproducing process, the requirement is to move the material at the same rate of speed as in the recording process through the reproducing station, whose function is to derive from the magnetic state of the material a signal voltage which can be amplified in the electronic section of the recorder to produce a usable audio power.

Magnetic recording also lends itself to a further basic operation which gives to magnetic recording a unique advantage over almost any other type of recording. This principle is the erasing principle. Since a magnetic recording consists of a varying degree of magnetization in some form of carrier, it is possible to conceive of the idea of erasing a magnetic recording by subjecting the material to some operation which will demagnetize the material. In the conventional magnetic recorder this process of erasing is automatically and simultaneously effected when a recording is being made, since it is obvious that if a new recording is being made on a piece of material, it is desirable to erase from that material any old recording.

We shall now consider under the three heads of Recording, Erasing, and Play-Back, how these basic operations in magnetic recording are accomplished.

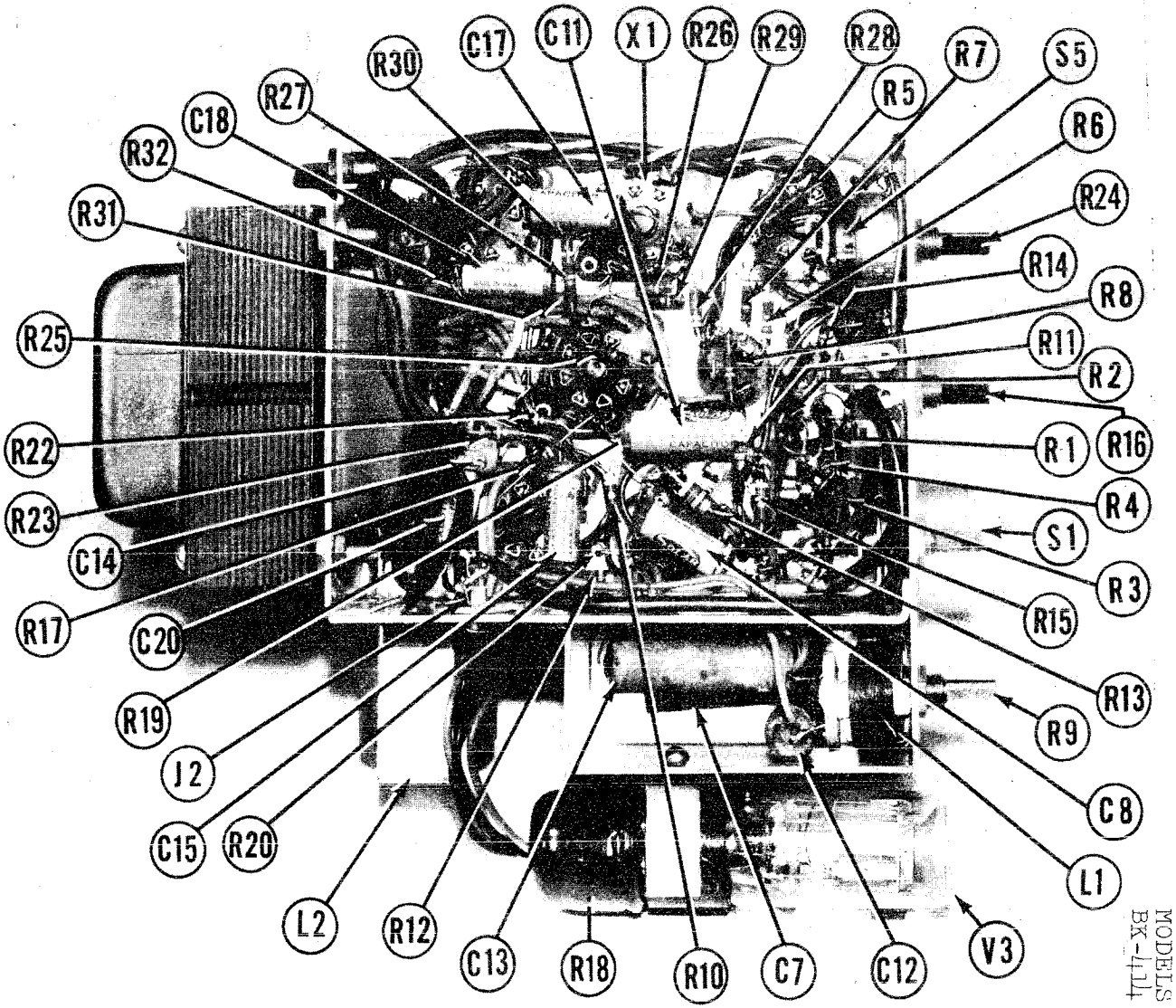

Fig. 25—*Small Amplifier Chassis—Bottom View—A*

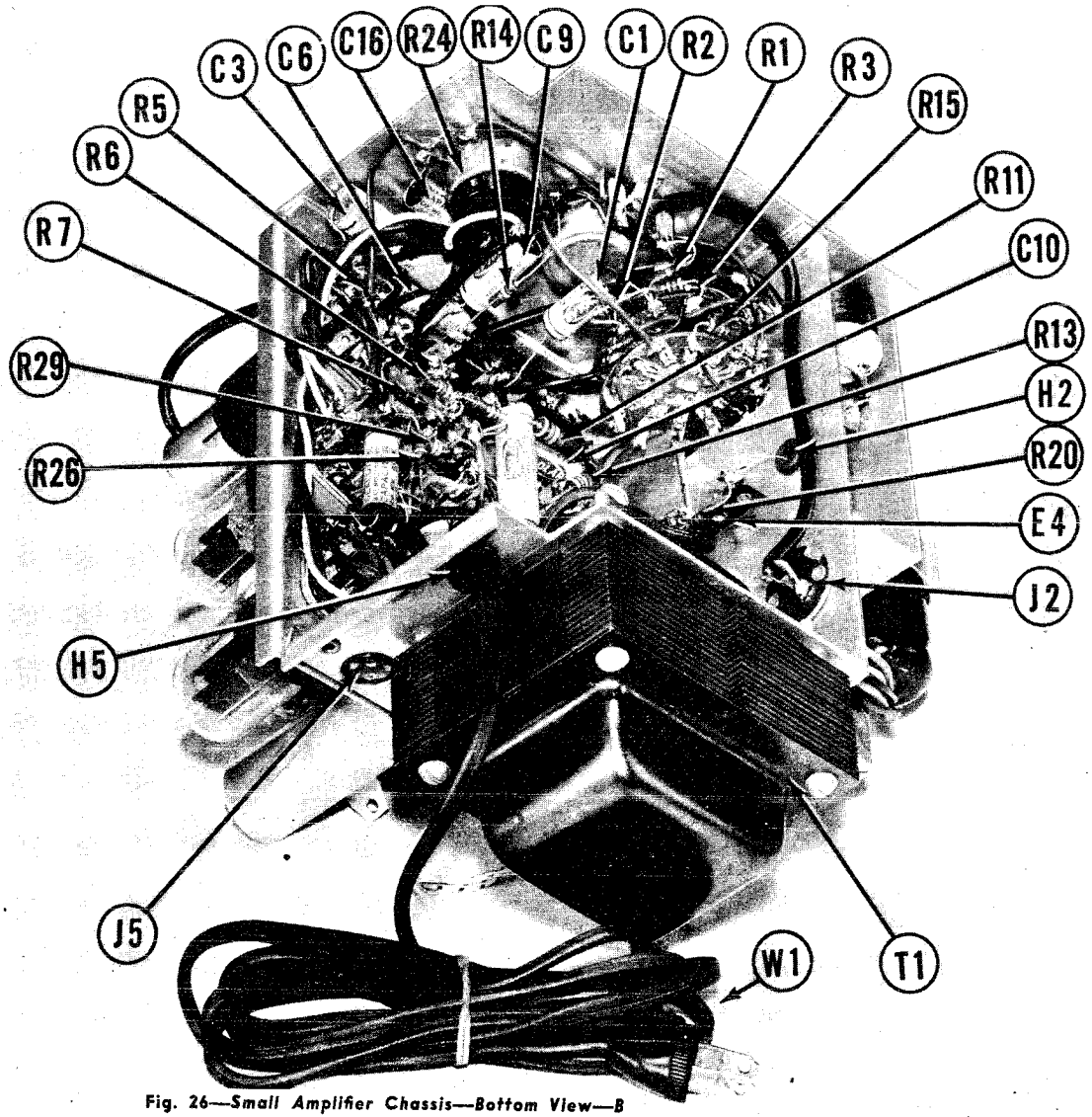

Fig. 26—*Small Amplifier Chassis—Bottom View—B*

RECORDING

Fig. 27 shows an electromagnet in contact with a section of magnetic ribbon. The dashes in the ribbon and the arrows in the magnet indicate by their direction and concentration the magnetic condition of any particular part of the system. Note that to the left of the magnet and in the unrecorded portion the particles in the ribbon are completely unoriented, having no net force. This case of disorientation is one which exists in a demagnetized magnetic material and represents, in magnetic recording an erased or unrecorded section of ribbon. Note that the force lines in the electromagnet set up across the air gap, where the ribbon makes contact with this electromagnet, a relatively intense field as indicated by the bunching of the arrows. This intense field penetrates the ribbon causing the unoriented condition of the magnetic particles in the ribbon to be changed to a more or less oriented condition. The amount of orientation is controlled, of course, by the amount of current flowing instantaneously in the recording magnet. It is well to understand that it requires more energy to produce complete orientation of the magnetic particles than it does to obtain partial orientation. In this way, if the current through the recording head increases slowly, for example, more and more orientation is established in the material until finally all of the particles are completely oriented and this represents the maximum energy which can be stored in the material. The condition of completely unoriented particles corresponds to the noise level of the material, and the condition of saturation, when all of the particles are oriented, corresponds to the maximum signal which can be recorded on the material. The ratio between these two figures is the maximum dynamic range of the material.

This simple picture of the mechanics of making a magnetic recording is unfortunately obscured by the fact that the remaining magnetization of the recording material is not quite proportional to the recording magnetic field, particularly at small recording currents, and this results in a distorted magnetic pattern after the ribbon leaves the recording pole-pieces. To guard against this happen-

ing, a very simple trick is used. This trick consists of superimposing upon the current in the coil corresponding to the signal a second current of relatively high amplitude but of such a high frequency that it cannot be heard in the reproducing process. The function of this high frequency, current, which will hereafter be termed "bias current", can be understood very simply if one considers that it is to add to the relatively weak signal current sufficient energy to leave in the ribbon permanent magnetic orientation proportional to the signal currents. By the use of this bias current superimposed on the signal current any intensity of recording signal from the very lowest to complete saturation will leave a corresponding degree of magnetization in the magnetic material, and this magnetization will be as permanent as the material itself until the material is again subjected to some form of magnetic process.

ERASING

Magnetic Erasing can be defined as the process of removing from a magnetic medium any net orientation in its magnetic state.

There are two basically different methods of erasing a magnetic recording; one method, which is the earliest and most simple, utilizes a powerful Direct Current field, such as that produced by a permanent magnet (See Fig. 28 A). As the recording medium passes this magnet the field magnetizes the material to saturation leaving the magnetic state of the material oriented in such a manner as to completely wipe out the modulations which had represented the recorded signal.

This simple method, however, does not leave the magnetic recording medium in the best state for a subsequent noise-free recording when A. C. bias is employed. Therefore, the second basic method of erasing is used almost exclusively. This preferred method utilizes an alternating current magnetic field for erasing. (See Fig. 28 B). As the magnetically recorded material approaches the alternating field type erase head, each incremental section of material is magnetized first one way and then the other, as the direction of field reverses, and when the material is in the center of such an erasing head, these magnetic cycles are of sufficient magnitude to saturate the material, which effectively erases the previously recorded signal. As the

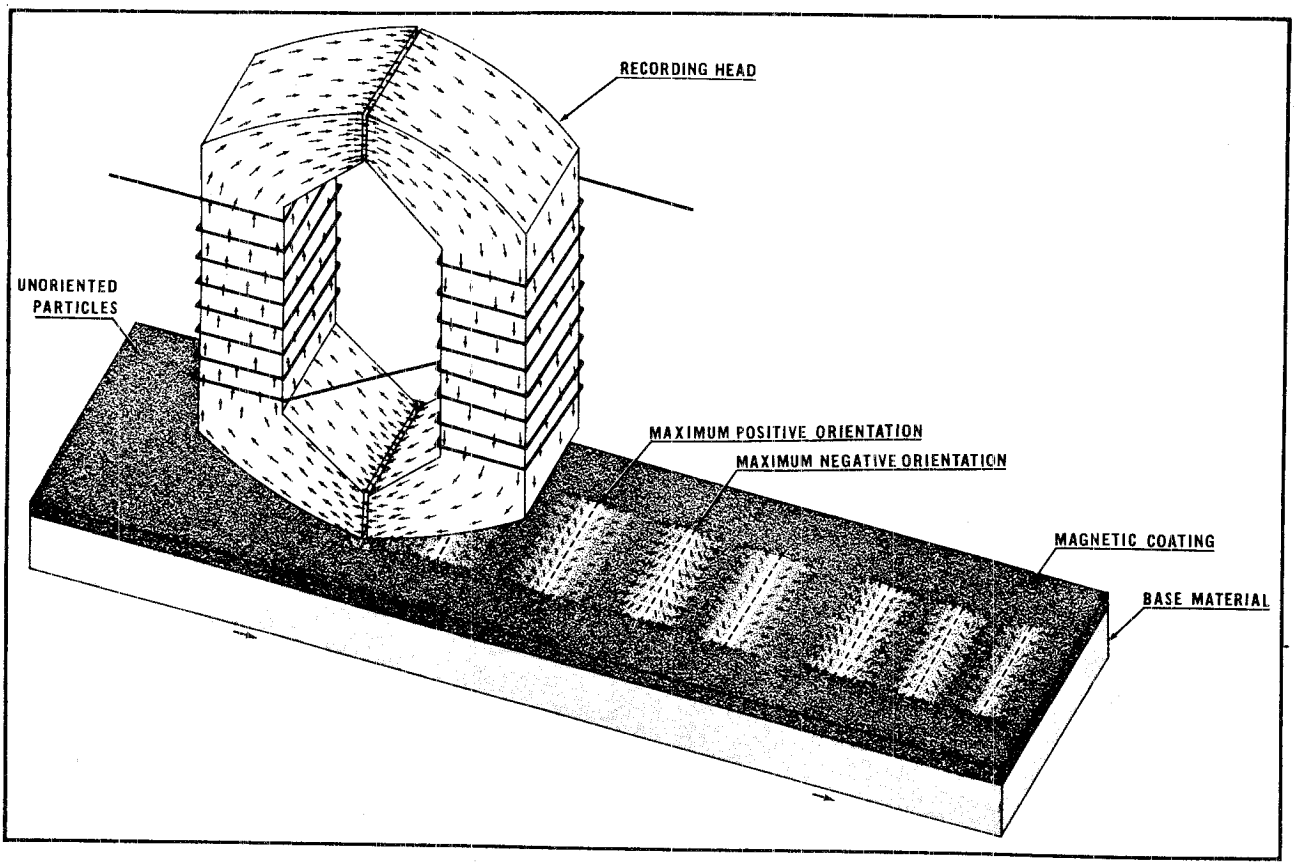

Fig. 27—*Principles of Magnetic Recording*

Fig. 27 is not quantitative as to flux distribution as it is only intended to schematically illustrate the principle of operation of a magnetic recorder head.

material leaves the erasing head, it is still subjected to the reversing field directions, but each succeeding cycle is weaker than the last, due to the increasing distance between a given section of material and the erase head. The final result is such that the recording medium is left completely demagnetized, ready for a new recording.

In the Model BK-411, this type of erase is accomplished by the use of permanent magnets arranged in such a manner to produce a reversing field in the recording medium as the medium passes each pole of the magnets (See Fig. 28 c and 28 d).

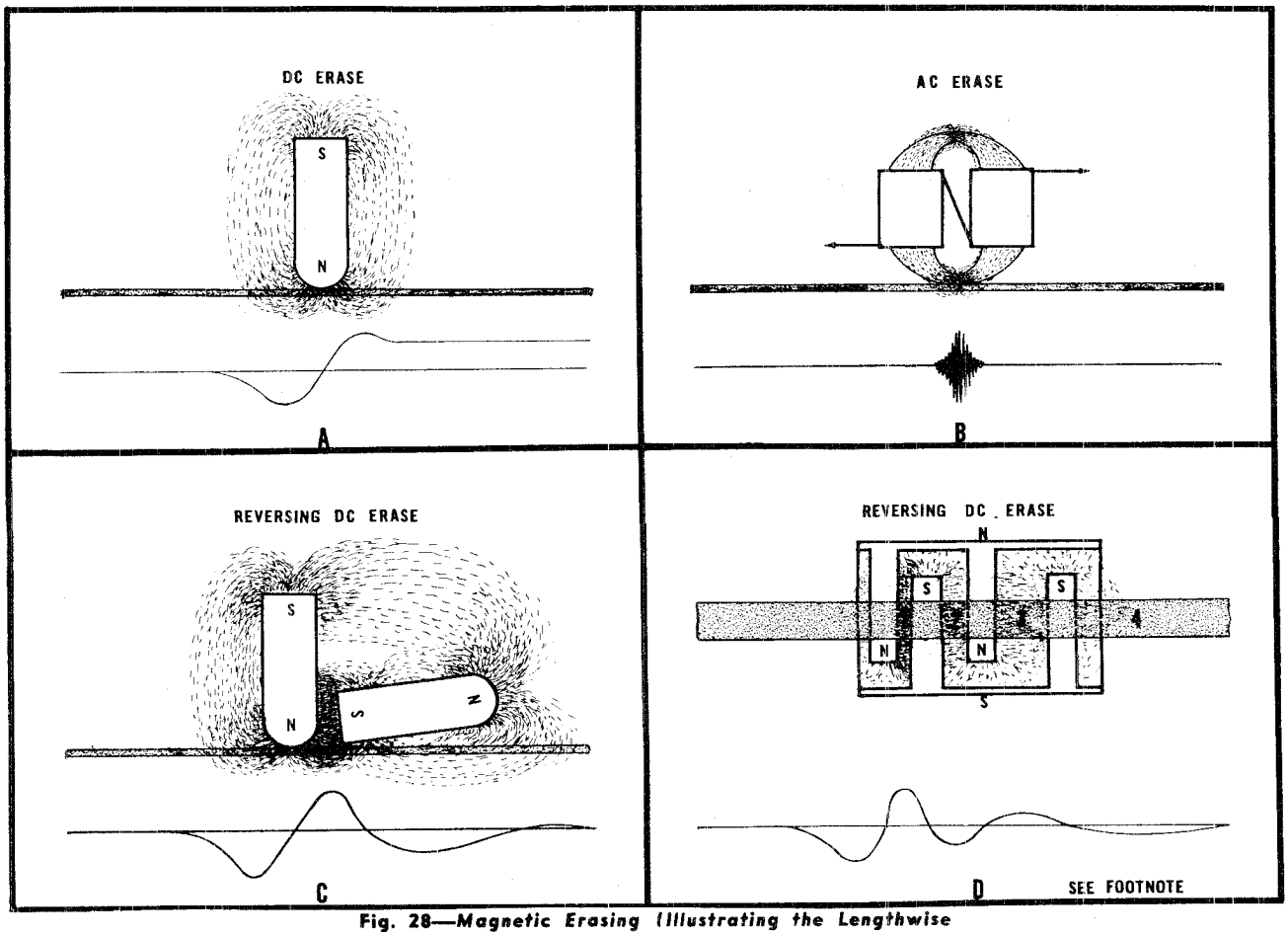

Fig. 28—*Magnetic Erasing (Illustrating the Lengthwise Magnetization Component of the Recording Medium)*

As the ribbon passes this type erase head it should contact the first pole and gap (1) to become completely magnetized, pass through the magnetic field of the second gap (2) at a small distance from the second pole to become partially magnetized in the opposit direction, pass through the third gap (3) at a greater distance from the third pole to become magnetized again in an opposit direction but to a lesser degree than before, and finally pass through the fourth magnetic field (4) at a greater distance from the last pole. This results in a demagnetized state of the ribbon.

PLAYBACK

The playback process is possibly the easiest to understand of the three processes in magnetic recording. Here it can quite easily be appreciated that any degree of net orientation of the magnetic particles of a given section of recording medium will produce a net external magnetic field. If we move a conductor across such a field a voltage will be established in the conductor. This is the basic theory of the dynamo and was discovered by Faraday in 1831. In magnetic recording these net fields are very weak and therefore special efforts have to be made to produce from these fields as much voltage as is possible; practically speaking, these efforts result in a pickup structure which may be identical to the recording structure. Instead of having a single turn of wire close to the magnetic medium, a set of polepieces are in contact with the medium and any difference in the field from one section of medium to another sets up a magnetic field across these polepieces. Many turns of extremely fine wire are wound on these polepieces and as the magnetized medium moves by the polepieces the magnetic force exerted thereby thread through the polepieces and induce a voltage in the many turns of fine wire. This voltage is then fed to an amplifier wherein it produces sufficient power to operate a speaker.

EQUALIZATION

It might be expected in such a complicated series of processes as have been described that the frequency response of such an over-all system would not be exactly the same to a high frequency audio signal as it would be to a low frequency audio signal. Such is the case, unfortunately, and since a recorder should do equal justice to any frequency to be recorded, it requires that the amplifiers associated with the magnetic recorder must have characteristics which are the inverse of those of the recording medium, thus producing a net over-all effect which is reasonably independent of frequency.

To illustrate this problem of equalization, Fig. 29 Curve A shows the frequency response obtained using flat amplifiers in recording and reproducing on the BK-411 Recorder using the head and the speed of that particular recorder. It will be seen that such a system would be deficient in both low frequencies and very high frequencies. Curve B shows the frequency characteristics of the amplifier actually used with the BK-411 when that amplifier is in recording position. Curve C shows the characteristics of the playback amplifier and Curve D is the result of superimposing Curve C upon Curve A and B and shows the actual measured over-all frequency response of the recorder.

In addition to these fixed characteristics of the recording process and of the recording amplifier and playback amplifier, the BK-411 Recorder has a variable frequency network, the "Tone" control, which operates to suppress as much as desired the high frequencies in the playback process. The "Tone" control has no effect on a recorded signal although it might appear that it was doing so because it does affect the sound through the speaker while a recording is being made from the radio input circuit.

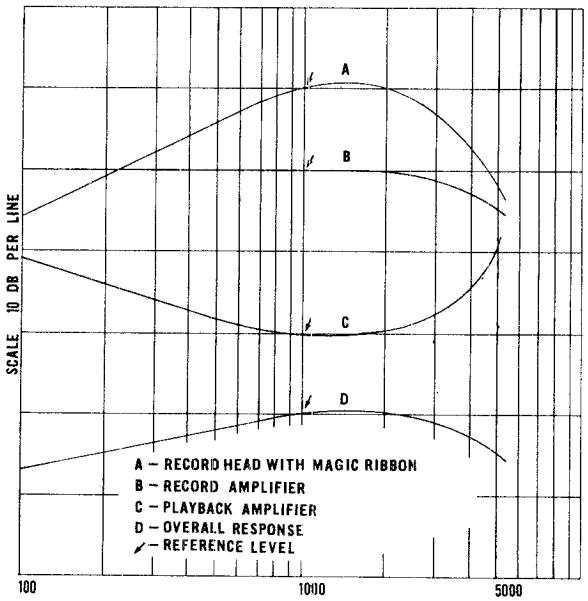

Fig. 29—*Frequency Characteristics*

SECTION IV
Operating Instructions

INTRODUCTION

Best results are obtained when proper care is given the Model BK-411 Soundmirror.

IMPORTANT—Before connecting the Soundmirror to a power source be sure that it is 105 to 120 Volts 60 cycles alternating current. DO NOT connect the unit to a Direct Current Source. The warranty is void if the Soundmirror is connected to a power source other than 105 to 120 Volts 60 cycles a.c.

If other than the voltage or frequency specified above is the only available power source a 150 watt transformer, inverter, or converter must be installed in the line.

PREPARATION

Power—Plug the line cord into a power line receptacle of 105 to 120 volts, 60 cycles a.c. and turn the "Tone Control" clockwise to turn "power on". The power switch is attached to the Tone Control.

Operate the control lever through the "Stop" position to cause all control mechanisms to be in neutral position before threading. Allow the unit to warm up a few moments before using.

Reels—Place the reel with "Magic Ribbon" on the left hand turntable so that the ribbon comes off the left side of the reel. Be sure the magnetic coating on the ribbon faces the center of the reel. (In the Brush "Magic Ribbon" this coating is the black side).

Place the empty reel on the right hand turntable.

Be certain that the key pin (A) of each turntable fits into the key slot (B) of each reel. (See Fig. 30). Correct positioning allows proper action of each automatic trip lever (C).

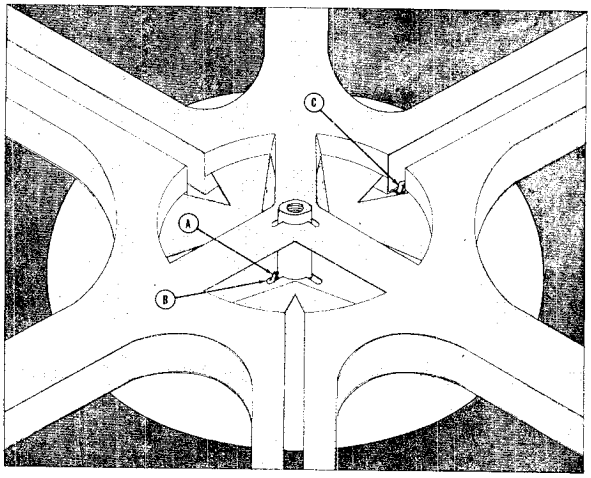

Fig. 30—*Reel Keying of Turntable*

THREADING

1. After placing reels on turntables, as instructed in paragraph above, grasp the free end of the ribbon in the right hand, and with the left hand

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guide the ribbon into the "Recording Slot", from the left side to the right side keeping the slack adjusted until the ribbon rides smoothly when pulled through the slot (see illustration Fig. 31).

2. Thread the free end of the ribbon into the hub of the take-up reel. Give the reel one or two complete turns by hand to allow the ribbon to grip around the hub of the reel and take up the slack. (See illustration Fig. 32).

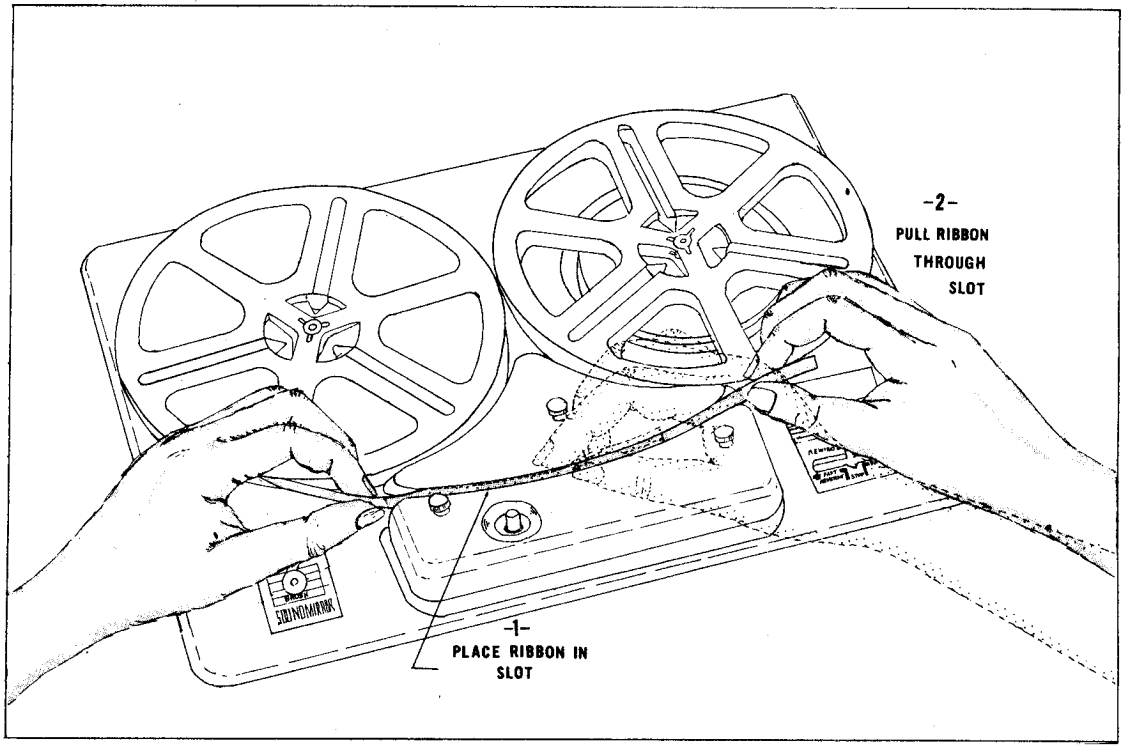

Fig. 31—*Threading Ribbon In Slot*

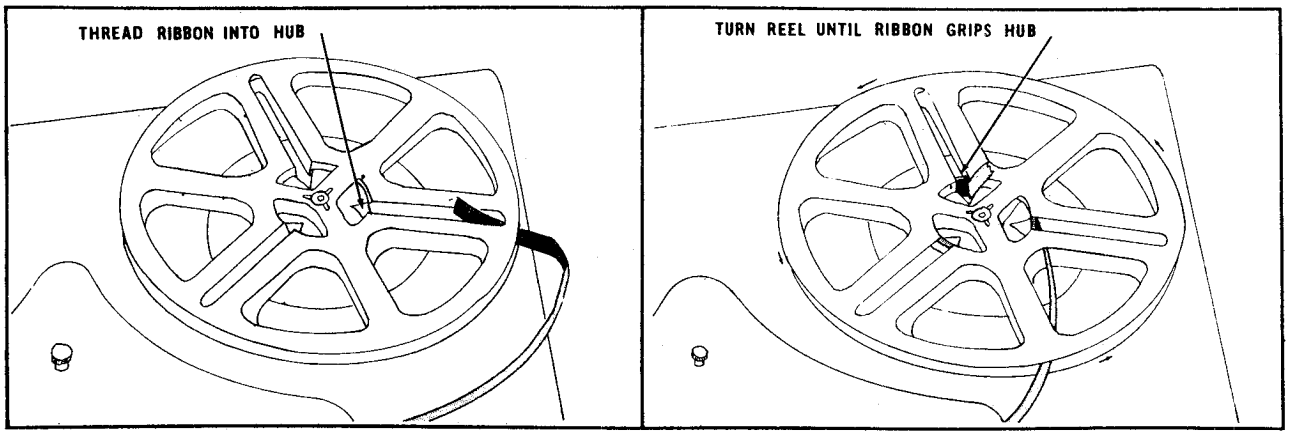

Fig. 32—*Threading Ribbon In Take-up Reel*

RECORDING FROM MICROPHONE

Set the controls as follows: (See Fig. 33 for controls).

1. Turn the Selector Switch (3) to the "Record-Mic." position.

2. The "Speaker Volume" control (4) is used only when recording from the radio input circuit.

3. The "Tone Control" (5) does not affect the recording process, but can be used during monitoring or playback operation.

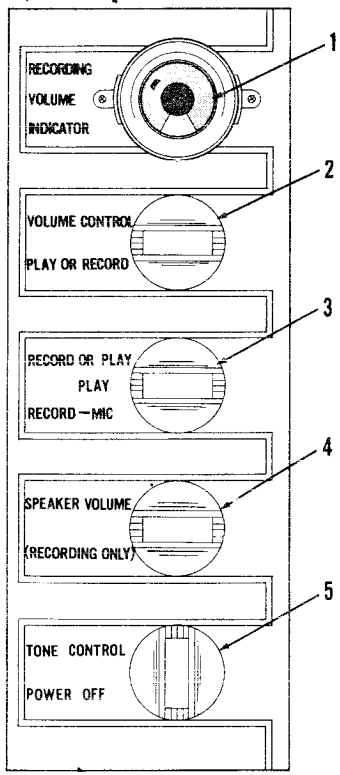

Fig. 33—*Amplifier Controls*

4. Shift the Control Lever (Fig. 34) up, and to the right, as far as possible to the "Record" position while pressing on the Erase Pin which locks the erase head against the ribbon. This operates a switch which causes the Volume Indicator shadow to open. This position sets the ribbon in motion. Note: The control Lever, when released, will automatically return to its neutral position.

5. Turn the "Volume Control" (2) clockwise gradually to set the recording level, which is indicated by the "Recording Volume Indicator". (1)

Correct recording level is obtained when the Indicator shadow just closes with the loudest sounds being recorded.

6. At the end of each recording turn the recording volume control (2) completely counter-clockwise, gradually, before stopping the ribbon to prevent sudden breaks of sound during playback.

RECORDING FROM RADIO

The Soundmirror should preferably be wired to the Radio. For wiring instructions see Page 42.

Set the controls as follows:

1. Turn the Selector Switch (3 Fig. 33) to the "Record-Radio" position.

2. Adjust the "Speaker-Volume" control (4) for the desired listening volume from the Soundmirror speaker.

3. Adjust the "Tone Control" (5) for the desired listening tone.

4. Follow steps 4, 5, and 6 in "Recording from Microphone."

STOP

The "Magic Ribbon" may be stopped at any point by shifting the control lever to the position marked "Stop". (See Fig. 34).

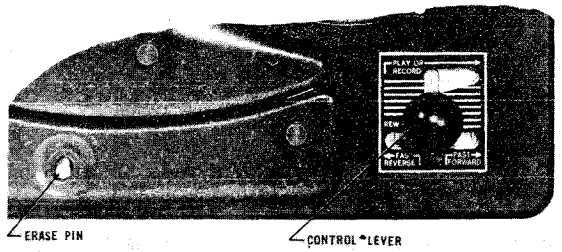

Fig. 34—*Control Lever*

REWIND

If the recording is allowed to continue to the end, the ribbon will automatically rewind. When desiring to rewind the ribbon before reaching the end, the control lever may be moved to the position marked "Rewind," being careful not to shift the lever on past to the "Stop" position.

This sets the machine for rewind and the lever can then be released. The lever must be moved to the "Stop" position before returning it to the "Record" or "Play" position.

FAST FORWARD OR FAST REVERSE

The ribbon may be run rapidly in either direction by moving the control lever to the proper position; "Fast Forward" at the bottom right or "Fast Reverse" at the bottom left (Fig. 34). The lever must be held in position during either operation. If it is desired to stop the ribbon at any point after it has attained a fairly high speed in either direction, the lever should be held in the opposite direction for a moment to cause a braking action and to prevent "slacking" of the ribbon. As the reels come to rest, the lever should then be moved to the "Stop" position to prevent winding in the opposite direction.

PLAYBACK

To play a recording after the ribbon has been rewound, and if necessary rethreaded, set the controls as follows:

1. Turn the selector switch (3 Fig. 33) to the "Play" position.

2. The "Speaker Volume" control (4) is not used during the playback operation.

3. Shift the control lever to "Play" position. This sets the ribbon in motion.

4. Adjust the "Volume Control" (2) for the desired listening volume.

5. Adjust the "Tone Control" (5) for the desired listening tone.

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OPERATIONAL CARE

The model BK-411 Soundmirror is designed to give long service with a minimum of maintenance. It is recommended, however, that care be exercised in handling and operating the Soundmirror to assure high quality performance. The following should be kept in mind at all times:

1. Keep the pole-pieces of the Record-head clean and free from accumulated dust, dirt, or ribbon residue.

Whenever the ribbon residue becomes collected and "piled" on the pole pieces it may be removed by the "flick" of a toothpick or similar non-metallic implement. In stubborn cases the use of a small swab dampened with acetone may be required.

CAUTION: Use acetone sparingly and avoid getting it on the felt pad which presses the ribbon against the head.

Care should be exercised with the use of any implement to prevent marring the surface of the pole pieces.

Loss of high frequencies is evidence of a dirty head. The front trim cover (A-12, Fig. 4) must be removed to clean the head.

When the trim covers are removed for any purpose, be sure to replace them so they do not interfere with the action of the erase head bracket (18), the roller bracket (44), or the reels. (See points A and B of Fig. 4).

2. Dust from the surface of the ribbon gradually accumulates on the capstan bearing block. (O-82, Fig. 8). Large accumulations of this material can cause trouble. This material should be brushed away with a small dry brush (toothbrush or similar implement). Do not use anything hard which will mar the surface of the capstan. The front trim cover (A-12 Fig. 4) must be removed for this operation.

3. An attempt to operate the recorder in a warm room immediately after prolonged exposure to low temperatures may produce a poor recording because of moisture condensation on friction drive surfaces.

4. Any deformation in the rubber pressure wheel (O-84, Fig. 9) which presses the ribbon against the capstan spindle, will be kneaded-out by the normal operation of the recorder. However, should the Control Lever have inadvertently been left in the "Play or Record" position and the pressure wheel left in contact with the spindle for an extended length of time, there will temporarily be a speed variation in the movement of the ribbon until this rubber has been kneaded into a uniform state. Therefore, to obtain highest quality recordings, it is desirable to run the recorder for a few minutes before actually attempting to make a recording. Upon completion of recording or playing be sure to shift the control lever to the "Stop" position. This position disengages the pressure wheel from the capstan spindle.

5. Sufficient ventilation should be provided for best results in the operation of the Soundmirror. Do not set the recorder on a radiator. Allow at least three inches space between the rear of the cabinet and the adjacent wall for air circulation.

SECTION V
Maintenance

INTRODUCTION

Servicing the Model BK-411 Soundmirror is as simple as servicing any popular combination radio and record changer.

The following information will aid the serviceman in a quick and thorough analysis and overhaul of the subject equipment.

A Symptom – Cause – Remedy – chart will be found on pages — to — to provide a quick reference to possible troubles and their remedy.

Photographs and drawings of the complete and sub-assemblies as well as descriptive methods for disassembly and re-assembly of various parts are included throughout the book.

The reference numbers located on the photographs, schematic and exploded view drawings are a reference to items in the list of Material.

DISASSEMBLY OF UNIT

To Remove Amplifier From Cabinet

1. Disconnect the Soundmirror from the power source.

2. Remove reels and ribbon.

3. Remove the cardboard back from the cabinet. (Provided on later units.)

4. Disconnect the interconnecting plugs P-3 and P-4 (Fig. 16) which connect the top panel to the amplifier. Be careful when removing plugs to not damage the sockets. DO NOT PRY PLUGS FROM SOCKETS.

5. Disconnect the speaker plug P-5 from jack J-5.

6. Disconnect the microphone plug P-1 from the jack J-1.

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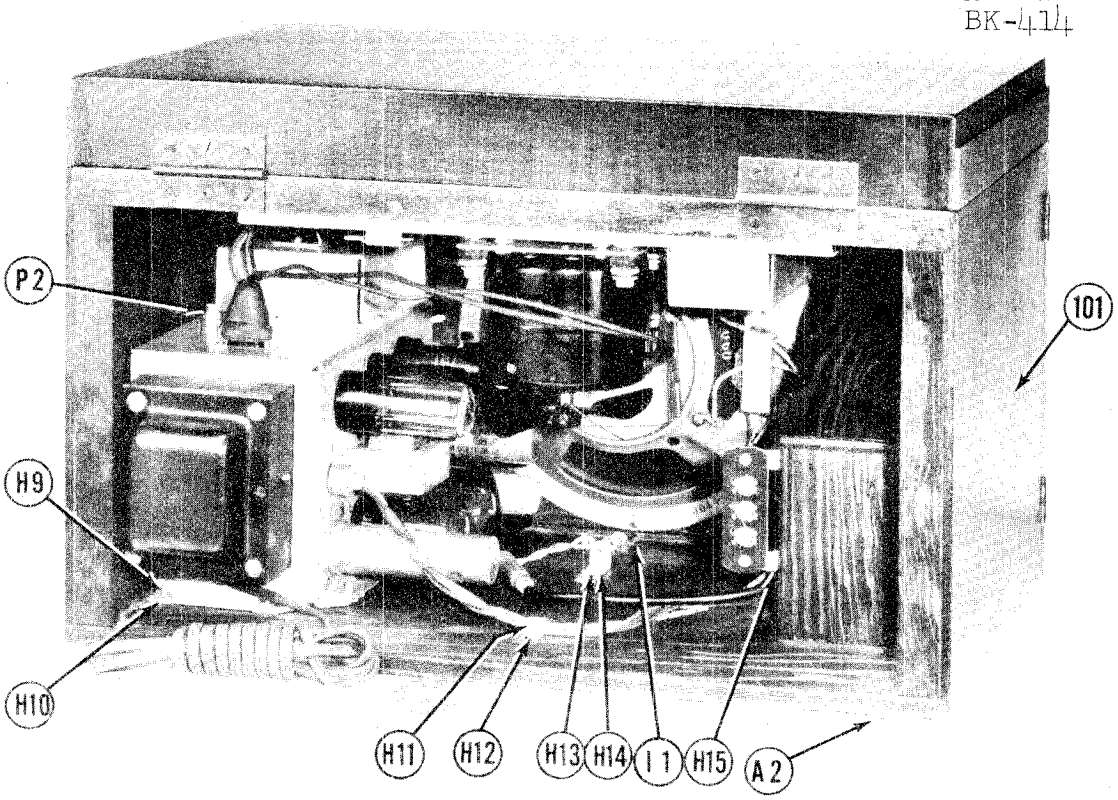

Fig. 35—*Model BK-411—Rear View*

7. Remove the pilot lamp holder from its mounting.

8. Remove the four control knobs A, B, C, and D located on the front panel (Fig. 6).

9. Remove the screws (H9 Fig. 35) which hold the amplifier chassis to the bottom of the cabinet.

10. Carefully slide the amplifier out the rear of the cabinet.

To Remove Top Panel From Cabinet

11. Follow steps 1 through 4.

12. Remove the two small trim covers A-10 and A-12 held in place by three knurled thumb screws H-101. (See Fig. 4).

13. Remove the control lever knob (501) by screwing it counter-clockwise while holding the lever with a pair of pliers.

14. Remove the large trim cover A-14.

15. Remove the four screws which mount the top panel to the cabinet and lift the panel from the cabinet.

To Remove The Speaker

16. Follow steps 1 through 15.

17. Remove the screws which mount the speaker terminal strip to the side of the microphone compartment. (H-15, Fig. 35).

18. Remove the screw (H-12) which mounts the speaker cable clamp (H-11) to the bottom of the cabinet.

19. Remove the four screws which mount the speaker to the grille board and lift the speaker out of the cabinet.

To Remove The Speaker Grille

20. Follow steps 1 through 19.

21. Remove the four screws which mount the grille board to the cabinet.

22. Remove the tacks or staples holding the grille cloth to the edge of the grille board.

23. Remove the staples holding the grille to the face of the grille board.

To Remove Pilot Light Rod

24. Follow steps 1 through 19.

25. Remove the staples holding the rod in place.

26. Drive the rod through the hole (from outside to inside) with a small mallet and pin drift or similar implement.

When replacing the rod, drive it in from the outside, keeping the beveled portion of the rod facing upward so that the light from the pilot lamp will be directed toward it when in the final position.

TUBE REPLACEMENT

Tubes are made accessible by removing the back cover from the cabinet.

CAUTION: TO AVOID BURNS AND CUTS caused by heated tubes and moving fan blades, TURN THE POWER OFF, and allow the tubes to cool and the fan to stop before attempting tube replacement.

The tubes are located as shown in Figs. 20 and 21.

NOTE: When replacement of the 6J7 tube becomes necessary be sure to place the shield cap (O-1) on the grid, otherwise hum may occur. The

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shielded lead to the grid cap should be carefully placed for minimum hum. The best position will usually be with this lead as close to the bottom of the cabinet as possible.

It is also recommended that this tube be selected for a minimum of microphonics.

PILOT LAMP REPLACEMENT

To replace the Pilot lamp the back cover of the cabinet must be removed.

The lamp is of the bayonet base type and may be removed from its socket by pressing the lamp into the socket slightly and twisting it until the guide pins allow the lamp to come out of the socket.

Early units have a lamp socket mounted on a bracket which in turn is mounted on the floor of the cabinet immediately behind the pilot light rod. Later units have a lamp holder which clips onto the flange of the speaker frame. In either case the lamp should be positioned to align with the pilot light rod so that the rod will transfer the most light.

RECORD-PLAY HEAD REPLACEMENT

Remove the Record-Play Head as follows:

1. Remove the top panel from the cabinet. (See steps 11 through 14 above).

2. Remove the record-play head mounting screws. (H-108, Fig. 13).

3. Remove the capstan drive assembly mounting screws (H-143 and H-144) and carefully lower the assembly away from the panel enough to slip the record-play head out of the hole.

Replace head as follows:

4. Assemble the capstan drive assembly and the Record-Play head (E-1) by placing the head and the mounting clamp (H-131) between the flywheel and the bracket.

5. Hold the assembly in the left hand and position it onto the panel while tightening the flat head screw (H-144, Fig. 13) enough to hold the drive assembly until the other mounting screws are placed in position in the following sequence:

a. The screw between the head and the capstan spindle (H-108-A, Fig. 13).

b. The screw nearest the erase head (H-108-B).

c. The screw between the capstan spindle and the right hand ribbon guide (H-143).

6. Adjust the head for hum cancellation as outlined on page 40.

7. Alternately tighten (a) and (b) until the head is aligned vertically when the screws are completely tightened.

8. Tighten screws (H-143 and H-144) completely.

ERASE HEAD REPLACEMENT

Replacement of the erase head will only become necessary when the magnets are too weak to thoroughly erase any signal from the ribbon, or if any part becomes damaged. If such is the case replacement procedure is as follows:

1. Remove the small Trim Covers A-10 and A-12 (Fig. 4).

2. Set the mechanism control as for recording (the control lever being moved to the "Record" position while pressing the erase pin to lock the erase head in an accessible position).

3. Remove the screw (H-134, Fig. 13, or H-22, which holds the erase head to its bracket. At this point the parts held together by the clamp (H-136, will tend to fall apart, therefore it is desirable to hold the parts with the left hand while removing the above mentioned screw.

In the case of the multipolepiece type erase head, the parts are held together by the two screws H-21.

4. Assemble new and/or old parts in order Be sure that the orientation of the magnets (E-7a and b) permits them to attract each other and that the rounded end of the magnets (E-7a) faces the ribbon.

In the case of the multi-polepiece erase head, the mounting hole is relocated on the bracket A-23 to accommodate the change in overall dimensions of the head. When desiring to install the multi-polepiece erase head on previous units the bracket A-23 must be replaced by bracket A-23a (part number 107272-501) or, a hole must be drilled in the bracket A-23, and tapped for a No. 4-40 screw.

Note: Brass screws are used in this assembly to prevent a partial short-circuit of the magnetic field.

5. Place the assembly on the mounting bracket and replace the screw which holds the head in position.

6. Adjust the head for minimum noise as outlined on page 38, then tighten screw to hold the head in the proper position.

7. Replace the trim covers. Be sure they do not interfere with the action of the erase head bracket moving up and down, the pressure wheel bracket, and the takeup reel when tightened in position.

REPLACEMENT OF CAPSTAN DRIVE ASSEMBLY

To replace the capstan drive assembly follow procedure outlined in "Record-Play Head Replacement" page 34. Some units contain a type of capstan drive assembly which can be disassembled from the lower end of its mounting bracket by the following procedure:

1. Remove the top panel from the cabinet as outlined in steps 11 through 15 on page

2. Remove the drive belt (O-77, Fig. 8).

3. Remove the two allen-head screws (H-133,

4. Carefully pull the capstan spindle and flywheel assembly out of the upper bearing (O-78, . This allows replacement of only the spindle and flywheel assembly and the lower bearing assembly. To replace the upper bearing and bracket assembly, follow procedure as outlined in "Record-Play Head Replacement" page 34.

5. Replace parts and/or assemblies in reverse order as outlined above.

Before and after replacement of spindle and flywheel assembly, check for binding in the bearings. Spin the flywheel with the finger to be sure the

assembly rotates freely. The drive belt must be displaced for this check. If binding occurs in the lower bearing, realign the bearing by tapping lightly on all its sides. This should jar the bearing just enough to cause it to align itself with the spindle (O-82). If the binding occurs in the upper bearing (O-78, reposition the lower bearing bracket (A-26) to center the spindle (O-82) in the upper bearing (O-78). To reposition the bracket, loosen the two allen head screws (H-133) just enough to move the bracket to a point which allows the spindle to turn freely in the upper bearing (O-78) when the set screws are again tightened.

If correct alignment of bearings, etc. does not eliminate the binding, check for a bent capstan spindle, and replace if bent.

NOTE: Any binding or excessive friction in any part of the drive assembly will result in a speed variation of the ribbon and thus produce a pitch variation known as "Flutter".

The capstan flywheel is made of three identical discs which rotate on the same axis. Each disc contains an indexing notch on its circumference. These notches are spaced 120° apart to provide a balance in the flywheel and produce a minimum of "Flutter" during recording or reproduction.

REPLACEMENT OF PRESSURE WHEEL ASSEMBLY

The pressure wheel assembly (Fig. 9) consists of a bracket (A-16), a spring (O-85), a shaft (O-83), a wheel (O-84), and a pressure pad (MS-2) which is attached to the bracket. To replace the complete assembly:

1. Remove the small trim cover (A-12) and the "Tru-Arc" retaining ring (O-64), see Fig 4.

2. Lift the assembly off the post, being careful not to damage the spring (O-85).

3. Slide the spring out the end of the bracket. The wheel and shaft should then come out easily.

4. Replace parts in reverse sequence of steps 1, 2, and 3.

The link which couples the control lever system to the pressure wheel bracket is coined on one edge to increase the width and thus prevent a locking effect which occurs if the center line of the link intersects the pressure wheel bracket pivot point. (See point "A" of Fig. 8). Should the link become worn to the extent that the mechanism locks, replacement of the complete pressure wheel bracket assembly is required.

REPLACEMENT OF PRESSURE PAD

The friction between the pressure pad and the ribbon will in time wear the felt pad. When it becomes necessary to replace this pad it is recommended that a good cement such as Bakelite Corporation No. BC-6052 be used. Care should be taken to prevent any cement from getting on the face of the felt which contacts the ribbon. After replacement is made the pressure should be adjusted as outlined on page 42.

REPLACEMENT OF BELTS

If the unit fails to start with a full reel of ribbon on the take-up turntable, due to slippage of the clutch belt (O-76, Fig. 8), this belt should be replaced.

When replacing either belt, install it as shown in Fig. 8. Be sure that the clutch belt does not rub against itself at the crossover point. This may be adjusted by raising or lowering the drive pulley on the motor shaft. Under normal operation, rubber dust from the clutch belt will accumulate. This dust should be removed thoroughly from the mechanism.

DISASSEMBLY AND REPLACEMENT OF TURNTABLE ASSEMBLY

1. Remove the "Tru-Arc" retaining ring (O-52, Use a number 22 "Tru-Arc" pliers.

2. Lift the turntable assembly from the reel post (O-57). The assembly may be divided into the upper cup (O-53), the lower cup (O-56), and the tripping trigger (O-54 or O-55).

3. Replace either trigger if damaged.

4. Reassemble parts in order

Be sure cups fit together with insides facing each other and indexed according to the notches and slots in their edges.

NOTE: If the reel guide pin is broken off, the cup must be replaced. DO NOT ATTEMPT TO BEND THE PIN into position because it is likely to break off.

5. Install the assembly on the reel post and replace the "Tru-Arc" retaining ring making sure it fits into the groove on the reel post. A slight downward pressure on the cup near the post will reveal the groove.

DISASSEMBLY AND REPLACEMENT OF CLUTCH ASSEMBLY

1. Remove top panel from cabinet (see steps 11 through 15, page 34).

2. Remove the turntable assembly as in steps 1 and 2 of "Disassembly of Turntable", above.

3. Remove the clutch belt (O-76, Fig. 8).

4. Remove the two screws which mount the clutch lifter bracket assembly (A-18 or A-21,

Slide the assembly out at one side being careful not to distort the clutch lifter spring attached to the bracket. Remove the switch cover A-22 for access to the rewind bracket. NOTE: Be careful not to lose the ball actuator (O-70) from the rewind bracket (A-18).

5. While holding the clutch raising lever in an extreme position carefully remove the small "Tru-Arc" retaining ring (O-69) located at the lower end

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of the reel post (O-57). This requires the use of the No. 0018 "Tru-Arc" pliers.

6. Lift out the reel post assembly being careful not to lose the clutch lifter pin (H-115). This allows the clutch and pulley to be lifted from the clutch bearing assembly (A-15).

7. The felt clutch (O-58) is cemented to the upper face of the pulley and under normal conditions need not be removed, however if damaged it may be replaced in the following manner:

a. Peel off the old felt from the pulley.
b. Remove the old cement by washing the pulley thoroughly with benzol or similar solvent.
c. Apply a coat of cement (such as No. BC-6052 made by the Bakelite Corporation) to the upper face of the pulley. Apply only to the area to be covered by the felt. Allow it to dry. Apply a second coat to the pulley and allow it to become tacky.
d. Place the felt on the pulley and center it on item O-59 and allow it to become completely set. Note: The use of a small weight to press the felt to the pulley while it is setting will assure a firm adhesion.
e. After the cement is thoroughly set and dry, apply a few drops of light oil to the felt and allow it to soak in.

8. If necessary, remove the clutch-pulley bearing assembly by removing the hex nut (H-117) on lower side of chassis. Replace any damaged or worn out parts.

In some early units, trouble may be encountered with the recording ribbon continually dragging on the lower edge of the take-up reel during the recording or playing process, even though the clutches are adjusted properly. This may be corrected by removing the appropiate spacer washer (H-106, Fig. 13) from beneath the clutch bearing housing (A-15). To do this the spring (O-102) must be lowered slightly to prevent the dragging on it of the clutch pulley (O-59, To lower the spring, a hole (approximately 1/16" diameter) should be drilled in the chassis immediately above the trip lever latch (H-141, Fig. 13) and below the spring post. The end of the spring should then be placed through the hole and one leg of the spring anchor slot in a manner which provides the lowest positioning of the spring.

9. Reassemble the clutch pulley, the reel post, and the lifter pin and install onto the clutch bearing.

10. Install the "Tru-Arc" retaining ring on the lower end of the reel post.

Install the clutch lifter bracket assembly. Note: If installing the rewind bracket—be sure to replace the ball (O-70) which actuates the contact arms of the motor switch.

11. Install the turntable assembly. (See step 5 of "Disassembly of Turntable",

12. Install the clutch belt (O-76) as shown in Fig. 8.

13. Position the clutch lifter brackets and adjust the clutches as outlined in "Clutch Adjustment",

14. Plug the motor leads into a power source.

15. Wear in the clutch felts for about 15 to 30 minutes each in the following manner:

a. Place a full reel on the take-up turntable and anchor it in a stalled position by applying a piece of Scotch Tape from the reel to the panel.
b. Shift the control lever into the "Record or Play" position and allow the unit to operate.
c. After the takeup clutch is worn in, place the full reel on the rewind turntable and anchor as in "a" above.
d. Shift the control lever to the "Rewind Position" and allow unit to operate.

16. After the clutch felts are worn in, readjust the clutches to be sure conditions listed under "Clutch Adjustment", page 41, are still satisfied.

REPLACEMENT OF MOTOR

1. Remove the top panel from the cabinet. (See steps 11 through 15,

2. Remove the shield (A-22) from the rewind clutch lifter bracket and disconnect the motor wire from the switch (S-6).

3. Disconnect the other wire from the interconnecting power plug P-4.

4. Remove the rubber belts (O-76 and O-77 Fig. 8).

5. Remove the two binding head screws (H-102 Fig. 38) which mount the motor to the chassis.

6. Loosen the 8-32 allen head set screws (H-103) and remove the drive pulley (O-62) from the motor shaft.

7. Remove the 4 hex nuts which mount the motor to the plate assembly (A-19).

8. To replace the rubber shocks; remove the 4 hex nuts (H-126) holding the shocks in place, remove the motor mounting plate (A-19) from the plate assembly (A-17), remove the rubber shocks from the plate and install new ones, install onto plate assembly and replace screws. Note: It is best to replace all four rubber shocks to assure proper balance of motor.

Be sure to replace ground wire (W-3, Fig. 11) to prevent electrical hum from motor.

9. Install new motor and reassemble onto chassis in reverse order of steps 3 through 8.

10. After installation of rubber belts adjust the height of the drive pulley on the motor shaft to a position which prevents rubbing at the crossover point of the clutch belt (O-76).

11. Adjust the position of the motor on the chassis to a point which causes least vibration of the drive belt (O-77), and which gives the greatest tension to the clutch belt (O-76).

REPLACEMENT OF CONTROL SPRINGS

The control mechanism requires nine springs

of various sizes. Do not interchange springs of different sizes, as the tension of each spring is critical.

Identification of springs is found in Figs. 11 through 15.

ADJUSTMENT OF ERASE HEAD FOR MINIMUM NOISE

The erase head of the early BK-411 consists of two rectangular permanent magnets which are located in a position against the ribbon (when engaged) so that any previous recording becomes erased as the ribbon passes it.

The erasing process should disarrange the minute particles of the magnetic material on the ribbon so that no signal is reproduced from the playback head. However, if the two magnets do not approach the ribbon at the proper angle, the erasing effect is changed and results in an arrangement of the particles so that they produce a noise signal in the playback head.

It is desirable to find a position which will result in a minimum of noise being produced. This may be done by the following method.

1. Thread the Soundmirror with ribbon containing a recorded portion which may be erased during this adjustment.

2. Remove the two small trim covers A-10 and A-12.

3. Turn the power switch (on the tone control) clockwise to the "on" position and allow the tubes to warm.

4. Set the Amplifier controls for "Playback" operation and the top panel controls for "Record" operation. (This puts the erase head in contact with the ribbon, thus erasing the ribbon before it enters the play-back head.

5. Adjust the playback volume control for maximum volume and the tone control for maximum high frequency response.

6. Loosen the screw (H-134, Fig. 13) that holds the erase head to its mounting bracket and rotate the head first one way and then the other until a point of minimum noise is found. (Do not rotate the head too far in either direction, or erasure will be incomplete.)

7. Tighten the screw to lock the head in this position.

8. Shift the control lever to the "STOP" position to allow the erase head to drop away from the ribbon.

9. Replace the trim covers.

In later production of the model BK-411 the multi-polepiece erase head is used. This head, contains only one magnet. However, due to the arrangement of the polepieces assembled with the magnet, the resultant effect of its use is that of many magnets, thus increasing the number of magnetic flux reversals in the recording ribbon as it passes the head, and producing more effectively an a.c. type of erase. (See Fig. 28d footnote).

The adjustment for minimum noise from the multi-polepiece erase head is the same as the adjustment for the two-magnet type erase head listed in steps 1 to 9 above.

Note: Any remaining noise produced by the erase head will be even further reduced by the action of the 30 K. C. bias current present in the record head during the normal recording process.

ADJUSTMENT OF RECORD-PLAY HEAD FOR MINIMUM HUM AND/OR MAXIMUM HIGH FREQUENCY RESPONSE

Excessive hum during any pause in the recording while the unit is in the play-back position may be caused by magnetic lines of force being radiated from sources such as the motor, power transformer, filter choke, etc., inductively creating an unbalanced voltage in the play-back head.

This condition may be corrected by reestablishing the balance by properly directing the magnetic lines of force through the two windings of the head, and is accomplished by slightly rotating the head either clockwise or counter-clockwise as the case may require.

To find the correct position:

1. Turn the power on and allow the tubes to warm.

2. Set the Amplifier Controls for playback operation at full volume.

3. Remove the small trim covers (A-10 and A-12 Fig. 4).

4. Loosen the mounting screws (H-108, Fig. 13) on either side of the record-play head enough to allow the head to be rotated slightly.

5. Place the ribbon around the back side of the record-play head and the capstan drive spindle.

6. Shift the control lever to the "Play" position.

7. Rotate the record-play head in either direction until a point of minimum hum is found.

8. Tighten the screws to hold the head in this position.

9. Shift the control lever to the "Stop" position to stop the reels. Fig. 39, Section 1, shows the head in the normal position. The cut-a-way of the head shows how the polepieces should contact the ribbon.

It is important to check this position after rotating the head to prevent the results shown in section 2 of Fig. 39. If the head is rotated too far in either direction the gap will not contact the ribbon and will result in a lack of high frequencies or no signal at all being recorded or reproduced.

To check this condition:

10. Place a mark on the panel at point "B" of Fig. 39 to identify the "minimum hum" position of step 7 above. The mark should be made in line with the end edge of the opening in the record head.

11. Place a recorded portion of the ribbon through the record-play head and the capstan drive spindle.

12. Shift the control lever again to the "Play" position.

13. Loosen the record-play head mounting screws enough to rotate the head toward "A" or "C" (Fig. 39) while listening to the signal being reproduced from the ribbon. When the position is found which allows the higher frequencies to be reproduced, place a second mark on the panel to identify this position.

If this position does not coincide with the position of least hum, then a choice or a compromise position must be made.

14. Alternately tighten the screws to lock the head in the position chosen.

MODELS BK-411,
BK-414

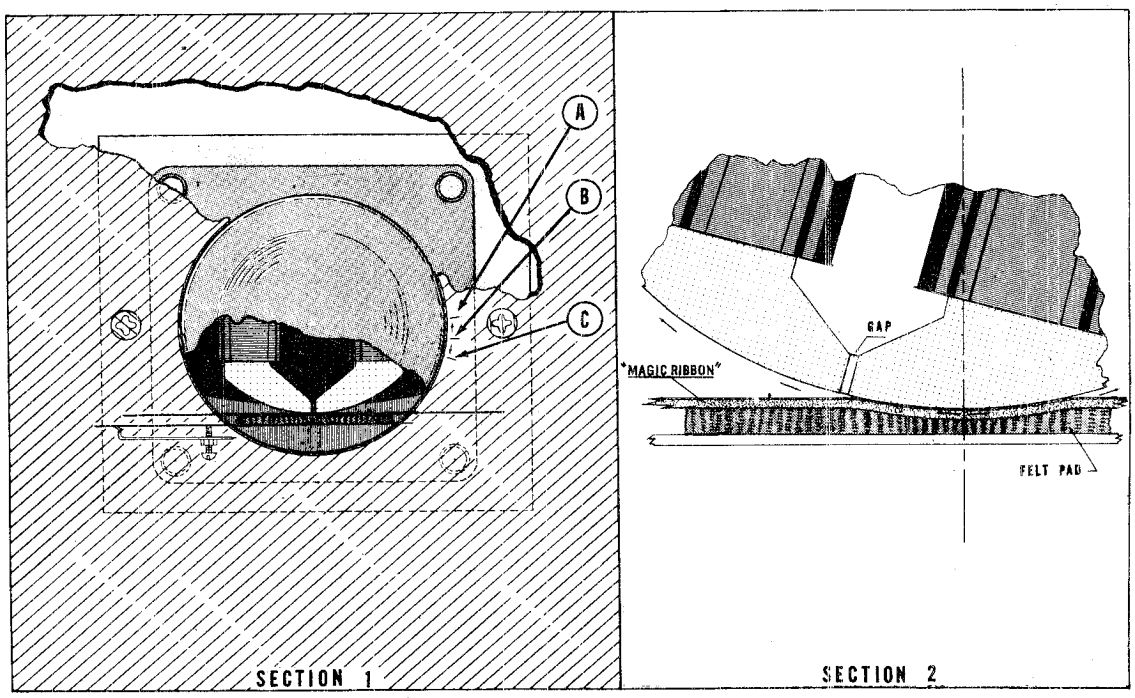


Fig. 39—*Record-Play Head Adjustment*

ADJUSTMENT OF CLUTCHES

The clutches are adjusted and set at the factory and under normal conditions should not require readjustment. In early BK-411 units the set screws for this adjustment were first dipped in glyptal then put into the reel posts and adjusted. As the glyptal dried the adjustment became set.

In later production of the model BK-411, longer set screws were installed, including a locking nut to secure their position after the clutch adjustments were made. items H-19 and H-20). This was done to facilitate adjustments as well as accommodate the reel hold-down nut which fits on the upper portion of the setscrews. (See item H-18,

No glyptal is required with this arrangement, therefore the following step No. 2 and the latter part of steps No. 1 and No. 10 shall be ignored in the adjustment of the above set screws H-20.

If it becomes necessary to replace any part of the clutch assembly, readjustment becomes necessary and proper procedure is as follows:

1. Remove the set screws located in the top end of the reel posts with a number 8 allen wrench. If the old glyptal is set too hard for the screws to turn readily, apply a few drops of solvent such as G. E. No. 1500 Glyptal thinner to dissolve the glyptal.

2. Re-dip the set screws in the G E. No. 1201 glyptal and replace into reel posts.

3. Place the control lever in the "Fast Forward" position and adjust the set screws so that the rewind clutch turns freely and the take-up clutch is engaged.

Note: Turning the screws clockwise disengages and counter-clockwise engages the clutch.

4. Place the control lever in the "Fast Reverse" position and adjust set screws so that the take-up clutch turns freely and the rewind clutch is engaged.

Note: Some units may contain a small friction brake placed between each turntable and its corresponding clutch-cup face. This will apply a small amount of drag on each turntable, preventing complete freedom of its rotation when not engaged with the clutch.

5. Recheck to be sure condition 5 is satisfied.

6. Place the lever in the "Play or Record" position and be sure condition 3 is still satisfied.

7. Trip the automatic rewind trip lever (Fig. 5) and be sure condition 4 is satisfied. This should be checked with the erase head up and again with the erase head down.

8. Correct adjustment satisfies all conditions listed above.

9. Check adjustments also to be sure retainer

ring (O-69) does not bind on the adjacent washer and bearing housing (H-118 and A-15) when the clutch raises. (The mechanism must be removed from the cabinet to see these parts.)

10. Both clutches should engage in the "Stop" position to produce complete braking action. When the clutch adjustments are completed, the machine should be allowed to set without operating for approximately four hours to allow the glyptal to harden.

ADJUSTMENT OF RIBBON TENSION

The pressure of the ribbon against the record head can be adjusted by turning the screw (H-112, Fig. 12) mounted on the pressure wheel bracket assembly. (Be sure to first loosen the hex nut before making adjustment.)

This pressure is measured in terms of tension by attaching a scale to the end of a piece of ribbon which is drawn through the ribbon guides, record head, pressure pad, and behind the capstan assembly at approximately 7½ inches per second to produce a scale reading of 1½ to 2½ ounces. This adjustment is made accessible by removing both trim covers (A-10 and A-12).

ADJUSTMENT OF RIBBON GUIDES

The ribbon guides (O-66 and O-67) are located beneath the head trim cover (A-10) and are mounted on the panel with the guide posts (O-65) by mounting screws (H-140, Fig. 11).

Approximate positioning of guides on panel is shown in Fig. 4. Final adjustment of guides is made by slightly rotating the guide clockwise or counter-clockwise around the guide post to increase or decrease the friction of the ribbon through the guides during the "Fast-Reverse" or "Fast-Forward" process. Proper adjustment allows the ribbon to wind tightly onto the reel within a reasonably short length of time. The guides should be shaped in a vertical plane with respect to the posts to facilitate the ease of threading.

Note: Units containing the small friction brakes attached to the clutch-cup face do not require the ribbon guides since the proper friction or drag on the turntables is obtained by their use.

ADJUSTMENT OF ROLLER PRESSURE

The pressure of the rubber wheel (O-84, Fig. 9) against the ribbon and capstan spindle (O-82, Fig. 10) is adjusted at the factory and it is not recommended that any adjustment be attempted in the service field but rather that any component found to be defective be replaced with a new part.

If the ribbon tends to crawl up or down on the capstan spindle, it indicates that the spring (O-85) may not be seating properly in the grooves of the wheel shaft (O-83). If this condition is not the case, then the spring may have inadvertently been bent in a manner causing one arm to press more than the other. Since the adjustment is critical, it is recommended the spring be replaced rather than adjusted.

Another possible cause for this trouble is insufficient ribbon tension at the record-play head. For adjustment see "Adjustment of Ribbon Tension", above.

LUBRICATION

Caution: Do Not Over Oil

MOTOR—The motor should be oiled once every three months with No. SAE 20 oil.

MECHANISM — All moving or sliding parts should be cleaned thoroughly of any dirt, dust, or rubber dust that may have accumulated. After cleaning apply a thin coat of light oil to all sliding surfaces. Wipe off any excess amount of oil. Do not allow oil to get onto the belts or the driving surfaces of the pulleys.

OILITE BEARINGS—The following are of this type and need very little lubrication.

1. Clutch Pulley Bearings.
2. Capstan Spindle Bearing.
3. Pressure Wheel Bearing.

CONNECTING SOUNDMIRROR TO RADIO

To Record From Radio:

Fig. 40 illustrates a preferred method of connecting the Model BK-411 Soundmirror to most radios. The connection, as illustrated, is made at the last detector stage preceding the audio ampli-

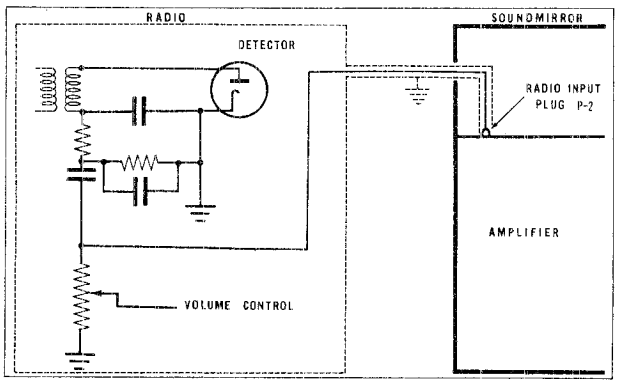


Fig. 40—*Radio Connections to Soundmirror*

fier stage, usually at the input of the radio volume control. Connection at this point allows the operator to have full control of the recording volume at the Soundmirror.

Radio circuits having a d. c. potential on the volume control will require a blocking capacitor between the radio and the Soundmirror connection. The value of the capacitor should not be less than .002 mfd.

To eliminate hum pick-up while recording from the radio, a low capacity coaxial type cable should be used to make the connection.

To prevent loss of high frequencies it is suggested that this cable be as short as possible. More than five feet will result in appreciable loss of high frequencies.

To Playback Through Radio:

Radios of the console type usually contain a high fidelity audio amplifier system which makes it desirable to play the Soundmirror recording through that system. A connection for this purpose is illustrated in Fig. 41.

The double pole double throw toggle switch shown may be installed on the back of the Soundmirror.

The lead from the radio to the Soundmirror Amplifier should be shielded to prevent hum pick-up from being fed into the radio amplifier.

To make the connection to the Soundmirror Amplifier:

1. Disconnect the wire which leads from the tone control (R-24) to contact "Q" of the Selector Switch (S-1).

2. Connect the D. P. D. T. Switch, as instructed in Fig. 41, to the contacts remaining vacant as a result of step 1 above.

3. The shield of the switch leads should be connected to the nearest ground tie point in the Soundmirror amplifier.

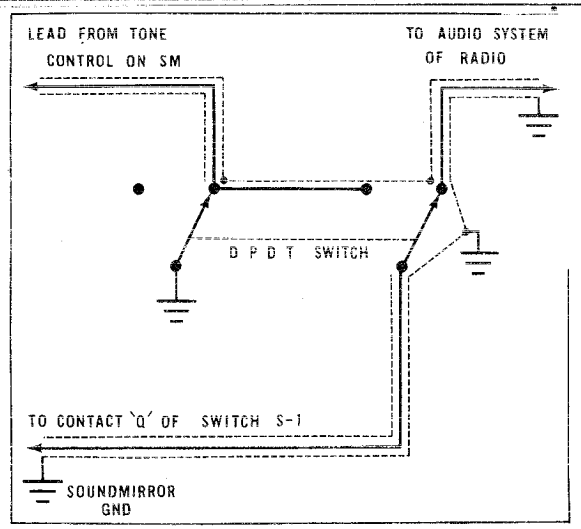


Fig. 41—*Soundmirror Connection to Radio*

SYMPTOM	CAUSE	REMEDY
INSUFFICIENT OR NO ERASE	1. Weak Magnets (E-7).	1. Replace (See instructions, page 35).
	2. Misaligned Magnets.	2. Readjust as instructed on page 38.
	3. Misplaced Magnets.	3. Place as shown
DOES NOT RECORD	1. Shorted or open head circuit.	1. Check connections and leads to switch S-2 and S-3.
	2. Grid shield cap shorted to grid lead on V-1.	2. Line inside of Shield Cap with insulating material.
	3. Open Coupling Capacitors C-6 or C-7.	3. Replace capacitor.
	4. Defective V-1, V-2, or V-7.	4. Replace.
	5. Open L-1.	5. Replace.
	6. Defective S-1.	6. Replace.
	7. Defective J-1, or J-2 (Radio input only.)	7. Replace.
	8. Defective associated resistors.	8. Replace.
	9. Defective wiring.	9. Rewire.
DISTORTION **Record Channel**	1. Insufficient 30 KC Bias Current through record head.	1. Proper current is 2.0 MA with S-4 in No. 1 position and 4.5 MA in No. 2 position.
	2. Defective components in Osc. circuit V-4.	2. Replace defective component (Check L-1).
	3. Leaky or shorted coupling capacitors C-6 or C-7.	3. Replace defective component.
	4. Defective components in associated circuits of V-1 and V-2.	4. Replace defective component.

SYMPTOM	CAUSE	REMEDY
Monitor Channel ("Record-Radio" position only)	1. Check for shorted coupling capacitors C-6, C-10, C-17, or C-18.	1. Replace defective component.
	2. Defective associated components of V-1, V-2, V-5, and V-6.	2. Replace defective component.
	3. Overloading of Input Stage V-1 by signal from Radio.	3. Reduce radio signal voltage to Soundmirror.
	4. Defective Output transformer or Speaker.	4. Replace.
Playback Channel	1. Check for shorted coupling capacitors C-6, C-7, C-17, C-18.	1. Replace defective components.
	2. Defective V-1, V-2, V-5, or V-6 or any associated circuit component.	2. Replace defective components.
	3. Open grid of one half of V-6.	3. Check tube socket contacts and squeeze together enough to grip tube prongs.
	4. Defective output transformer or speaker.	4. Replace.
	5. Insufficient erasure of previous recording causing undesired or unintelligible signal.	5. See "Insufficient or No. Erase" of Symptoms.
	6. Flutter.	6. See "Wow and Flutter" of Symptoms.
HIGH HUM	1. Defective tubes or ground connections.	1. Replace or rewire accordingly.
	2. One side of filament shorted to ground.	2. Check Pilot lamp holder and associated wiring.
	3. Open grid circuit.	3. Rewire.
	4. Microphonic tube.	4. Replace defective tube.
MICROPHONICS (Howling or Whistling when unit is jarred)	1. Microphonic 6J7 tube V-1.	1. Select non-microphonic tube and replace.
WEAK OR NO OUTPUT	1. Broken jumper wire on output terminal strip (E-3).	1. Replace wire.
	2. Defective power cord or plug.	2. Replace.
	3. Defective tubes.	3. Replace defective tube.
	4. Shorted capacitors—check C-4, C-5, C-8, C-9, C-19, C-21, or C-22.	4. Replace defective part.
	5. Open capacitors—check C-6, C-7, or C-10.	5. Replace defective capacitor.
	6. Open Osc. Coil L-1 (No B + to V-2).	6. Replace coil.
	7. Defective Output transformer or Speaker.	7. Replace defective part.
	8. Defective contacts or wiring of selector switch S-1.	8. Replace or rewire.
	9. Defective Power Transformer.	9. Replace.
	10. Open playback head.	10. Replace.

SYMPTOM	CAUSE	REMEDY
	11. Dirty polepieces of head (produces weak output).	11. Clean heads.
	12. Defective contacts from head to amplifier.	12. Rewire or replace defective plug or socket.
POOR FREQUENCY RESPONSE	1. Accumulation of dirt and ribbon residue on record/play head.	1. Clean head.
Insufficient Highs	2. Insufficient recording bias current.	2. See "Insufficient Record Bias" of Symptoms.
	3. Defective component in compensating network.	3. Replace defective part.
Insufficient Lows	1. Insufficient recording bias current.	1. See "Insufficient Record Bias" of Symptoms.
	2. Defective component in compensating network.	2. Replace defective part.
CONTINUAL TRIPPING OF RE-WIND TRIP LEVER	1. Reels improperly placed on turntable.	1. Place the reel on turntable so that the ribbon nearest the center of the reel holds the trigger above the trip lever until approximately 20-40 turns of ribbon remain on the reel, at which time the trigger should drop down and trip the lever to cause the ribbon to rewind. (See Fig. 5).
	2. Rewind trigger (Fig. 5) bent.	2. Reshape item O-54.
RIBBON SPEED TOO SLOW (Correct speed 7.2 to 7.9 inches per second.) Nominal: 7.5 inches per second.	1. Pressure pad—pressure too great.	1. Readjust according to procedure outlined in "Adjustment of Ribbon Tension", page 42.
	2. Rewind clutch misadjusted causing it to be engaged.	2. Readjust – see "Adjustment of Clutches", page 41.
	3. Capstan flywheel shaft binding in lower bearing.	3. Replace capstan drive assembly. See "Replacement of Capstan Drive Assembly", page 35.
	4. Motor shaft binding in motor bearings.	4. Replace motor.
"REWIND", "FAST-REWIND" OR "FAST-FORWARD" STICKS (Will not return to neutral upon actuating control lever.)	1. Control lever mechanism binding at some point.	1. Clean dirt, burrs, or cause of binding. After cleaning, lubricate parts with (SAE-10) light oil.
	2. Motor switch mounting bracket not positioned properly.	2. Reposition bracket slightly to satisfy condition. Check conditions to be sure ball (O-70, Fig. 15) does not fall out when control mechanism is actuated.
WOW AND FLUTTER	1. Pressure wheel defective, binding, or rubbing on capstan bearing housing.	1. Replace defective wheel. Remove source of binding (check wheel shaft for possible source), also check alignment of pressure spring against shaft. See "Adjustment of Roller Pressure", page 42.
	2. Excessive pressure of pressure pad against record/play head.	2. Readjust—See "Adjustment of Ribbon Tension", page 42.
	3. Binding motor shaft bearing.	3. Replace motor.
	4. Binding capstan lower bearing.	4. Replace capstan drive assembly.

SYMPTOM	CAUSE	REMEDY
	5. Binding reel-post bearing.	5. Clean or replace bearing or reel post.
	6. Damaged capstan drive belt.	6. Replace belt.
	7. Bent capstan.	7. Replace capstan drive assembly.
RIBBON BREAKS AT CAPSTAN SPINDLE	1. Pressure wheel shaft improperly seated on pivot.	1. See "Adjustment of Roller Pressure", page 42.
FAILURE TO OPERATE WITH POWER ON	1. Line voltage too low.	1. Proper line voltage is 105-120 volts, 60 cycles a.c.
	2. Control lever inadvertently left in "Rewind" position.	2. Shift control lever to "Stop" position then to "Record" or "Play".
	3. Clutches misadjusted.	3. See "Adjustment of Clutches", page 41.
	4. Controls fail to lock in "Record" position, or jammed due to excessive dirt in mechanism.	4. Clean mechanism thoroughly and lubricate.
	5. Dislocated ball actuator on motor switch mechanism (Item O-70, Fig. 15).	5. Replace ball and readjust mounting of switch bracket to prevent ball from being dislocated when clutch raising lever is actuated.
	6. Capstan drive belt worn out.	6. Replace belt.
	7. Defective motor switch.	7. Replace switch.
	8. Defective motor.	8. Replace motor.
FAILURE OF CAPSTAN TO PULL RIBBON	1. Capstan spindle-shaft binding in lower bearing.	1. Replace capstan drive assembly.
	2. Broken or weak capstan drive belt.	2. Replace belt.
	3. Capstan spindle jammed with accumulated ribbon residue on bearing.	3. Clean thoroughly.
	4. Roller pressure insufficient.	4. See "Adjustment of Roller Pressure", page 42.
FAILURE TO TAKE-UP RIBBON OR WINDS TOO LOOSELY ON TAKE-UP REEL	1. Clutches misadjusted.	1. Readjust—See "Adjustment of Clutches", page 41.
	2. Ribbon guides misadjusted.	2. Readjust—See "Adjustment of Ribbon Guides", page 42.
	3. Clutch belt slipping.	3. Clean motor drive pulley with carbontetrachloride. Reposition motor to tighten belt. If unsatisfactory, replace belt.
FAILURE TO REWIND RIBBON PROPERLY	1. Clutches misadjusted.	1. Readjust—See "Adjustment of Clutches", page 41
	2. Ribbon guides misadjusted.	2. Readjust—See "Adjustment of Ribbon Guides" page 42.
	3. Failure of automatic trip, due to reel binding against edge of trigger.	3. Readjust angle of reel key pin to prevent reel from binding trigger. (See Fig. 30).
	4. Binding of slide assembly (O-94, Fig. 11).	4. Clean mechanism thoroughly and lubricate.

MODEL BK-414
PORTABLE SOUNDMIRROR

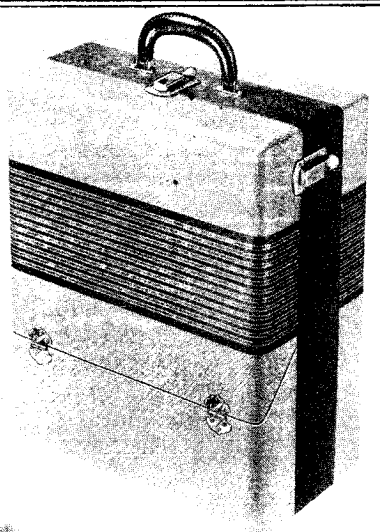


Fig. 42—*Model BK-414 Portable Soundmirror*

INTRODUCTION

The operation and function of the Model BK-414 Portable Soundmirror is basically the same as that of the Model BK-411 Soundmirror.

The construction features in the carrying case and the cabinet for these two models are different however, and require different procedures for their disassembly and reassembly.

The following information in addition to the preceding information, in general, will be sufficient to service and overhaul the Model BK-414.

The parts listed on pages 56 to 63 is a combined parts list for the Models BK-411 and BK-414.

DISASSEMBLY OF MODEL BK-414

To remove unit from case:

1. Remove the control knob (501) and the trim covers (A-10, A-12, and A-14). (See Fig. 43).

Note: On later units the trim cover (A-14) is held in position by two additional screws located at each corner of the cover near the control panel.

2. Remove the two screws (H-146) located at the front of mechanism panel. (See Fig. 44).

3. Lift up the mechanism at the front, allowing it to fold back on the hinge far enough to facilitate the disconnecting of the record head inter-

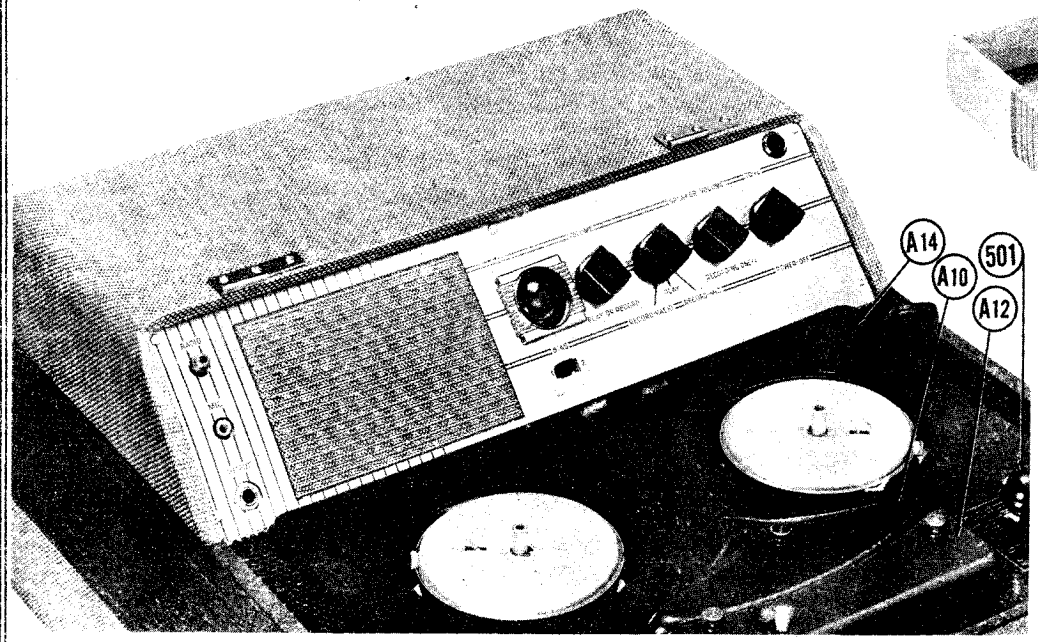
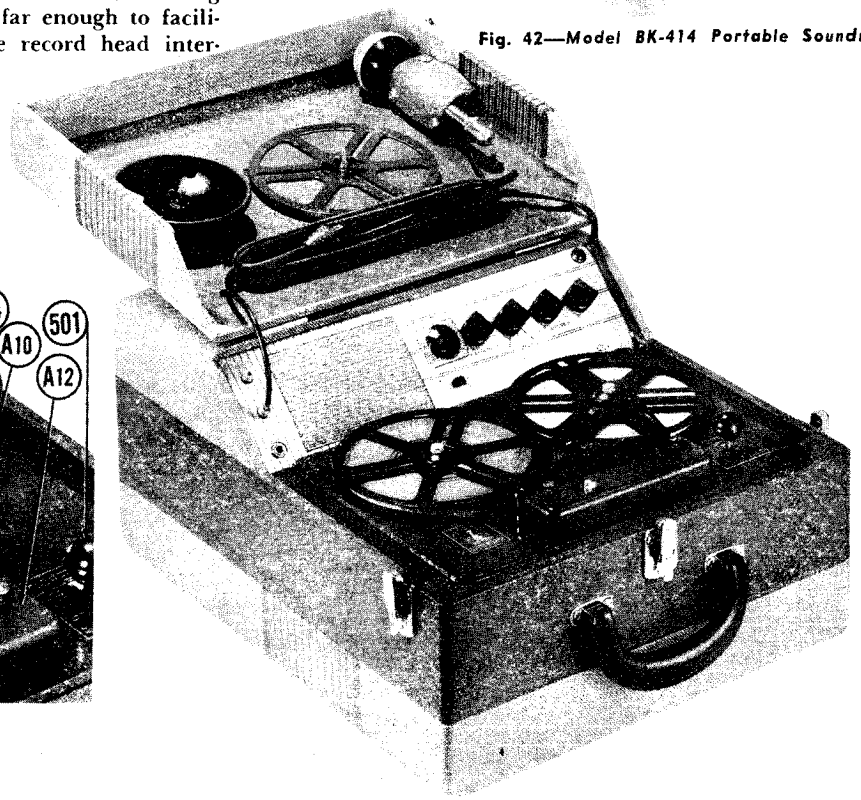


Fig. 43—*Model BK-414 Control Panel View, and Disassembly Step No. 1*



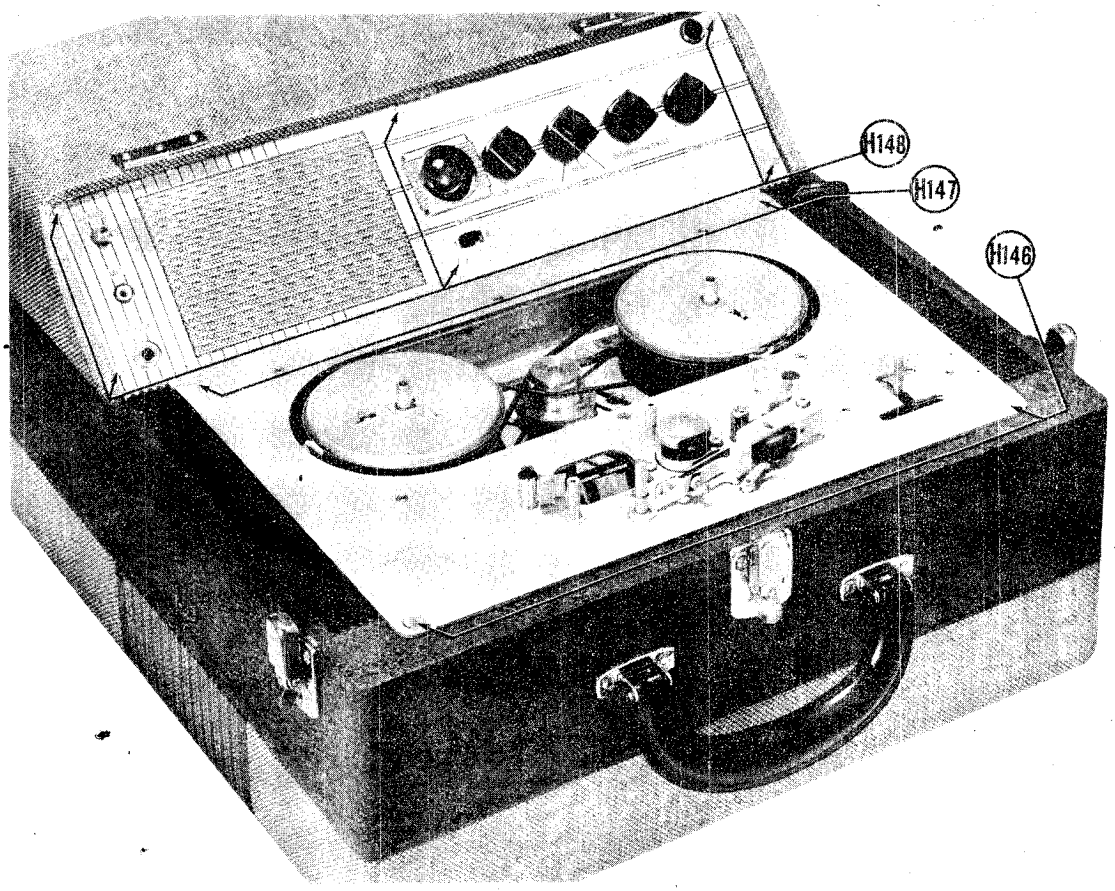


Fig. 44—*Disassembly Step No. 2, 4 and 7*

connecting cable (W-4) and the motor connecting plug (P-4). (See Fig. 45).

4. Remove the two screws (H-147) holding the mechanism to the hinge and lift the mechanism from the case. (See Fig. 44).

5. Remove the five screws (H-150) holding the ventillating grilles (O-103) and (O-104) to the case. (See Fig. 46). Note: The two screws nearest the control panel must be completely removed to facilitate the removal of the amplifier.

6. Remove the four control knobs (601) from the amplifier control panel. (See Fig. 46).

7. Remove the six screws (H-148) holding the amplifier trim panel in position. (See Fig. 44).

8. Carefully remove the trim panel (A-27, Fig. 47). Note: Some trim panels fit very snugly between top of case and edge of hinge at points shown by arrows, in Fig. 47, and may require a slight amount of prying at these points to lift the trim over the edge of the hinge. Be careful in prying not to bend or damage the trim panel.

9. Remove the three screws (H-152) holding the amplifier to the case. (See Fig. 48).

10. Remove the screw (H-154) holding the amplifier base board in the track. (See Fig. 48).

11. Carefully slide the amplifier unit toward the front of the case and lift it out when the amplifier base board clears the top of the case. (See Fig. 49). Note: While sliding the unit forward, hold the left side of the unit to prevent tearing of the leatherette covering of the case at the point indicated by the arrow in Fig. 49.

12. After servicing amplifier reassemble it in the case in the reverse sequence of steps 1 through 11.

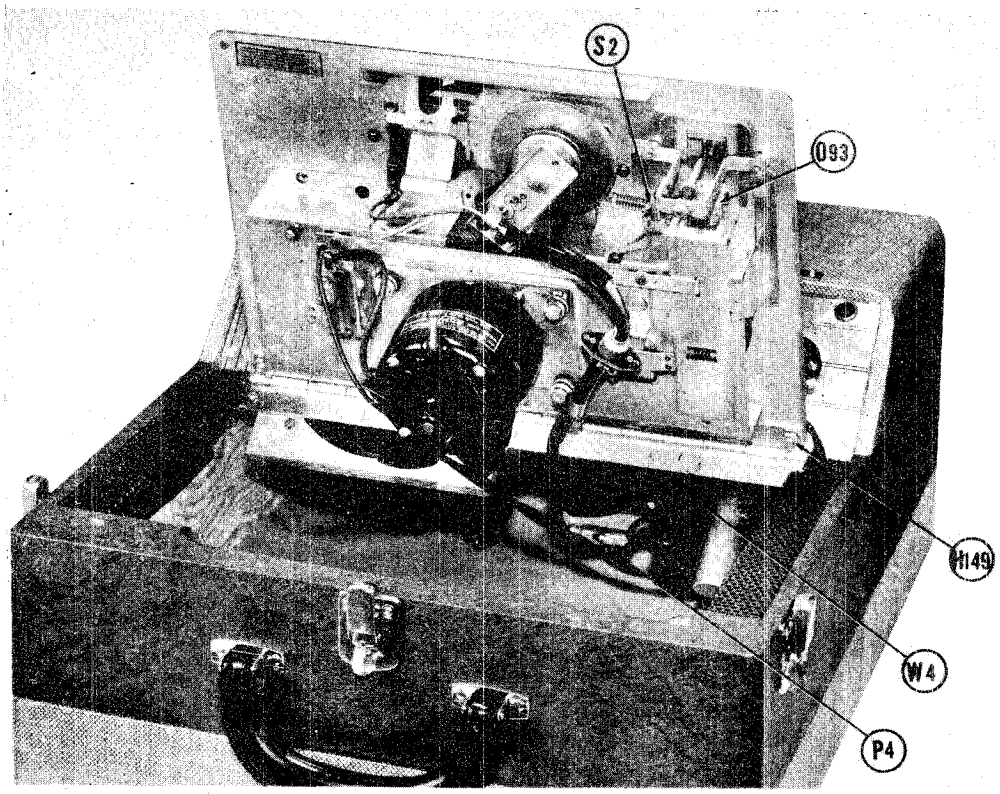


Fig. 45—*Disassembly Step No. 3*

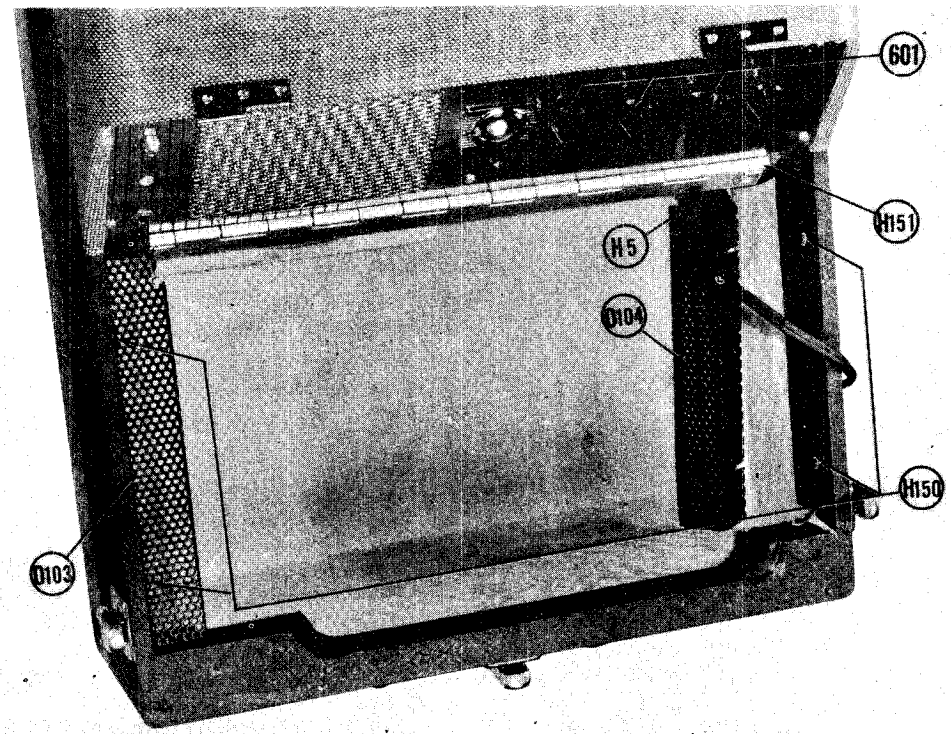


Fig. 46—*Disassembly Step No. 5 and 6*

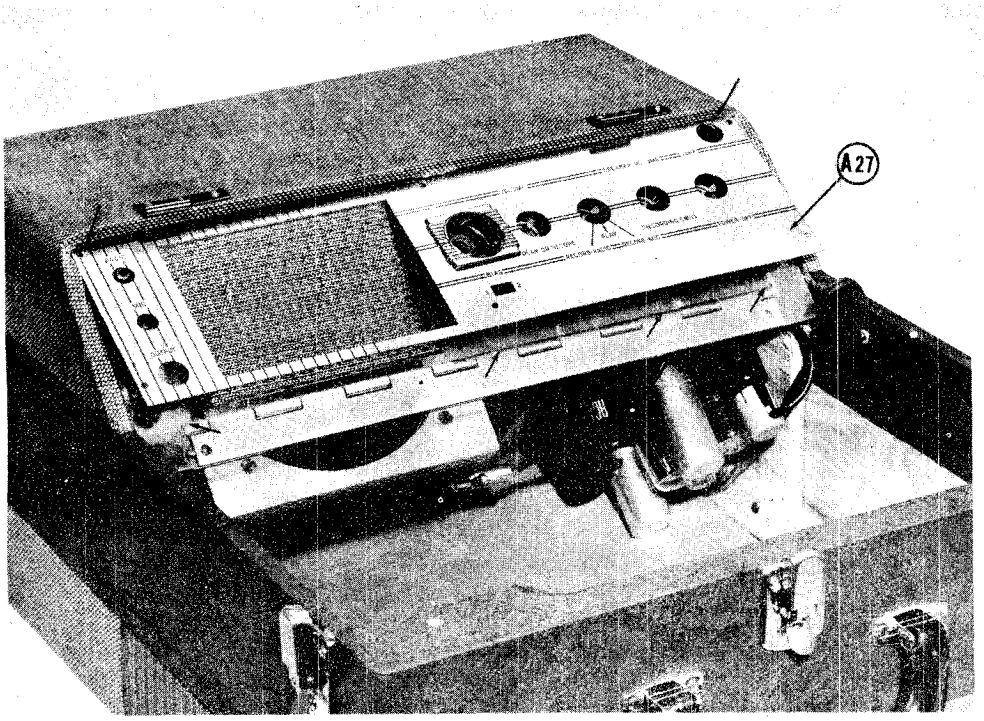


Fig. 47—*Disassembly Step No. 8*

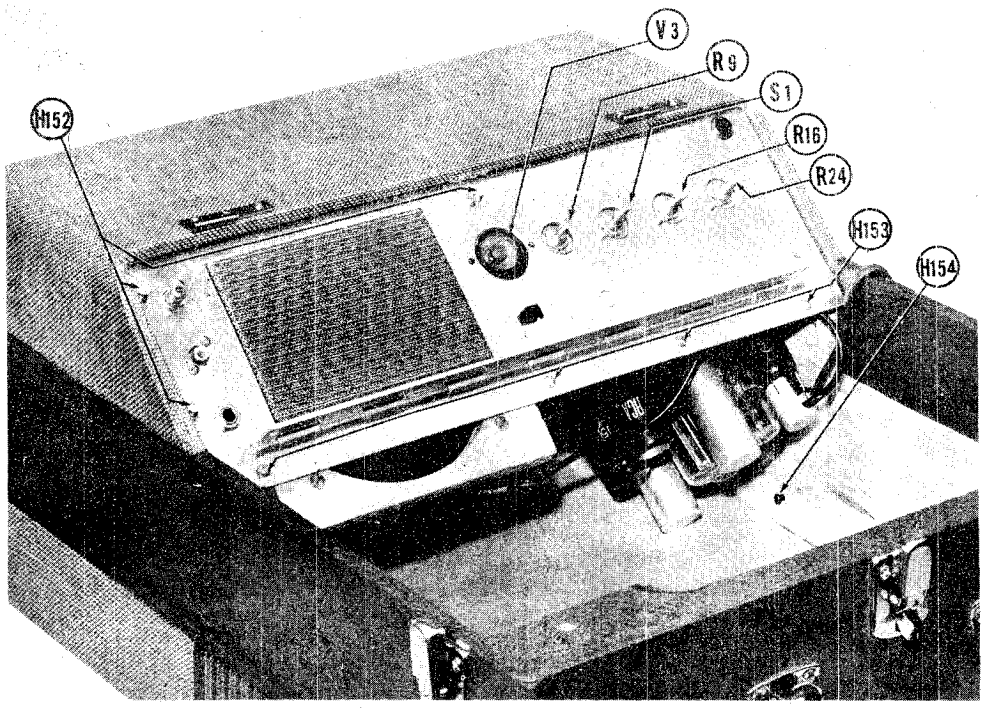


Fig. 48—*Disassembly Step No. 9 and 10*

MODEL BK-414

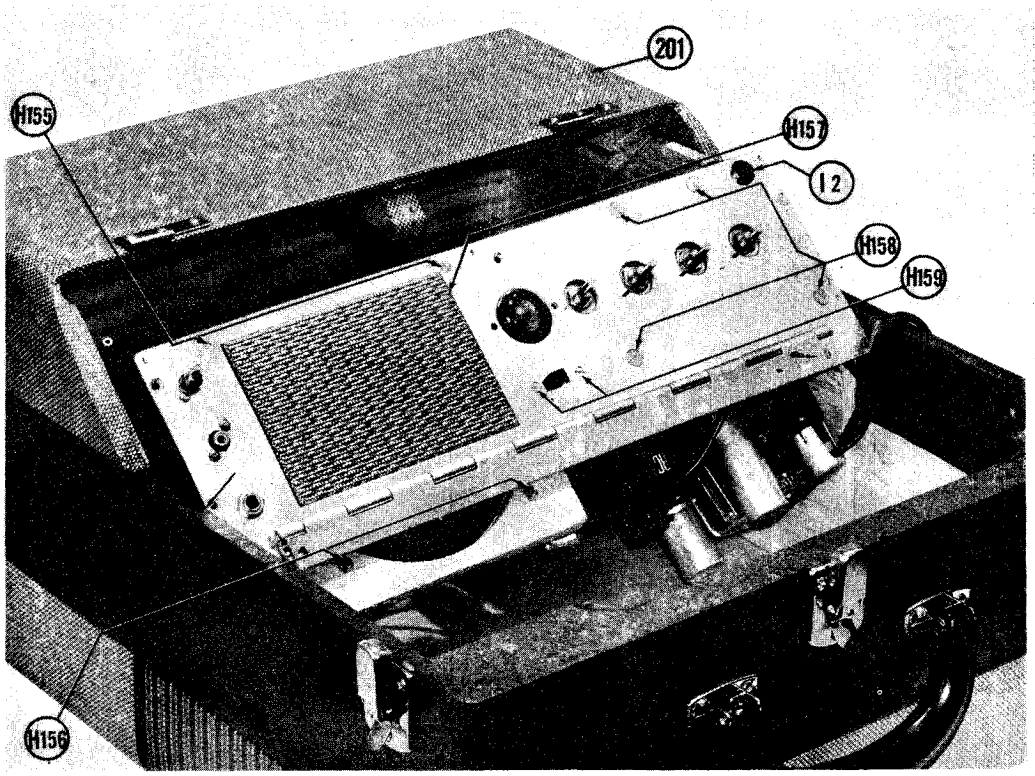


Fig. 49—*Disassembly Step No. 11*

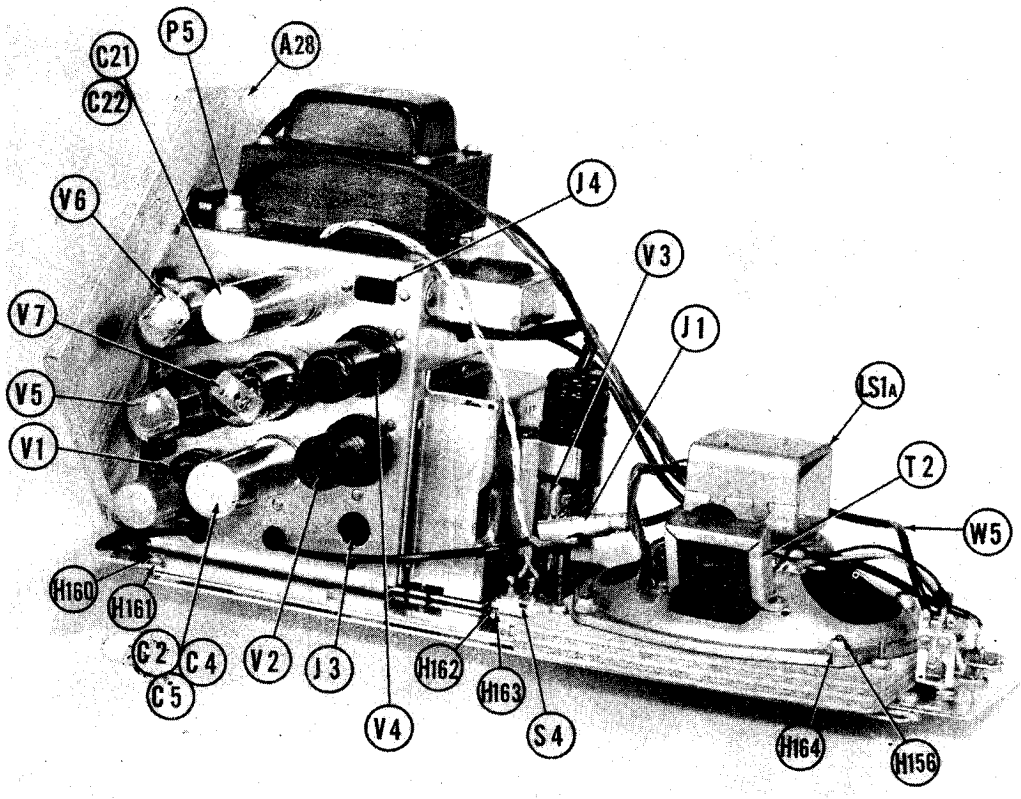


Fig. 50—*Amplifier for Model BK-414—Tube View*

MODEL BK-414

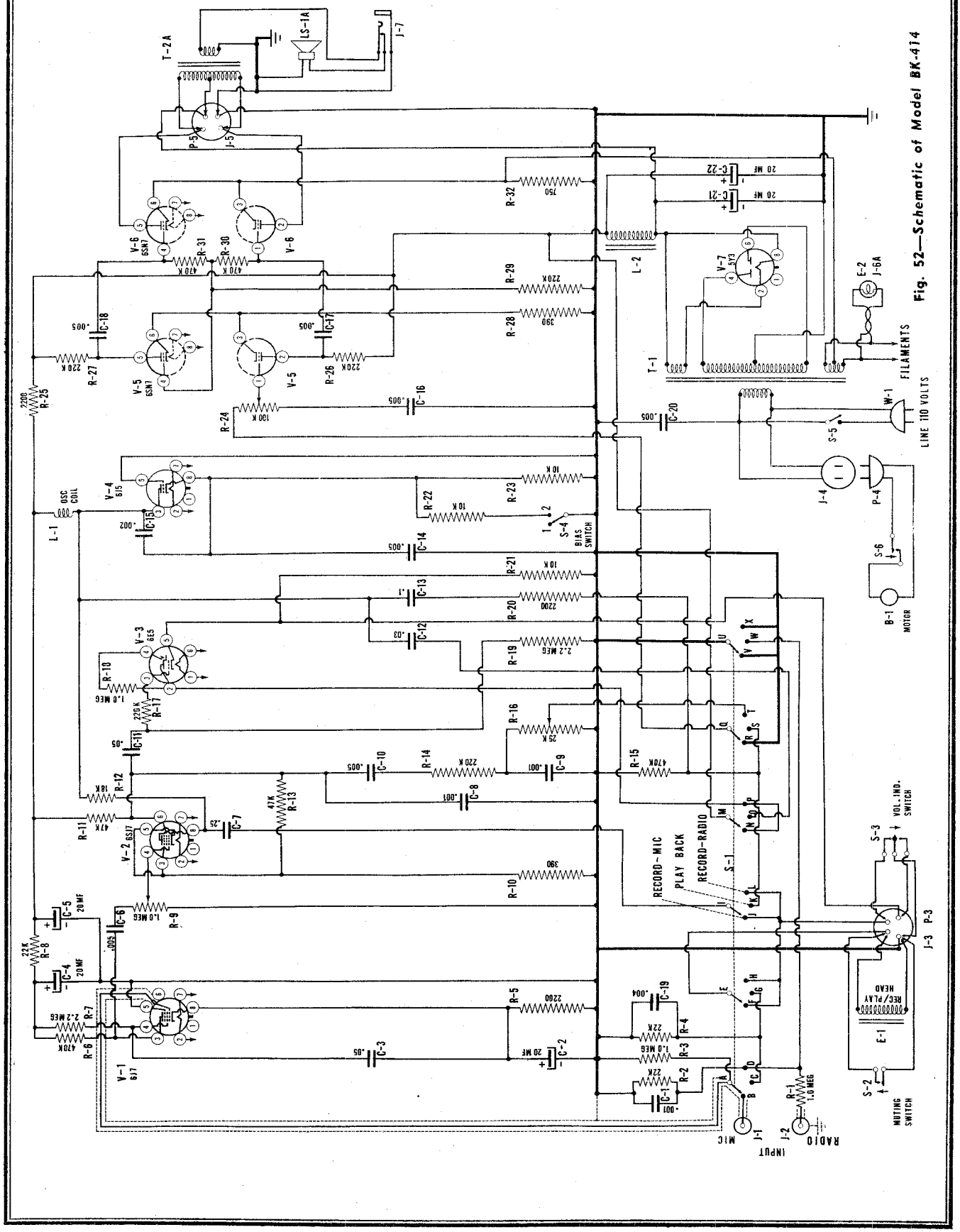


Fig. 52—Schematic of Model BK-414

MODEL BK-414

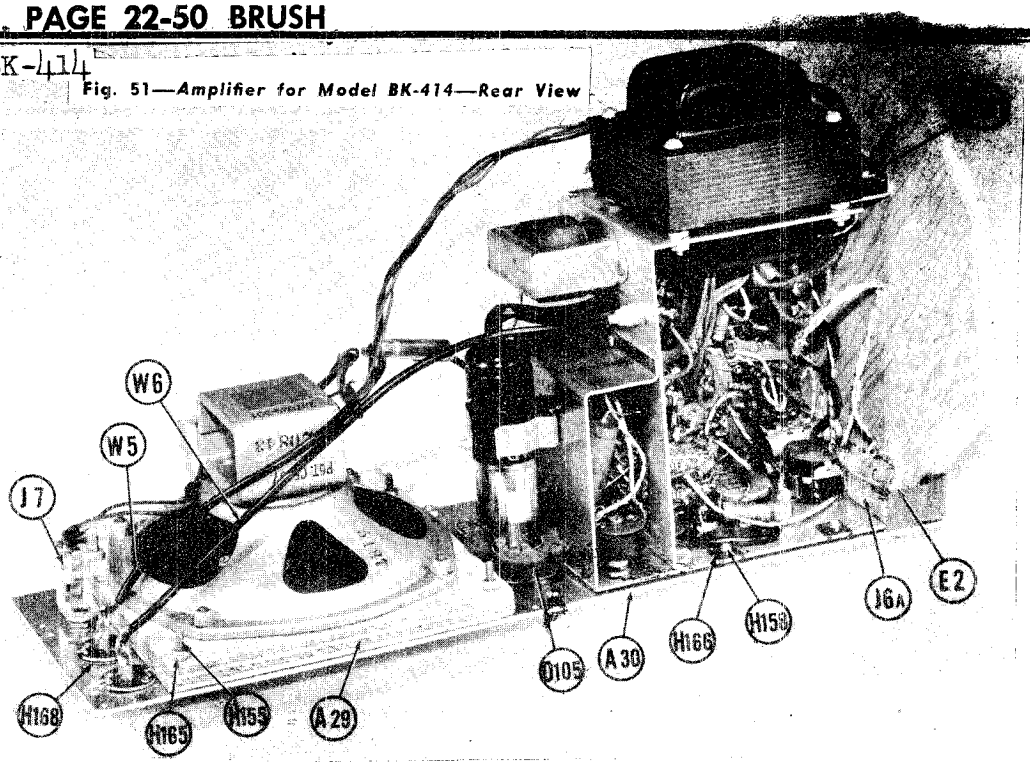


Fig. 51—*Amplifier for Model BK-414—Rear View*

The electronic circuit of the above amplifier is shown in Fig. 52. Location of the various electronic components may be seen in figures 20 through 26 as well as Fig. 50 and 51.

LIST OF MATERIAL

Symbol	BRUSH Part Number	DESCRIPTION
A-1	206790-501	BOARD, Speaker Mounting: including grille cloth and screen; for mounting 8" speaker.
A-2		FOOT, Mounting: 3/8" thick cork 1 1/4" diameter.
A-3	104215-501	BASE, Microphone.
A-10	206517-501	COVER, Trim: for covering the record and erase head to give dress finish to mechanism; includes rubber moulding (A-11) and knurled thumb screw (H-101).
A-11	106827-1	MOULDING, Rubber: for protecting finish of adjacent trim covers A-14; mounts onto trim cover A-10.
A-12	306518-501	COVER, Trim: for covering the pressure wheel mechanism; includes rubber moulding (A-13) and knurled thumb screws (H-101).
A-13	106827-2	MOULDING, Rubber: for protecting finish of adjacent trim cover A-14; mounts onto trim cover A-12.
A-14	306503-501	COVER, Panel Trim: for covering top panel mechanism to give dress finish; includes control instruction plate.
A-15	106365-501	HOUSING, Clutch bearing: supports and houses clutch bearing.
A-16	206444-501	BRACKET, Pressure Wheel: for mounting pressure wheel and associated mechanism.
A-17	106163-501	PLATE, Motor Shock Mount.
A-18	206409-501	BRACKET, Clutch lifter: Rewind position.
A-19	106122	PLATE, Motor Mounting.
A-20	104213-4	MOUNT, Vibration: Rubber; 5/8" lg. x 19/32" diameter.
A-21	106407-501	BRACKET, Clutch Lifter: Take-up position.
A-22	206293	COVER, Switch: covers switch S-6; overall dimension 3 1/2" lg. x 2" wd. x 1 1/4" high; mtg. flange on one side.
A-23	106408-501	BRACKET, Erase Head Mounting. (Deleted)
A-23A	107272-501	BRACKET, erase head: for mounting new type erase head (see figure 36); mounting hole drilled and tapped to accomodate new type erase head.
A-24	206332	BASE, Erase Head Mounting. (Deleted)
A-25	206139	BRACKET, Capstan Drive Mechanism.
A-26	106394-501	BRACKET, Capstan Bottom Bearing.
A-27	307032	PANEL, trim: Etched; for Amplifier Control panel.
A-28	207326	BOARD, Amplifier Mtg.: 3/8" Plywood drilled for five mtg. screws; overal dimension 9 3/16" lg. x 7 13/16" high x 3/8" thick.
A-29	207050	BOARD, speaker mtg.: 1/2" 5 ply plywood; milled with one 5 1/2" diameter hole for speaker; four speaker mtg. holes, and four holes for mtg. board to panel; overall dimension 6 1/4" long x 6 1/4" high x 1/2" thick.

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A-30	407024	PANEL, recorder mtg.: No. 11 gauge aluminum panel with necessary holes for mtg. complete amplifier equipment; overall dimension 15 31/32" long x 5 1/8" wide.
B-1	206322	MOTOR, A.C.: four pole shaded pole induction type; 1/50 hp.; 1400 R.P.M. full load; 115 v. a.c.; 60 cy.; single phase; .93 amps. at full load; includes cooling fan and No. 18-32 set screw.
C-1	3-106093-3	CAPACITOR, fixed: paper; .001 mfd. ± 20%; 600 VDCW.
C-2	103253	CAPACITOR, fixed: electrolytic; section (=) of 3 sections; 20 mfd; 25 VDCW; 3" long x 1" diameter metal can (can includes C-4 and C-5).
C-3	2-106094-2	CAPACITOR, fixed: paper; .05 mfd. ± 15%; 400 VDCW.
C-4	103253	CAPACITOR, fixed: electrolytic; section (□) of 3 sections; 20 mfd.; 450 VDCW; 3" long x 1" diameter metal can (can includes C-2 and C-5).
C-5	103253	CAPACITOR, fixed: electrolytic; section (Δ) of 3 sections; 20 mfd.; 450 VDCW; 3" long x 1" diameter metal can (can includes C-2 and C-4).
C-6	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-7	3-106093-7	CAPACITOR, fixed: paper; .25 mfd. ± 20%; 600 VDCW.
C-8	3-106093-3	CAPACITOR, fixed: paper; .001 mfd. ± 20%; 600 VDCW.
C-9	3-106093-3	CAPACITOR, fixed: paper; .001 mfd. ± 20%; 600 VDCW.
C-10	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-11	2-106094-2	CAPACITOR, fixed: paper; .05 mfd. ± 15%; 400 VDCW.
C-12	4-106093-8	CAPACITOR, fixed: paper; .03 mfd. ± 10%; 600 VDCW.
C-13	2-106094-1	CAPACITOR, fixed: paper; .1 mfd. ± 15%; 400 VDCW.
C-14	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-15	4-106093-6	CAPACITOR, fixed: paper; .002 mfd. ± 10%; 600 VDCW.
C-16	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-17	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-18	3-106093-4	CAPACITOR, fixed: paper; .005 mfd. ± 20%; 600 VDCW.
C-19	3-106094-5	CAPACITOR, fixed: paper; .004 mfd. ± 10%; 400 VDCW.
C-20	106100-6	CAPACITOR, fixed: paper; (Mica Mold); .005 mfd. — 20 + 40%; 600 VDCW.
C-21 and C-22	102711	CAPACITOR, fixed: electrolytic; two sections; 20-20 mfd.; 450 VDCW; 3" long x 1" diameter metal can.
E-1	306784-501	RECORD-REPRODUCE HEAD: Includes cable assembly and connecting plug.
E-2	105710-1	LAMP, incandescent: Pilot lamp, 6-8 volts; .25 amps; Bayonet base; Mazda No. 44.
E-3	106441-501	BOARD, terminal: 3 screw terminals mounted on molded bakelite strip 2 1/2" long x 7/8" wide x 1/8" thick; for external speaker connections.
E-4	104099-3	BOARD, terminal: two lug terminals; one lug support; mounted on 1/16" bakelite.
E-5	206684	SHIELD, oscillator: covers oscillator coil and supports clamp for V-3; overall dimension 3 7/8" long x 3 15/16" wide x 1 3/8" high.
E-6	104099-2	BOARD, terminal: one lug terminal; one lug support mounted on 1/16" thick bakelite; used on speaker assembly.
E-7	106469	MAGNET, erase head.
E-8	L-83	LUG, terminal.
E-9	206931	POLEPIECE, top: for new type erase head (see figure 36).
E-10	106939	MAGNET, erase head: for new type erase head (see figure 36).
E-11	206932	POLEPIECE, bottom, for new type erase head (see figure 36.)
H-1	3219-5	GROMMET, rubber: fits 3/8" hole in 1/16" panel; I.D. 9/32".
H-2	7618-3	GROMMET, rubber: fits 5/16" hole in 1/16" panel; I.D. 3/16".
H-3		SCREW, wood: No. 6 x 3/4"; mounts speaker to baffle board.
H-4		WASHER, plain: 3/8" x 5/32" x 1/32"; steel cad plated.
H-5	103890	CLAMP, power cord: lock type; used on early units only.
H-5	105859-1	CLAMP, power cord: strain relief type; .530" diameter x .545" long.
H-6		SCREW, self tapping: type " Z"; No. 4 x 1/4" binding head; secures oscillator shield to chassis.
H-7		WASHER, internal lock: No. 8.
H-8		NUT, hexagon: No. 8-32.
H-9		SCREW, self tapping: No. 10 x 3/4"; type " Z"; rd. hd.
H-10	103838-4	NUT, speed: "U" type; fits .072—.081 panel thickness; for type No. 10 " Z" screws.
H-11	100511	CLAMP, cable: for routing speaker cable along floor of cabinet.
H-12		SCREW, wood: No. 6 x 1/2"; rd. hd.; for mounting H-11.
H-13 and H-14	obsolete	SCREWS AND WASHERS: obsolete; new type pilot lamp holder clips onto flange of speaker frame above indicator rod. (see J-5 for new lamp holder).
H-15		SCREW, wood: No. 6 x 5/8; Phillips round head.
H-16	104788	CLIP, microphone support.
H-17	106723	ESCUTCHEON: for 6E5 Volume Indicator.
H-18	107185	NUT, reel clamping: knurled cap; 3/4" diameter skirt; 9/16" diameter cap; tapped at top for 8-32 thread; drilled at bottom 3/8" diameter; 5/16" high.
H-19		NUT, hex: No. 8-32, small; 7/32" across flats, 3/32" thick.
H-20		SCREW, set: No. 8-32 x 5/8" long; allen head; cup point.

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Symbol	BRUSH Part Number	DESCRIPTION
H-21		SCREW, machine: No. 5-40 x 11/16" long; round head; brass, cad. plated.
H-22		SCREW, machine: No. 4-40 x 3/4" long; round head; brass.
H-23		WASHER, internal lock: No. 4; bronze.
H-101		SCREW, knurled thumb: No. 6-32 x 1/4" long; brass-antique bronze; secures trim covers A-10 and A-12.
H-102		SCREW: No. 10-24 x 3/8; shakeproof, bd. hd.; motor mounting.
H-103		SCREW, set: No. 8-32 x 1/4; hollow cup; for drive pulley.
H-104		WASHER, external lock: No. 10; for motor mounting.
H-105	106120-1	WASHER, motor mounting.
H-106	106527	WASHER, spacer: for clutch bearing housing (deleted on later units).
H-107		NUT, hex: 3/8-32; secures erase bracket sleeve.
H-108		SCREW, machine: No. 6-32 x 3/8 round head; record head mounting.
H-109		WASHER, internal lock: No. 6 int.; record head mounting.
H-110	106454-1	SPEED NUT, Tinnerman: pressure pad adjustment.
H-111		NUT, hex: No. 4-40; pressure pad adjustment.
H-112		SCREW, machine: No. 4-40 x 1/2; pressure pad adjustment.
H-113		PIN, cotter: 1/16" diameter x 7/16" long; for control lever.
H-114		WASHER, plain: No. 8; for control lever.
H-115	106117	PIN, clutch lifter.
H-116		WASHER, internal lock: 1/2"; bearing housing mounting.
H-117	106157	NUT, hex: bearing housing mounting. 1/2-20 N. C. two thread.
H-118		WASHER, plain: No. 8; clutch bearing thrust.
H-119		SCREW, machine: No. 5-40 x 1/2"; fl. hd.; motor switch (S-6) mounting.
H-120		WASHER, internal lock: No. 6; switch cover mounting.
H-121		SCREW, type " Z": No. 6 x 1/4"; round head; switch cover mounting.
H-122	106170	HINGE, erase head bracket.
H-123	106179	WASHER, spacer: motor vibration.
H-124	106671	WASHER, plain: .172" I.D., x 1/2" O.D. x .049" thick; motor vibration mounting.
H-125		WASHER, internal lock: No. 8; motor vibration mounting.
H-126		NUT, hex: No. 8-32; motor vibration mounting.
H-127		PIN, cotter: 1/16" diameter x 1 1/2" long; erase head bracket mounting.
H-128		WASHER, internal lock: No. 3/8"; capstan bearing mounting.
H-129		NUT, hex: No. 3/8-32: capstan bearing mounting.
H-130	106173	WASHER, flat: spacer, capstan drive.
H-131	106269	CLAMP, cable: record head cable clamp.
H-132		WASHER, spring lock: No. 10; capstan lower bracket mounting.
H-133		SCREW, cap: No. 10-32 x 3/8"; socket head; capstan lower bracket mounting.
H-134		SCREW, machine: No. 4-40 x 1/2"; round head; erase head mounting (deleted see H-22).
H-135		WASHER, internal lock: No. 4; erase head mounting. (deleted see H-23).
H-136	106331	CLAMP, erase magnet (deleted).
H-137	106155	RIVET, solid: mounts clutch raising lever assembly.
H-138	Deleted	CLAMP, cable: secure cables from record head and switch (S-3).
H-139		WASHER, internal lock: No. 8; mounts ribbon guide posts.
H-140		SCREW, machine: No. 8-32 x 3/8"; round head brass; mounts ribbon guide posts.
H-141	206159	LATCH, trip lever.
H-142		WASHER, flat: latch retaining; No. 8 plain.
H-143		SCREW, machine: No. 6-32 x 1/4" long; round Phillips head; mounts capstan drive assembly.
H-144		SCREW, machine: No. 6-32 x 1/4" long. fl. hd.; mounts capstan drive assembly.
H-145		SCREW, machine: No. 5-40 x 1/2" long; fl. hd.; mounts item S-3.
H-146		SCREW, self tapping: P.K. type "A"; No. 10 x 1" fl. hd. for mounting mechanism panel to case.
H-147		SCREW, machine: No. 10-32 x 3/8" fl. hd.; for mounting mechanism panel to hinge.
H-148		SCREW, self tapping: P.K. type " Z"; No. 4 x 3/16" bd. hd.; for mounting trim panel to amplifier control panel.
H-149		NUT, hex: No. 10-32; for mounting mechanism panel to hinge.
H-150		SCREW, wood: No. 4 x 3/8" round head; for mounting ventilator grilles to case.
H-151	207051	HINGE, panel: for mounting recorder mechanism to amplifier panel.
H-152		SCREW, wood: No. 6 x 1/2" flat head; for mounting amplifier panel to case.

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Symbol	BRUSH Part Number	DESCRIPTION
H-153		SCREW, machine: No. 6-32 x ¼" round head; for mounting hinge to amplifier panel.
H-154		SCREW, wood: No. 8 x 1" round head; for locking amplifier mounting board in track of case.
H-155		SCREW, machine: No. 6-32 x ⅞" flat head; for mounting speaker mounting board to amplifier control panel.
H-156		SCREW, machine: No. 8-32 x 1" flat head; for mounting speaker to speaker mounting board.
H-157	207053	GRILLE, speaker.
H-158		SCREW, self tapping: P.K. type " Z", No. 10 x ⅜" flat head; for mounting amplifier chassis to amplifier control panel.
H-159		SCREW, machine: No. 4-40 x ¼" flat head; for mounting bias switch (S-4) to control panel (model BK-414 only).
H-160		NUT, hex: No. 6-32; for mounting hinge to amplifier control panel.
H-161		WASHER, internal lock: No. 6; for mounting hinge to amplifier control panel.
H-162		NUT, hex: No. 4-40; for mounting bias switch (S-4) to amplifier control panel.
H-163		WASHER, internal lock: No. 4; for mounting bias switch (S-4) to amplifier control panel.
H-164	104870-7	NUT, elastic stop: No. 8-32; cad. plated; for mounting speaker to speaker mounting board.
H-165	104870-6	NUT, elastic stop: No. 6-32; cad. plated; for mounting speaker mounting board to amplifier control panel.
H-166	103838-4	SPEEDNUT: for mounting amplifier chassis to control panel. Same as H-10.
H-167		SCREW, self tapping: P.K. type " Z"; No. 10 x ¾" flat head; for mounting amplifier chassis to amplifier mounting board.
H-168	106739	WASHER, insulating: for microphone input jack located on control panel.
I-1	106705	ROD, pilot indicator: translucent; lucite; amber; 3" long x ¼" diameter; one end rounded other end beveled 45°.
I-2	1-105708-1.	LENS, indicator light: pilot light jewel.
J-1	106763	CONNECTOR, female contact: microphone input jack; single contact; extension type.
J-2	104546	CONNECTOR, female contact: radio input jack; single contact phonoplug type.
J-3	106730	CONNECTOR, female contact: record-play head connector; four round contacts; wafer socket type.
J-4	104765	CONNECTOR, female contact: power receptacle for motor circuit; two (2) rectangular contacts; molded bakelite; 10 amps at 250 v. or 15 amps at 125 v.
J-5	106730	CONNECTOR, female contact: output transformer circuit; four round contacts; wafer socket type.
J-6	106786	LAMPHOLDER, pilot light: bayonet base type; for 6-8 volt pilot lamp; clip on type mounting; solder lug connections.
J-6-A	105707	HOLDER, indicator lamp: pilot lamp bracket (model BK-414 only).
J-7	21421	JACK, output: for tip and sleeve type plug; see wiring diagram figure 52.
L-1	103865	COIL, oscillator: 30 mh. ± 5 mh. at 1000 cps.; "Q" not less than 1 at 1000 cps.; for 30 K.C. bias oscillator circuit.
L-2	200925	REACTOR, filter: choke; 10 hy.; 62 ma.; 300 ohms D.C. resistance; open metal frame; 2⅞" long x 1½" wide x 1⅝" high; 2 mounting holes 2⅜" center to center.
LS-1	305975	SPEAKER, magnetic: 3.2 ohms voice coil; permanent magnet type; overall dimension 8 3/32" diameter x 3 53/64" deep. R.M.A. Std. Mtg.
LS-1-A	207496	SPEAKER: 3-4 ohm voice coil Jensen Model P6-T, spec. no. S3914.
MI-1	206789-501	MICROPHONE, crystal: Brush Development Company Model BA-106-B.
MS-1	11293-2	PAD, felt: for erase head bracket.
MS-2	106129	PAD, felt: for ribbon pressure at record-play head.
O-1	104655	SHIELD, grid cap: for V-1 (6J7) grid; 27/32" diameter x 1" long cad. plated.

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Symbol	BRUSH Part Number	DESCRIPTION
O-2	100699-4	CLIP: for mounting V-3 (6E5 tube) volume indicator; 1 1/4" long x 1 1/4" high x 9/16" wide (overall dimensions).
O-3	106930	SPACER, polepiece: brass; for new type erase head (see figure 36).
O-50	BK-921	REEL, Ribbon: empty; 7" diameter x 3/8" thick.
O-51	106516	RETAINER, thumb screw: flat washer; 3/8" diameter x .015 thickness; hole .120" diameter.
O-52	104307-5	RING, retaining: "Truarc"; I.D. .281"; cat. No. 5100-31.
O-53	206147	CUP, reel drive: reel support; 3.925" diameter x 15/64" deep.
O-54	106423-501	TRIGGER, rewind: actuates automatic rewind trip lever; located in rewind reel cup sub-assembly.
O-55	106152	TRIGGER, take-up: actuates automatic stop trip lever; located in take-up reel cup sub-assembly.
O-56	206148	CUP, clutch: faces on clutch; 3.937" I.D. x 1/8" deep.
O-57	106351-501	POST, reel: sub-assembly; supports reel cups.
O-58	106146	FELT, clutch: clutch facing.
O-59	106366-501	PULLEY, clutch: sub-assembly; 3 25/32" diameter x 15/64" thick; pulley "V" angle 60°
O-60	106212	BEARING, clutch thrust: oilite; .750" O.D., .315" I.D. x .031" thick.
O-61	106213	RETAINER, oil: felt; 5/8" O.D., 5/16" I.D., 3/32" to 1/8" thick.
O-62	106472	PULLEY, belt drive: overall dimension—1.656" diameter x 1 3/32" high; 3 belt grooves, 1 large diameter and 2 small diameter; mounts on drive motor shaft .3130—.3135 diameter.
O-63	105711-3	BEARING, reel post: standard oilite No. A-375-3; press fitted to item A-15; reamed to .188" I.D.
O-64	104307-1	RING, retaining: "Truarc" No. 5100-25; I.D. .225".
O-65	106262	POST, ribbon guide: 5/8" long x .370" diameter; one end tapped for No. 8-32 machine screw.
O-66	206320	GUIDE, ribbon: left hand; overall dimension 29/32" long x 23/32" wide x 25/32" high.
O-67	206321	GUIDE, ribbon: right hand; overall dimension 29/32" long x 23/32" wide x 25/32" high.
O-68	106119	SPRING, shift rod: control lever; free length 2 1/32" long; I.D. 7/32"; consists of 9 1/2 coils of No. 18 B. & S. GA. spring bronze.
O-69	104307-6	RING, retaining: "Truarc" No. 5100-18; .170/.164 I.D.
O-70	7553	BALL, steel: 3/16" diameter; ball actuator for switch S-6.
O-71	106270-501	ROD, control lever: shift rod; 3 17/32" long x 3/16" diameter.
O-72	106401	INSULATOR, switch cover: made from .032" thick Wilmington fyberoid armature slot paper cut 5 11/16" long x 1 15/16" wide; folded 1 1/8" from each end.
O-73	206460-501	CAPSTAN, drive: sub-assembly, complete; includes spindle, spindle bearing, flywheel, pulley, lower bearing, and mounting bracket.
O-74	106143	SLEEVE, erase pin: mounts erase bracket hinge (H-122) and supports erase pin (O-75); overall dimension 1/2" square x 3/8" high; one end threaded 3/8-32; sleeve I.D. 1/4",
O-75	106142	PIN, erase: actuates erase head bracket to engage head; 1 17/32" long x .240" diameter; stop flange at one end 1/32" thick; .028" wide retainer slot milled 3/4" from flange end.
O-76	106340	BELT, rubber: clutch drive; circular shape 8 5/8" diameter x 1/8" cross sectional diameter.
O-77	106339	BELT, rubber: motor drive; circular shape 3 5/8" diameter x 1/8" cross sectional diameter.
O-78	106364-501	BEARING, capstan spindle: sub-assembly; overall dimension 1" long x .374" diameter with flange .748" diameter x .032" thick near threaded end; thread size 3/8-32.
O-79	106137	DISC, flywheel: for capstan drive assembly; uses 3 each; overall dimension 3" diameter x .060" thick; indexing notch 1/8" x 1/32" along outer circumference.

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Symbol	BRUSH Part Number	DESCRIPTION
O-80 O-81 O-82	Sold only as one sub-assembly unit part No. 106338-501	CAPSTAN, drive: sub-assembly; includes items O-80, O-81, and O-82 press fitted and riveted together; individual parts not readily replaceable.
O-83	106127	SHAFT, pressure wheel: overall dimension 11/16" long x .1239" diameter.
O-84	106125	WHEEL, pressure: rubber tire mounted on metal rim with oilite bearing; overall dimension 1" diameter x 5/16" wide; bearing 7/16" long x .314" diameter, 1/8" center hole.
O-85	106128	SPRING, pressure wheel: Special; made from No. 16 G.A. (.037) music wire; overall dimension 2 1/8" long x 7/16" wide x 11/32" high.
O-86	206410	LEVER ASSEMBLY, raising; two (2) levers part No. 106113 riveted to a lever raising link part No. 106118; functions to engage or disengage the turntable clutches,
O-87	106616	SPRING, compression: clutch lever; free length 27/32"; consists of 9 1/2 coils .312" max. O.D.; 3 lb. force at 5/8" compressed length, ± 5%.
O-88	106405	SPRING, extension: for head locking slide sub-assembly; free length 11/16" center of end loop to center of other end loop; consists of 24 coils .255 O.D.; 4 lb. force at expanded length of 1 5/16".
O-89	106153	LEVER, rewind trip: for tripping automatic rewind controls; overall dimension 7/16" x 9/16" x 1 1/2".
O-90	106154	LEVER, take-up trip: for tripping automatic stop controls; overall dimension 2 3/16" x 27/32" x 9/16".
O-91	206112	SLIDE, latch cam: functions to reset take-up trip lever; overall dimension 6 1/8" long x 2 39/64" wide x 5/8" high.
O-92	206502	LEVER, clutch: actuates clutch raising lever assembly; overall dimension 7 11/16" long x 1 3/8" wide x 17/32" high.
O-93	206169	GATE, latching: functions to latch the clutch lever and the head locking slide; overall dimension 2 43/64" long x 1 3/8" wide x 13/16" high.
O-94	206391-501	SLIDE, head locking: functions to lock the erase head in its engaged position; overall dimension 8 15/16" long x 3 1/16" wide by 13/16" high.
O-95	106615	SPRING, extension: for trip bar extension return; free length 1 3/16" including end loops; consists of 22 1/2 coils, close wound, .255 O.D.; 4 lb. force at extended length of 1 15/16"; made from .032" diameter stainless steel type 302.
O-96	106406	SPRING, extension: for latch cam return; free length 1" including end loops; consists of 20 coils, close wound, .281 max. O.D.; 1 lb-14 oz. force at extended length of 1 23/32"; made from .026" diameter music wire.
O-97	106404	SPRING, extension: for latching gate; free length 3/4" including end loops; consists of 22 coils close wound, from .017" diameter music wire; coils 3/16" O.D.; 12 oz. force at extended length of 1 9/32".
O-98	Same as O-97	SPRING, extension: for rewind trip lever.
O-99	206392-501	BAR, trip lever sub-assembly; attached to trip lever bar link; part of control mechanism.
O-100	103142	CLIP, latch cam retainer: General Industries Co. part No. 21914; 7/16" long; made from No. 11 Ga. steel music wire.
O-101	106160	CAM, latch: part of control mechanism; overall dimension 1 5/32" long x 21/32" wide x 3/8" high.
O-102	106617	SPRING, extension: for trip lever latch; free length 27/32" including end loops; consists of 14 1/2 coils close wound from .028" diameter stainless steel type 302; coils .205" O.D.; 2 3/8 lbs. force at extended length of 1 1/8".
O-103	207126	GRILLE, ventilator: for left side of case (Model BK-414 only).
O-104	207060	GRILLE, ventilator: for right side of case (Model BK-414 only).
O-105	107220	BUSHING, tube: rubber bushing for protecting volume indicator tube.
P-1	106738-3	CONNECTOR, male contact: microphone input plug; single pin contact .125" diameter; phono-plug type with opening in shield for .175" diameter core.
P-2	106738-3	CONNECTOR, male contact: radio input plug; same as P-1.

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Symbol	BRUSH Part Number	DESCRIPTION
P-3	106765	CONNECTOR, male contact: record/play head connection; four pin-type contacts mounted and indexed on wafer insulator. Does not include shell (part number 106764).
P-4	1-107306-1	CONNECTOR, male contact: power connection of A.C. motor; 2 prong contacts; .138" x .230" opening for wire.
P-5	106765	CONNECTOR, male contact: output transformer circuit; four pin-type contacts mounted and indexed on wafer insulator. Does not include shell (part number 106764).
R-1	3-106771-3	RESISTOR, fixed: 1 megohm ± 20%; ½ watt; radio input circuit.
R-2	3-106771-7	RESISTOR, fixed: 22,000 ohms ± 20%; ½ watt; radio input circuit.
R-3	3-106771-3	RESISTOR, fixed: 1 megohm ± 20%; ½ watt; V-1 grid return.
R-4	3-106771-7	RESISTOR, fixed: 22,000 ohms ± 20%; ½ watt; reproduce-head shunt (play-back only).
R-5	3-106771-2	RESISTOR, fixed: 2200 ohms ± 20%; ½ watt; V-1 cathode.
R-6	103806-12	RESISTOR, fixed: 470,000 ohms ± 10%; ½ watt; V-1 plate load.
R-7	3-106771-8	RESISTOR, fixed: 2.2 megohms ± 20%; ½ watt; V-1 screen.
R-8	3-106771-7	RESISTOR, fixed: 22,000 ohms ± 20%; ½ watt; decoupling and B ± filter for V-1,
R-9	103469	RESISTOR, variable: 1 megohm; potentiometer; "Play" or "Record" volume control.
R-10	3-106771-5	RESISTOR, fixed: 390 ohms ± 20%; ½ watt; V-2 cathode.
R-11	2-106772-3	RESISTOR, fixed: 47,000 ohms ± 10%; 1 watt; V-2 screen.
R-12	2-106772-2	RESISTOR, fixed: 18,000 ohms ± 10%; 1 watt; V-2 plate load.
R-13	2-106772-3	RESISTOR, fixed: 47,000 ohms ± 10%; 1 watt; V-2 screen to cathode.
R-14	3-106771-1	RESISTOR, fixed: 220,000 ohms ± 20%; ½ watt; monitor volume limiting.
R-15	103806-12	RESISTOR, fixed: 470,000 ohms ± 10%; ½ watt; V-5 grid return (play-back only).
R-16	103469-2	RESISTOR, variable: 25,000 ohms; potentiometer; monitor volume control (record-radio only).
R-17	3-106771-1	RESISTOR, fixed: 220,000 ohms ± 20%; ½ watt; V-3 grid.
R-18	3-106771-3	RESISTOR, fixed: 1 megohm ± 20%; ½ watt; B ± supply to 6E5 target.
R-19	3-106771-8	RESISTOR, fixed: 2.2 megohm ± 20%; ½ watt; V-3 grid return.
R-20	3-106771-2	RESISTOR, fixed: 2200 ohms ± 20%; ½ watt; frequency compensating network.
R-21	1-106771-9	RESISTOR, fixed: 10,000 ohms ± 5%; ½ watt; closes shadow of 6E5 until erase-pin is pressed (not shown on photographs).
R-22	1-106771-9	RESISTOR, fixed: 10,000 ohms ± 5%; ½ watt; increases 30 KC bias current from V-4.
R-23	1-106771-9	RESISTOR, fixed: 10,000 ohms ± 5%; ½ watt; V-4 cathode.
R-24	106762-1	RESISTOR, variable 100,000 ohms; potentiometer; tone control (play-back and monitor only); includes power switch S-5.
R-25	3-106772-4	RESISTOR, fixed: 2200 ohms ± 20%; 1 watt; B + voltage dropping.
R-26	3-106771-1	RESISTOR, fixed: 220,000 ohms ± 20%; ½ watt; phase inverter (V-5) plate load (1st section).
R-27	3-106771-1	RESISTOR, fixed: 220,000 ohms ± 20%; ½ watt; phase inverter (V-5) plate load (2nd section).
R-28	3-106771-5	RESISTOR, fixed: 390 ohms ± 20%; ½ watt; phase inverter (V-5) cathode.
R-29	3-106771-1	RESISTOR, fixed: 220,000 ohms ± 20%; ½ watt; phase inverter (V-5) voltage divider.
R-30	103806-12	RESISTOR, fixed: 470,000 ohms ± 10%; ½ watt; pushpull output (V-6) grid (1st section).
R-31	103806-12	RESISTOR, fixed: 470,000 ohms ± 10%; ½ watt; pushpull output (V-6) grid (2nd section).
R-32	103713-40	RESISTOR, fixed: 750 ohms ± 5%; ½ watt; V-6 cathode.
S-1	106746-3	SWITCH, rotary: record-play selector; 2 sections, 3 poles each section, 3 positions.

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LIST OF MATERIAL

Symbol	BRUSH Part Number	DESCRIPTION
S-2	106909-501	SWITCH, lever: reproduce head muting switch; S.P.S.T. actuated by control lever mechanism.
S-3	106916-501	SWITCH, lever: renders volume indicator inoperative until erase head is engaged; S.P.D.T.
S-4	106801-1	SWITCH, slide: bias level; S.P.S.T.
S-5	See R-24	SWITCH, power: part of tone control R-24.
S-6	106317-501	SWITCH, lever: operates A.C. motor when actuated by control levers.
T-1	204902	TRANSFORMER, power: filament and plate type; input 117 v., 60 cycles, single phase; three secondary windings as follows—(1) high voltage 300 v. E.S.C. at 80 ma., leads red, red and yellow, and red, (2) rectifier filament 5 volts at 2 amps., leads yellow and yellow, (3) filament 6.3 volts at 4.8 amps., leads green, green and yellow, and green; overall dimensions 3¾" long x 3⅛" wide x 3½" high.
T-2	200923	TRANSFORMER, A.F. output: plate coupling type; primary impedance—22,000 ohms; 10 ma. E.S.C.; secondary—3.2 ohms; overall dimensions 2⅜" long x 1 5/16" high x 1½" wide.
T-2-A	107497	TRANSFORMER, A.F. output: plate coupling type; primary impedance 22,000 ohms; 10 ma. E.S.C.; secondary—3 to 4 ohms; overall dimensions 1¾" lg. x 1½" wd. x 1⅜" high.
U-1	406800-501	AMPLIFIER, A.F.: record/reproducer amplifier chassis, wired, complete with tubes.
V-1	7075	TUBE, electron: R.M.A. No. 6J7; input amplifier.
V-2	13678	TUBE, electron: R.M.A. No. 6SJ7; second stage; current converter.
V-3	105206	TUBE, electron: R.M.A. No. 6E5; record volume indicator.
V-4	9834	TUBE, electron: R.M.A. No. 6J5; 30 K.C. bias oscillator.
V-5	103185	TUBE, electron: R.M.A. No. 6SN7 GT.; twin-triode; phase invert
V-6	103185	TUBE, electron: R.M.A. No. 6SN7 GT.; twin-triode; pushpull power output.
V-7	102705	TUBE, electron: R.M.A. No. 5Y3-GT; rectifier, full wave; D.C. power supply.
W-1	206923	CABLE ASSEMBLY, power: P.O.S.J. 32, two conductor No. 18; stranded; rubber insulated; includes plug.
W-2	206741-501	CABLE ASSEMBLY, volume indicator: includes socket and socket shield for 6E5 tube; 5 color coded wires as follows: one (1) white-yellow tracer, one (1) white-red tracer, one (1) white-black tracer, one (1) white-blue tracer, one (1) white-green tracer; 1 megohm resistor; spaghetti tubing for covering all wires.
W-3	106515	STRAP, ground: No. 30 (.010) B & S GA. Phos. Bronze; overall length 2¾"; 11/64 diameter punch hole each end.
W-4	207203-501	CABLE, head extension: for connecting the record head and switch S-3 (located on mechanism panel) to amplifier (Model BK-414 only).
W-5	207059-501	CABLE, input extension: for microphone input jack on control panel to amplifier; includes input jack, shielded cable, and plug.
W-6	207059-501	CABLE, input extension: for radio input jack on control panel to amplifier; includes input jack, shielded cable, and plug.
X-1	106740	SOCKET, tube: 8 prong wafer type; mounting holes spaced 1½" center to center.
101	506690-501	CABINET; for housing complete recorder-reproducer mechanism and amplifier equipment for Brush Model BK-411 Soundmirror.
201	507055-501	CASE, carrying: for mounting amplifier and recorder mechanism; includes lid (Model BK-414).
501	106296	KNOB, control shift: for shifting positions of control mechanism; overall dimension 1" diameter; tapped for No. 10-32 thread; Kurz-Kasch, Inc. part No. S-801-10D.
601	2-103468-2	KNOB, control: for amplifier controls; walnut finish; push-on type w/spring; for ¼" shaft flattened to .156"; depth of shaft hole 17/32"; overall dimension 1" diameter x ⅝" high; Kurz-Kasch Inc. part No. S-453-29.

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Since the initial preparation of the BK-411 and BK-414 Service Manual, a considerable amount of service information has become available through field experience. This supplement is therefore issued to bring this information to the serviceman's attention and should be read thoroughly in conjunction with the manual. In addition to the items noted below, a revised symptom-cause-remedy chart is appended which has been based on this experience.

OUTPUT PLUG AND SHORT CIRCUITING

In early production of the BK-411 and BK-414, the output plug was mounted so that the shell of the plug could come in contact with the chassis and it was possible for a short circuit to occur from B+ to ground through the metal shell of this plug. This failure would cause a loud hum and might burn out either the rectifier or the output transformer. As soon as this condition was noted, an immediate change was made in production and all "Soundmirrors" in stock were protected by the addition of an insulating washer over the prongs of the output plug, making it impossible for the plug shell to ground to the chassis. All recorders should be checked to see that either the output plug socket has been remounted so that the plug shell cannot short or the insulating washer is present.

REDUCTION OF HUM

Excessive hum in these recorders is most commonly due to improper placement of the grid lead of the first 6J7 tube. This lead should be carefully oriented for minimum hum.

FAILURE OF MOTOR SWITCH

In early production of the BK-411 and BK-414, some difficulty has been encountered in the field with the motor switch's failing to operate, usually due to the actuator ball's having jumped out of the switch. If the ball is replaced and the recorder tripped into automatic rewind, it can be seen that the blade on which this ball rides almost escapes from under the ball. This switch should be carefully adjusted so that the ball remains positioned over the edge of the blade and the ball cannot escape. After this has been done, the switch should be checked to see that when the control lever is in the neutral position, the ball is actually in the center of the dimple made to receive it. In later production of the "Soundmirror", a protuberance was staked out on the side of the actuator lever so that the ball is not permitted to escape. In most recent construction, the pivot tongue on Part #092, Figure 11, Page 8, has been lengthened so that this pivot point can be adjusted by bending the tongue to prevent difficulty in adjustment of the motor switch.

If the recorder has the new type of clutch operating lever so that the pivot tongue can be adjusted, the following procedure should be used:

1. Loosen the clutch adjusting set screws (H-20) five or six turns each.

2. Raise the mechanism panel.

3. Move the control lever to the "Stop" position and release it. This assures that the mechanism is in the "Stop" condition.

4. Remove the two screws (H-121) holding the switch cover (A-22) over the automatic motor switch and remove the cover with its fiber inner lining.

5. Loosen but do not remove the two screws holding the clutch lifter bracket

assembly (A-18, Fig. 15) in place so the assembly can be moved freely. If the spring is distorted, straighten it or replace the assembly.

6. At this time check the positioning of the clutch operating lever (O-92, Fig. 14). In its neutral position, the axis of the round rod of the control lever (O-71, Fig. 5) should lie on the center line of the clutch operating lever. This means that the angular excursion of the clutch operating lever should be the same from neutral to the "Fast Forward" limit stop as it is from neutral to the "Fast Reverse" limit stop. In no case should the excursion from neutral to the "Fast Reverse" limit stop exceed the excursion from neutral to the "Fast Forward" limit stop. If the neutral position must be shifted slightly, it may be done by bending sideways the narrow section of the clutch operating lever (O-92, Fig. 11) that serves as a pivot, since the neutral position is determined by this pivot and the spring (O-87, Fig. 11).

7. The clutch lifter bracket assembly should now be so located that with the clutch operating lever centered, and the backlash of the connecting linkages taken up by moving the dimpled end of the clutch raising lever toward the motor, the ball actuator (O-70, Fig. 15) just drops into the dimple of the clutch raising lever. Tighten the two screws (H-169) securely.

8. Check to make sure that in the "Fast Forward" and "Play-Record" positions of the mechanism the raising lever does not jam and distort the bronze spring near the end where it is riveted.

9. Check to make sure that in the extreme excursion of "Rewind" and "Fast Reverse" positions the ball actuator (O-70, Fig. 15) cannot drop out.

10. Check to make sure that in both the "Fast Forward" and the "Fast Reverse" positions, the motor switch contacts close firmly, and that they are open in the "Stop" position.

11. If the spring of the clutch lifter bracket associated with the take-up reel is distorted, it should be repaired or the assembly replaced as is indicated above.

12. When replacing this assembly, adjust its position so that the dimple of the lifter lever causes maximum displacement of the bronze spring when moving from the "Stop" condition to the "Fast Reverse" condition. Check to make sure that in "Rewind" position the lifting lever does not jam and distort the bronze spring near the end where it is riveted. Tighten the two screws (H-169) securely.

13. Replace the switch cover (A-22) and tighten its screws securely.

14. Lower the unit back down onto the cabinet and adjust the clutches.

NOISY MOTOR

When an apparently noisy motor is encountered in the BK 411 or BK-414, first the clutch drive belts and then the capstan drive belt should be disengaged from the motor to definitely establish that the vibration is originating in the motor itself. If this is the case, the fan should be carefully examined for loose or bent blades. Many cases of vibration prove to be due to the shock mounts of the motor having become misaligned in shipments so that one mount is jammed and the motor is not really isolated from the chassis. A few "Sound-mirrors" were constructed in which the ground strap for the motor was of much too heavy material and transmitted vibration to the chassis. In almost all cases, if the fan is in good condition and

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the shock mounts are free and functioning properly, the motor noise will be found to be unobjectionable.

BELT GUIDE

Some difficulty was encountered in early production with the clutch drive belt, Part O-76, Figure 8, Page 6, jumping on the motor pulley so that the belt rubbed against itself and wore out quite rapidly. This problem has been eliminated by the use of a shorter and heavier belt and by the installation of a belt guide. This belt guide, Part #207143, should be installed under the motor mounting screw, Part H102, Figure 12, Page 9, and adjusted so that the belt does not touch the guide but is prevented by the guide from jumping out of its proper grooves. To install this guide the present motor mounting screw will require replacement with a half-inch No. 10 self-tapping screw. The belt guide is slipped under the screwhead and a No. 10 flat washer placed over the belt guide and a lock washer between the screwhead and the flat washer.

PRESSURE BRACKET BENDING

Quite frequently complaints of low volume, distorted recording and poor high frequency response prove to be due to the pressure bracket, A16, Fig. 9, Page 6, bending at the point where the arm joins the bracket, which in turn causes the head pad, MS2, no longer to bear directly on the recording head gap. This bending has only occurred in certain brackets which had a sharp corner in place of a radius in the arm of the bracket and then, only in machines which used the early relatively heavy head locking slide spring, Part O-88, Figure 11, Page 8. When this condition is discovered, the pressure wheel bracket should be replaced with one which has a satisfactory radius at the bends, and the head locking slide spring replaced with one of the newer type springs which will eliminate the violent recoil of this bracket which has contributed to the original bending.

MUTING SWITCH

Early production of the BK-411 "Soundmirror" was shipped without the installation of the muting switch which silences the recorder during automatic rewind. This switch, S-2, Part #106909-501, should be mounted on the inner side of the control rod bracket as shown in Figure 2. Most of these recorders have this bracket drilled for the mounting of this switch; however, if these holes have not been drilled, holes should be drilled as indicated in Figure 1. The

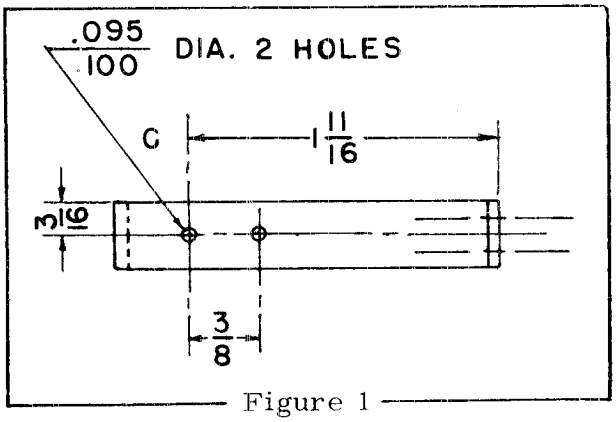
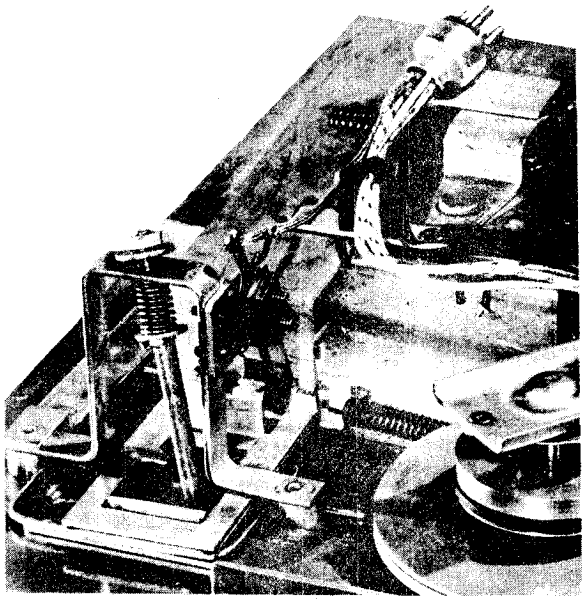
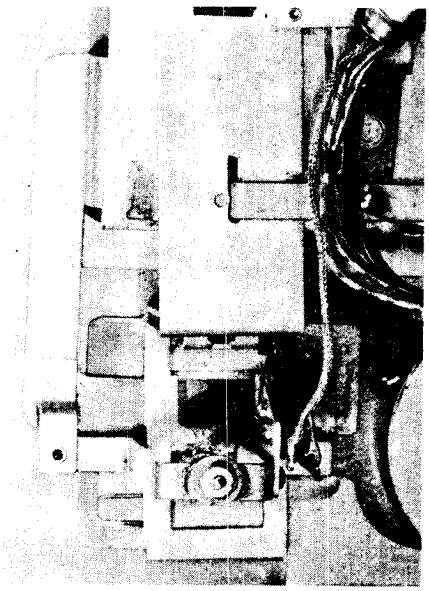


Figure 1

switch is mounted on the control rod bracket as shown in Figure 2 by means of two No. 4 self-tapping screws. On most recorders a shielded lead has been brought over to the switch position and taped back, which should be connected to the switch. However, if the lead is not present, a shielded lead should be run from the head plug and connected across the head. The shield of the lead should be connected to the inner blade of this switch and the center conductor to the outer contact. After mounting, the switch should be adjusted so that the actuator button passes inside of Part O-93, Figure 14, in all positions except automatic rewind, in which position the button is actuated by O-93.



Control Mechanism
In Fast Reverse Position
Switch Contacts Open



Control Mechanism
In Automatic Rewind Position
Switch Contacts Open

Figure 2 MUTING SWITCH

ELIMINATION OF RADIO AND TELEVISION INTERFERENCE

When operated in high field strengths of FM or television stations, the BK-411 and BK-414 "Soundmirrors" are sometimes subject to interference. In the case of interference from television stations, this sometimes appears as a loud hum or whistle, due to the synchronizing signals getting into the recorder. To eliminate this interference, the steps listed below should be tried in order:

1. A 50 mm condenser should be added between the point on the rotary selector switch, Part S1, Figure 25, to which the grid of V-1 returns, and the center or ground lug on the three-terminal strip which is situated on the front panel of the amplifier adjacent to the selector switch.

2. The condenser, C-4, bypassing the screen of the first gain stage, should be changed to the extent of removing the condenser connection from the cathode pin of the tube socket and connecting it to the ground lug on the condenser C-1, C-3, C-6.

3. A mica .001 condenser should be added from the cathode pin of V-1 to the same ground point on the electrolytic condenser as used in "2".

4. A mica .001 condenser should be added from the screen of V-1 to the same point on the electrolytic condenser as was used in "2" and "3".

INSTALLATION OF VU METER ON BK 401, BK 403, BK-411 AND BK-414 "SOUNDMIRRORS"

Requests have been received from the field, from time to time, for information on the connection of a VU meter to replace the cathode eye used as a volume indicator on the "Soundmirror". The changes required to do so are very simple, involving the connection of a VU meter from ground to the screen of

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the recording stage through a capacitor and, in the case of the BK-411 and BK-414, the addition of a series limiting resistor.

For the BK-401 and BK-403, the coupling capacitor from the recording stage screen to the 6E5 grid, C-25, should be changed from 0.1 mfd to 0.05 mfd, 600 volts. The meter is then connected directly from the capacitor to ground and the 6E5 tube removed.

In the case of the BK-411 and BK-414, the coupling capacitor, C-11, 0.05 mfd, should be changed to a 0.1 mfd, 600 volt capacitor, in series with a 6800 ohm 1/2 watt resistor. The meter is then connected from the 6800 ohm resistor to ground and the 6E5 tube removed.

In the case of the BK-411 and BK-414, the frequency response of the meter will be within $1\frac{1}{2}$ db over the normal recording range and is down only 5 db at 10 kc. In the case of the BK-401 and BK-403, the frequency response will be about $\pm$ 3 db over the range from 50 to 10,000 cycles. Due to the fact that the source impedance is not that recommended for the standard VU meter, the dynamic characteristics of the meter will be slightly altered. However, we believe that this will not be sufficient to interfere with its utility.

CONNECTION OF BK-411 AND BK-414 TO PERMIT MONITORING DURING MICROPHONE RECORDING AND USE AS A PUBLIC ADDRESS SYSTEM

In the BK-411 and BK-414, the amplifier has been deliberately constructed so that it is not possible to monitor during microphone recording. This has been done to eliminate the possibility of spoiling recordings by accidentally opening the monitor gain control and producing acoustic feedback during the recording process. However, in cases where the microphone is to be placed in another room or where the "Soundmirror" may be needed as a low-power public address system, it may be advantageous to make a modification of this circuit.

The necessary connection is made on the rear deck of the selector switch. The end of the 470K resistor, which is now common with the white lead with black tracer which goes to ground, should be removed from the switch. The resistor should be left connected to ground. A jumper should be run from the terminal thus vacated to the third terminal on the left which has a white lead with yellow tracer which goes to the rotor of the monitor gain control. With this change, the monitor amplifier will be in operation in recording from both microphone and radio. Therefore, care must be exercised when the microphone is in the vicinity of the recorder not to open the monitor gain control while recording.

SYMPTOM	CAUSE	REMEDY
DOES NOT RECORD		
a. Cathode eye does not light.	1. Record play switch in play position. (Fig. 6)	1. Set controls as outlined in operating instructions.
b. Cathode eye lights but does not indicate. Monitor O.K.	1. No input. 2. Erase pin not depressed. (Fig. 2) 3. Erase switch (S-3) not operating. 4. Defective coupling condenser C 7 or C 6. 5. Defective tube V-2.	1. Check input connections. 2. Check trim plate to see that it is not obstructing erase head. 3. Check for dirty or poorly adjusted contacts. 4. Replace. 5. Replace.
c. Eye indicates. Monitor O.K.	1. Defective coupling condenser C 7. 2. Shorting erase-switch S-3. 3. Defective head E-1.	1. Replace. 2. Adjust switch and leads. 3. Replace.
FAILURE TO DRIVE		
a. Motor operates but reels do not revolve.	1. Defective belt O-76. (Fig. 8) 2. Trim cover binding A-10. (Fig. 4) 3. Defective belt O-77. (Fig. 8) 4. Improper clutch adjustment.	1. Replace. 2. Adjust position of cover. 3. Replace. 4. Adjust according to instruction Pg. 41.
b. Motor does not run.	1. Ball jumped from position O-7. (Fig. 38) 2. Defective switch S-6. (Fig. 38) (See supplement) 3. Motor plug out P-4. (Fig. 16) 4. Fan blocked. 5. Capstan bearing binding O-78, A-26. (Fig. 37)	1. Replace ball and readjust according to supplement. 2. Clean and adjust contacts. 3. Insert P-4 into S-4. 4. Dress and/or lace wire leads. 5. Align bearing, lubricate. If bearing is damaged, replace.
FAILURE TO DRIVE IN REWIND	1. Improper clutch adjustment.	1. Adjust, Page 41.

SYMPTOM	CAUSE	REMEDY
	2. Improper ribbon guide adjustment. 3. Rewind clutch lifter bracket requires adjustment A-18. (Fig. 38) 4. Pressure wheel assembly (A-16 Fig. 38) does not disengage--head locking slide spring too weak O-88. (Fig. 11)	2. Adjust, Page 42. 3. Reform phosphor bronze spring and adjust bracket. See supplement. 4. Replace spring O-88.
FAILURE TO DRIVE IN FAST FORWARD	1. Improper clutch adjustment. 2. Improper ribbon guide adjustment. 3. Clutch lifter bracket maladjusted A-21. (Fig. 38)	1. Adjust clutches, Page 41. 2. Adjust ribbon guides, Page 42. 3. Reform phosphor bronze spring, adjust bracket; see supplement.
BREAKS TAPE	1. Insufficient head pad pressure. 2. Pressure roller not adjusted or spring deformed.	1. See ribbon tension adjustment, Pg. 42. 2. See roller pressure adjustment, Pg. 42.
FAILURE TO AUTOMATICALLY REWIND	1. Rewind trigger binding on reel O-54. (Fig. 38) 2. Rewind trigger bent. 3. Rewind trigger spring too weak. 4. Bar, trip lever (O-99, Fig. 12) binding. 5. Recorder not fully cocked take-up trip lever O-90 (Fig.13) did not catch on trip lever latch H-141. (Fig. 13)	1. Reposition reel to allow free movement of trip. 2. Reshape as in O-54, Fig. 38. 3. Reshape to increase tension. 4. Clean dirt, burrs or cause of binding and lubricate parts with Molycote thinned with carbon tetrachloride or use S A E 10 oil. 5. Oil take-up trip lever. Replace spring if necessary O-98. Bend lip on part H-141 toward part O-91 at their point of contact to allow part H-141 to travel greater distance.
FAILURE TO STOP AUTOMATICALLY	1. Reel binding take-up trigger O-55. (Fig. 38) 2. Take-up trigger bent.	1. Reposition reel to allow free movement of trip. 2. Reshape trigger O-55 as in Fig. 38.

SYMPTOM	CAUSE	REMEDY
	3. Take-up trip lever binding in reel cup.	3. Loosen hold down reel nut so as not to buckle cups.
MOTOR CONTINUES TO RUN	1. Switch improperly adjusted S-6. (Fig. 38)	1. Adjust switch contacts to open in stop position.
CONTROL KNOB FAILS TO LATCH	1. Latching gate binding O-93. (Fig. 14)	1. Clean dirt burrs or cause of binding, lubricate parts with Molycote or S A E 10 oil, replace spring O-97, Fig. 14, if necessary.
	2. Trim cover jamming pressure wheel or link (See Pg. 3) (Trim Cover)	2. Reposition covers to allow free movement of mechanism.
	3. Erase head binding on trim plate or not rising fully.	3. Reposition trim plate or file trim plate to allow head clearance.
POOR ERASE	1. Misaligned erase head.	1. See adjustment, Page 38.
	2. Head is dirty.	2. Brush away tape accumulation with stiff bristle brush.
	3. Ribbon guide mis-adjusted.	3. See ribbon guide adjustment, Pg. 42.
	4. Weak magnets.	4. Replace.
REWINDS SPONTANEOUSLY	1. Rewind trip lever misformed.	1. Reshape rewind trip lever O-54 as in Fig. 38.
	2. Tape wound loosely.	2. See adjustment of ribbon guides, Pg. 42.
HUM With Volume Control Open	1. Defective input, defective mike, etc.	1. Check connections and grounds.
	2. Mike plug grounding on panel.	2. On models BK-414 readjust trim plate A-27 or enlarge hole.
	3. Grid lead to V-1 misplaced.	3. Dress grid lead for minimum hum.
	4. High voltage transformer leads not dressed down to chassis.	4. Dress against chassis.

SYMPTOM	CAUSE	REMEDY
	5. Defective first stage tube V-1.	5. Replace.
	6. Poor ground connection on chassis.	6. Check all ground connections.
MECHANICALLY NOISY	1. Belt Whipping.	1. Adjust motor pulley O-62, Fig. 38.
	2. Loose or bent fan.	2. Straighten or tighten.
	3. Dirty clutch bearing.	3. Disassemble and clean, Page 37.
	4. Dirty capstan bearings.	4. Disassemble and clean, Page 35.
	5. Capstan belt hitting belt guide or head lead.	5. Move guide or head lead.
	6. Spaghetti on flywheel drive pins misplaced. (See Fig. 37)	6. Reposition, Page 36.
POOR FREQUENCY RESPONSE		
a. No Highs	1. Insufficient head pad pressure (Pg.42)	1. See adjustment of ribbon pressure, Page 42.
	2. Pressure pad not parallel to recording head gap.	2. Bend arm so pad is parallel and adjust pressure.
	3. Misadjustment of recording head.	3. Readjust, See Page 40.
	4. Compensating condenser C-12 failed.	4. Replace.
	5. Dirty head.	5. Clean.
b. No Lows	1. Insufficient bias. Note: Bias may be measured with a sensitive A-C voltmeter by placing a ten ohm resistor in series with ground lead from head.	1. See Page 16 Record bias circuit.
	2. C-13 or R-20 defective.	2. Replace.
	3. Low capacity coupling condensers.	3. Replace.
LOW OUTPUT	1. See above poor frequency response.	
	2. Low emission tube.	2. Replace.
	3. Defective head.	3. Replace.
	4. Defective output transformer or speaker.	4. Replace.

SYMPTOM	CAUSE	REMEDY
NO OUTPUT	1. Set not turned on.	
	2. Head plug out.	
	3. Output plug out.	
	4. Output plug shorted.	4. Replace. Add insulated washer.
	5. Speaker leads shorted.	
	6. Shorting link missing between terminals 1 and 2 on output terminal strip E-3.	6. Replace.
	7. Tube out.	
MICROPHONIC	1. Defective V-1.	1. Replace.
	2. Defective V-2.	2. Replace.
	3. Defective V-5.	3. Change V-5 to 6SN7 if 6SL7 was used.
LOOSE REWIND	1. See Tape Tension, Page 42.	
TOO SLOW		
a. Fast Forward	1. See failure to drive above.	
b. Fast Rewind	1. See failure to drive above.	
c. Record or Play	1. Capstan binding in bearings.	1. Clean, see Page 35.
	2. Line voltage too low.,	
	3. Capstan belt off groove.	3. Replace.
TOO FAST	1. Pressure assembly not engaged.	1. Correct cause of binding.
WOW AND FLUTTER	1. Pressure wheel defective, binding or rubbing on capstan bearing housing.	1. Adjust or replace.
	2. Excessive pressure of pressure pad against record/play head.	2. Adjust.
	3. Binding motor shaft bearing.	3. Clean, align, or replace.
	4. Binding capstan lower bearing.	4. Clean and align.
	5. Binding, reel-post bearing.	5. Disassemble and clean, Page 37.
	6. Damage of capstan drive belt.	6. Replace.
	7. Bent capstan.	7. Replace.

MODELS BK-442, BK-443P, BK-437, BK-437S, BK-439, BK-441

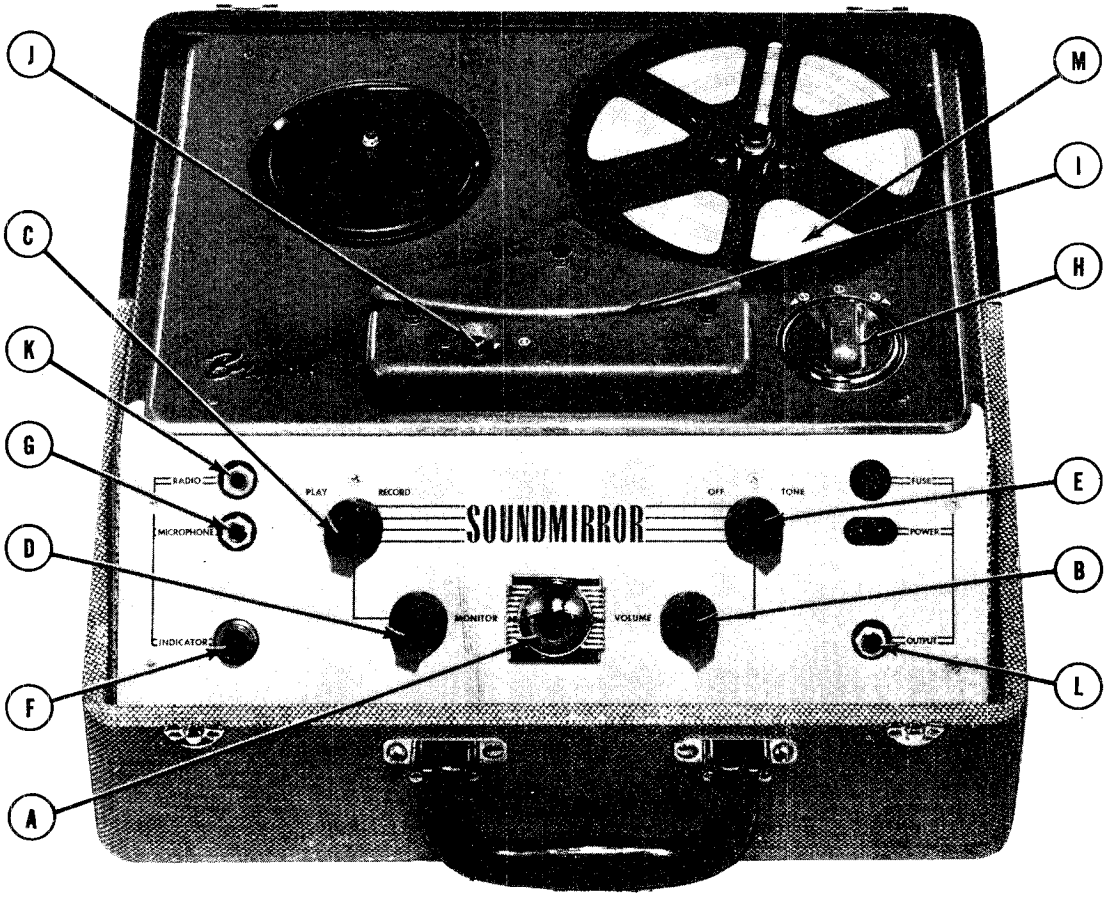
INTRODUCTION

This manual contains service information for a new series of "Soundmirrors" whose principal distinguishing characteristic is a rotary knob control in place of the lever control.

Most important in this line are the BK-442 table unit and the BK-443P portable unit which are covered in detail in the text. A number of variations of these will be encountered in the field such as the "-1" (50 cycle) units and the "S" units operating at one-half the tape speed. A number of mechanical chassis are in the field, designated by the model number BK-437 or BK-437S. Service information on these is precisely the same as on the mechanical sections of the complete machines. Small numbers of other machines of this series will be encountered in the field under model number BK-439 and BK-441. These are both table models which vary from a BK-442 only in the combination of speaker and output transformer employed. Specific service on these is otherwise the same as for the BK-442.

Certain of these models appear in an Underwriters' approved form and carry a further letter designation "U". The principal difference is the use of a number of extra shields for power wiring and these shields must be replaced when servicing such a unit.

FIGURE 1—PORTABLE SOUNDMIRROR



SOUNDMIRROR DESCRIPTION

The following letters "A" to "M" with description pertain to figures 1 and 2 for table model or portable model.

A. Recording Volume Indicator
B. Play or Record Volume Control
C. Selector Switch—Play or Record
D. Speaker Monitor Volume Control
E. Line Power Switch and Tone Control
F. Line Power Indicating Lamp
G. Microphone Input Connection
H. Tape Transport Control Knob

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I. Tape Slot—Play or Record
J. Erase Button—When recording depress this button in addition to moving the Control to Record Position
K. Radio Input Jack
L. Output Jack for External Speaker
M. Indexing Disc

Standard equipment with all models includes one 7-in. reel of Magic Ribbon* magnetic recording tape, one empty metal take-up reel and Brush non-directional microphone with cord and jack connection and detachable base.

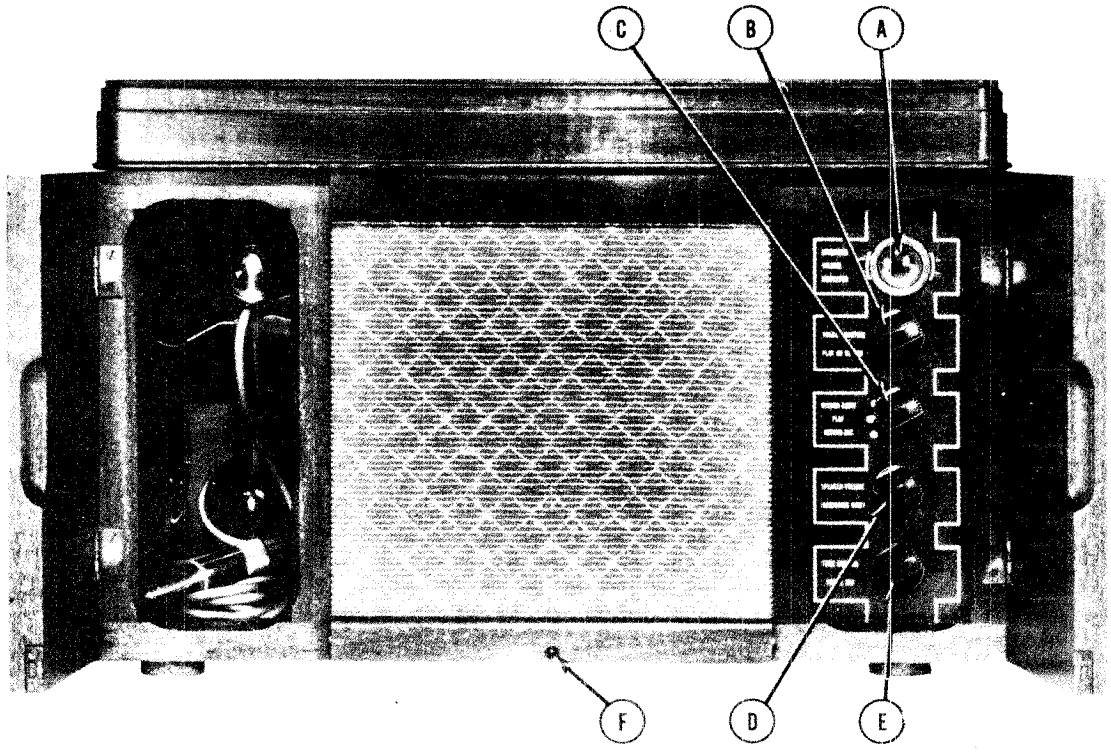

FIGURE 2—TABLE MODEL SOUNDMIRROR

MECHANICAL FUNCTIONS

The Soundmirror uses a single motor with one rubber belt to drive the capstan and another, crossed, to drive both turntable pulleys. Thus, whenever the motor is running, the pulleys revolve in opposite directions at constant speed.

Cemented to the top surface of each of the pulleys is a felt pad capable of engaging the lower surface of the associated turntables with the action of a light friction clutch. The direction of rotation of the pulleys is such that each turntable, when resting on its pulley, tends to reel in tape. A pair of cams are provided, one under each reel shaft, mounted and adjusted so that they can be used to lift the associated turntable free of its pulley. Two small felt pads which are mounted on springs on the pulley face remain in contact with the turntable when it is elevated and offer a slight amount of reverse drive torque when tape is being pulled from a reel. This action provides back tension to the tape and insures that the tape is wound tightly in fast forward and fast reverse.

The capstan is rotated by the motor by means of the smaller drive belt and provides a means for driving the tape at a fixed linear speed. This drive becomes effective when the pressure roller assembly is moved in and engages the tape against the capstan drive spindle. Under these conditions, the tape which ordinarily would have moved at fast forward speed is held to a constant playing speed by the capstan, the slippage in the felt clutch of the takeup reel turntable compensating for the difference in speeds.

The main arm performs several functions. When the control knob is depressed and rotated into play (record) position it rotates the main arm and locks into position. (1) The spring extending from the main arm applies a force against the erase pin providing a jam proof arrangement for depressing the pin either before or after the motion of the arm takes place. (2) The micro-switch actuator releases the micro-switch arm for operation. If no tape is present, the micro-switch arm passes through the slot in the tape guide, and the motor will not run. (In fast forward or fast rewind this feature is inoperative and the motor will run with or without tape). (3) The pressure wheel presses the tape against the capstan spindle, causing the tape to be driven at constant speed.

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The tape is also pressed against the two heads by the erase pressure pad assembly and the roller pressure pad assembly to insure close contact between the tape and the heads in the region of the gaps.

Steps in a typical operation are as follows:

FAST FORWARD: The control knob is rotated in direction of # 3. This rotates the clutch lever which turns on the motor and raises the rewind turntable, allowing the takeup turntable to remain engaged.

FAST REWIND: The control knob is rotated in the direction of #2. This rotates the clutch lever which turns on the motor and raises the takeup turntable, allowing the rewind turntable to remain engaged.

PLAY-RECORD: The control knob is depressed in the #1 position and rotated clockwise in the direction of #3, the clutch levers engage in the same fashion as occurs in fast forward; the control arm presses the roller assembly against the tape and capstan, thus giving the tape a constant linear speed, the micro-switch arm is released for operation and the erase spring engages the erase pin.

OFF: In any case when the control knob is rotated to the off (#1) position, the clutch lever is centered, opening the motor switch and allowing both turntables to engage their clutches. This acts as a brake to halt the motion of the tape.

PORTABLE MODEL GENERAL DISASSEMBLY

To Remove Sub Assembly From Case

1. Remove the two small trim covers (A-201 and A-203) held in place by three knurled thumb screws.
2. Remove the four binding head screws, then the main trim cover (A-205).
3. Remove the three screws (H-245) at the rear of the mechanical chassis.
4. Remove the two screws (H-244) holding the handle to the case.
5. Lift assembly out of the case slightly and disconnect the power supply, plug and the speaker plug. Remove the main sub assemblies.
   (a) This exposes the power supply which is attached to the case, and the speaker assembly.
6. Disconnect the erase head plug, the record head plug, and the motor plug.
7. Remove the four 8-32 flat head screws (H-235) located on each side of the mechanism.
8. Remove the two 10-32 screws (H-237) located on the front corners of the mechanism.
9. Remove the mechanism by sliding it away from the amplifier.

To Remove the Amplifier

10. Remove the four screws (H-233) on the front etched panel.

To reassemble the unit the exact reverse is done carefully when attaching the mechanism so that the projecting edge of the front etched panel goes between the erase spring actuator and the main chassis of the mechanism.

NOTE: Symbols for the mechanical chassis are shown on the exploded view page 23.

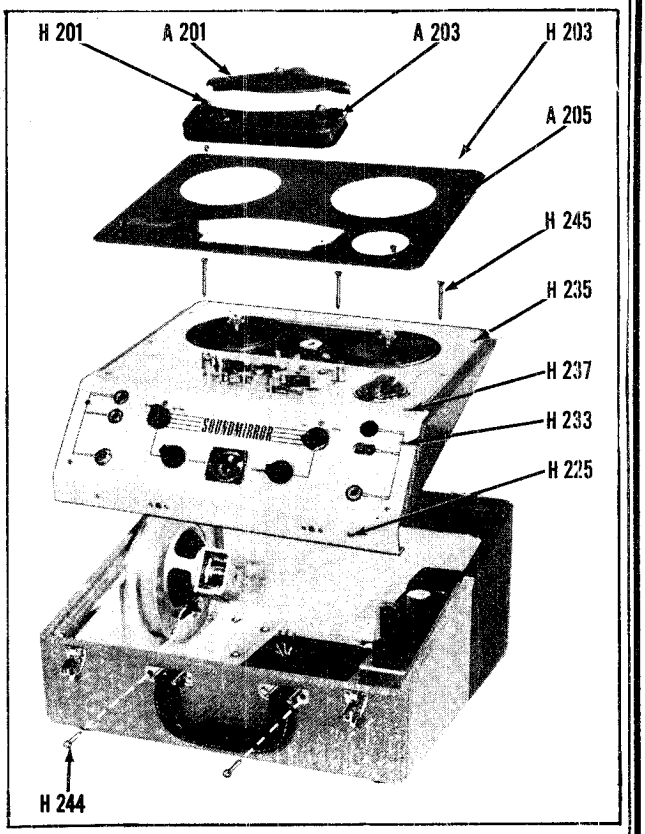

FIGURE 3—PORTABLE DISASSEMBLY

TABLE MODEL GENERAL DISASSEMBLY

To Remove Amplifier From Cabinet

1. Disconnect the Soundmirror from the power source.
2. Remove the cardboard back from the cabinet.
3. Disconnect the record head plug, speaker plug, erase head plug, motor plug, and remove the microphone and radio jacks from the output jack board. (Removing clamp which secures them).
4. Remove the pilot lamp holder from its mounting.
5. Pull off the control knobs located on the front panel.
6. Remove the screws which hold the amplifier to the bottom of the cabinet.
7. Slide the amplifier out of the rear of the cabinet.

To Remove the Mechanical Chassis From the Cabinet

8. Follow steps 1 through 3, (with the exception of jacks).
9. Remove the reels.

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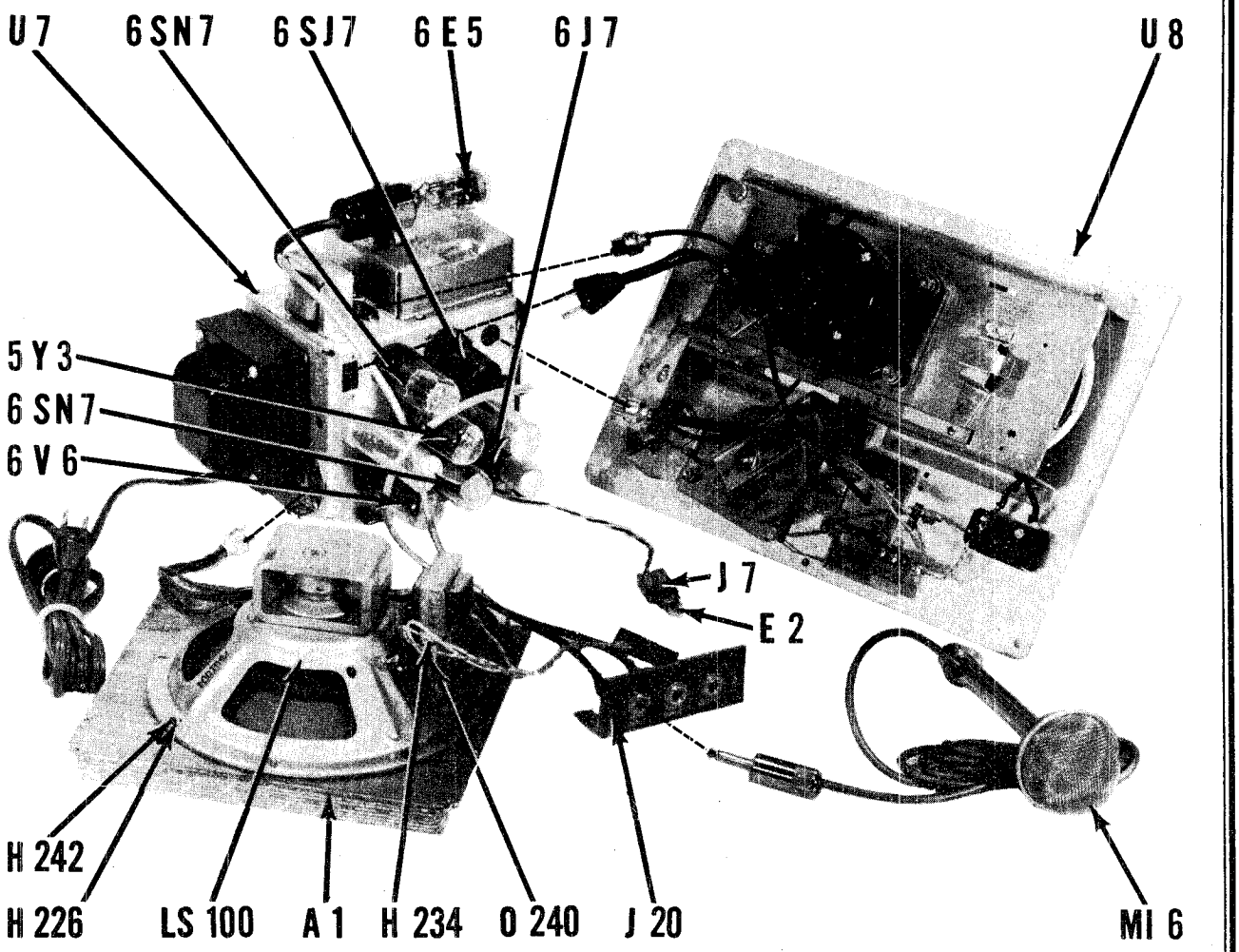

FIGURE 4—TABLE MODEL DISASSEMBLED

10. Remove the two small trim covers (A-200 and A-202) held in place by three knurled thumb screws.
11. Remove the four binding head screws, then the main trim cover (A-204).
12. Remove the four screws which mount the mechanical chassis to the cabinet and lift the chassis from the cabinet.

To Remove the Speaker

13. Remove the mechanical chassis and amplifier, steps 1 through 12 (above).
14. Remove the screw which mounts the speaker cable clamp to the bottom of the cabinet.
15. Remove the speaker output jack from the jack output board.
16. Remove the four screws which mount the speaker to the grille board and lift the speaker out of the cabinet.

NOTE: Symbols for the mechanical chassis are shown in the exploded view, Page 23.

SERVICE PROCEDURE

The operation and function of the portable and table model Soundmirrors are basically the same, except in the disassembly and reassembly as previously outlined. The following information is incorporated for both.

TUBE REPLACEMENT

Tubes are made accessible by removing the back cover from the table model cabinet. For the portable model follow steps 1 to 5 on page 4.

CAUTION: To avoid burns and cuts caused by heated tubes and moving fan blades, turn the power off, and allow the fan to stop and the tubes to cool before attempting tube replacement.

PILOT LIGHT REPLACEMENT

To replace the table model pilot light, the back cover of the cabinet must be removed. To replace por-

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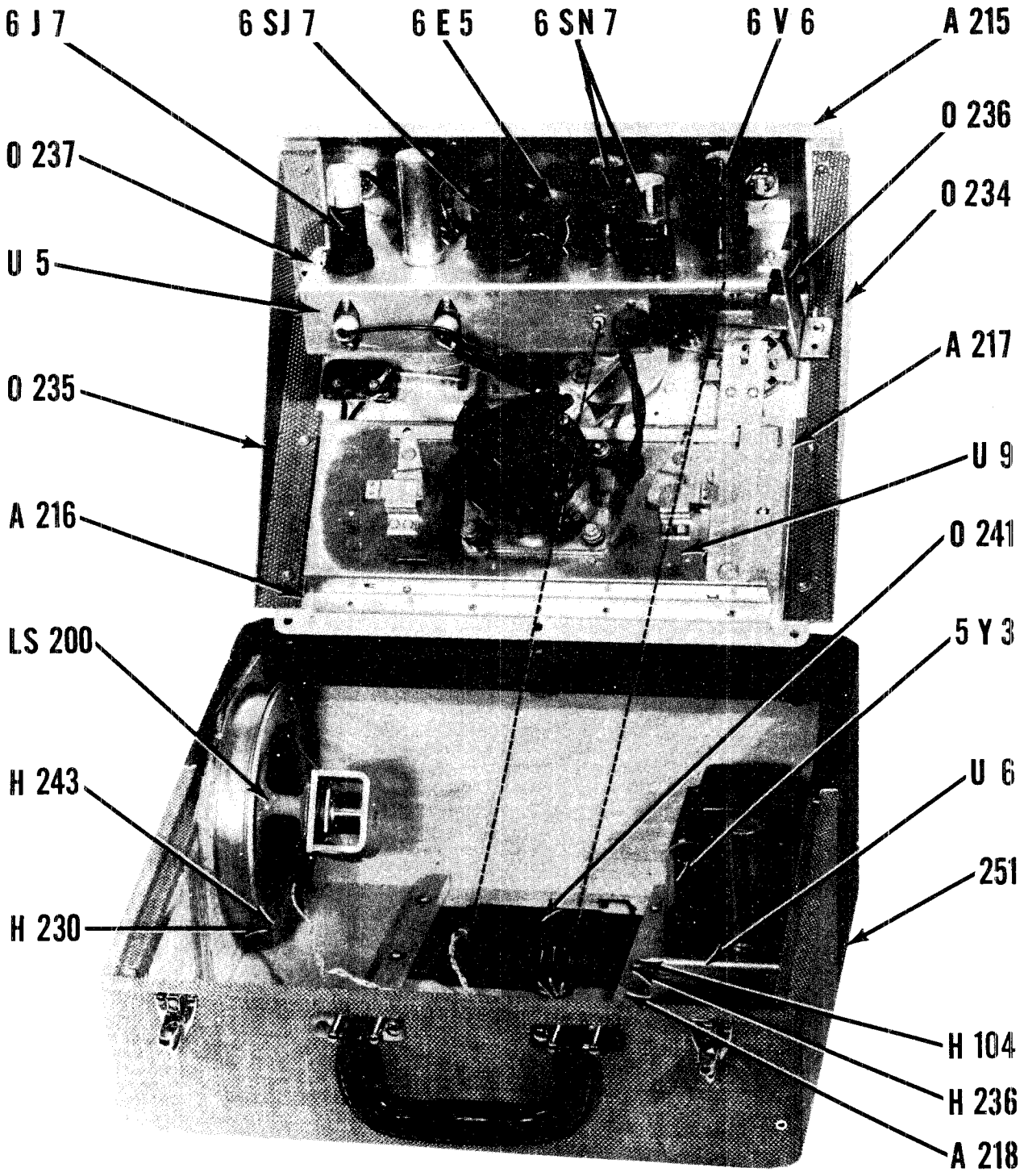

FIGURE 5—PORTABLE SOUNDRMIRROR DISASSEMBLED

table model pilot light unscrew lens from etched panel. (Both are bayonet base bulbs).

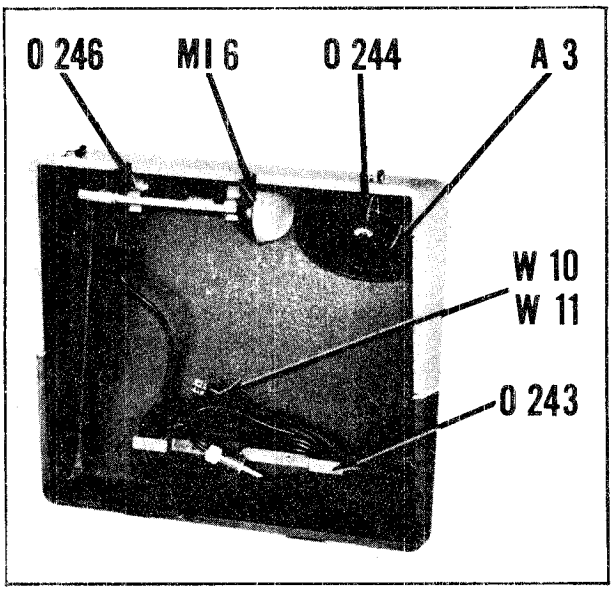

FIGURE 6—PORTABLE SOUNDMIRROR COVER

REPLACEMENT OF PRESSURE WHEEL ASSEMBLY

The pressure wheel assembly consists of a bracket, spring, shaft, wheel, and pressure pad which is attached to the bracket. To replace the complete assembly:

1. Remove the small trim cover and the "Tru-Arc" retaining ring.
2. Lift the assembly off the post, being careful not to damage the spring.
3. Slide the spring out the end of the bracket. The wheel and shaft will come out easily.
4. Replace parts in reverse sequence of steps 1, 2, & 3.

REPLACEMENT OF PRESSURE PAD

The friction between the pressure pad and the ribbon will in time wear the felt pad. When it becomes necessary to replace this pad, any quick drying cement may be used. Care should be taken to prevent any cement from getting on the felt which contacts the ribbon. After replacement is made, the pressure should be adjusted as outlined on adjustment of ribbon tension.

ADJUSTMENT OF ROLLER PRESSURE

The pressure of the rubber wheel against the ribbon and the capstan spindle is adjusted at the factory. It is not recommended that any adjustment be attempted in the service field, but that the defective part be replaced.

If the ribbon tends to crawl up or down on the capstan spindle, it indicates that the spring may not be seating properly in the grooves of the wheel shaft. If this is not the cause, then the spring may have been bent in a manner causing more pressure from one arm than the other. Since this is a critical adjustment it is recommended the spring be replaced rather than adjusted.

ADJUSTMENT OF RIBBON TENSION

This tension is measured by attaching a spring balance to the end of a piece of ribbon drawn only through the erase head, then through the record head. The tension required to move the tape through the erase head should be from 1 to 1½ oz.

The pressure of the ribbon against the erase head can be adjusted by bending the spring located on the erase arm assembly.

The pressure of the ribbon against the record head can be adjusted by turning the screw (H-112) mounted on the pressure wheel bracket assembly. Be sure to first loosen the hex nut (H-111) before making adjustment).

ADJUSTMENT OF RIBBON GUIDES

The ribbon guides (0-67 and 0-209) are located beneath the head trim cover and are mounted on the panel with the guide posts (0-65) by mounting screws (0-209). The guides must be mounted so that they will be parallel to the path to the tape.

RECORD–PLAY HEAD REPLACEMENT

1. Remove the mechanical chassis from the unit.
2. Remove the record-play head mounting screws.
3. Unsolder the three wires from erase switch (S-20), cut the lashing holding the head cable to the capstan bracket (A-25).
4. Remove the capstan drive assembly mounting screws (H-221, H-222 and H-224) and carefully lower the assembly away from the panel enough to slip the record-play head (E-21) out of the hole.
5. Assemble the capstan drive assembly and the record-play head by placing the head and the mounting clamp (H-131) between the flywheel and the bracket.
6. Hold the assembly in the left hand and position it onto the panel while tightening the flat head screw (H-224) to hold the drive assembly until the other mounting screws are placed in position in the following sequence.
   (a) The screw (H-222) between the head and capstan spindle.

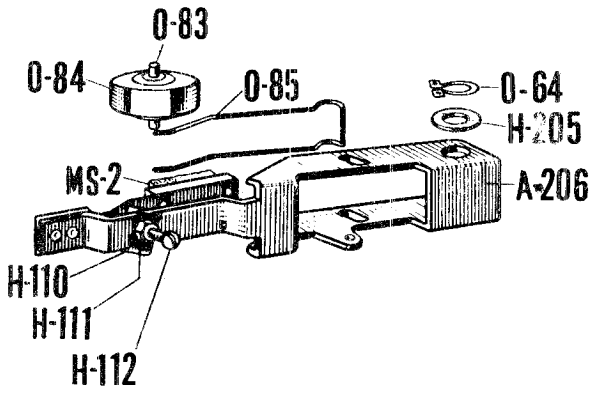

FIGURE 7—PRESSURE WHEEL ASSEMBLY

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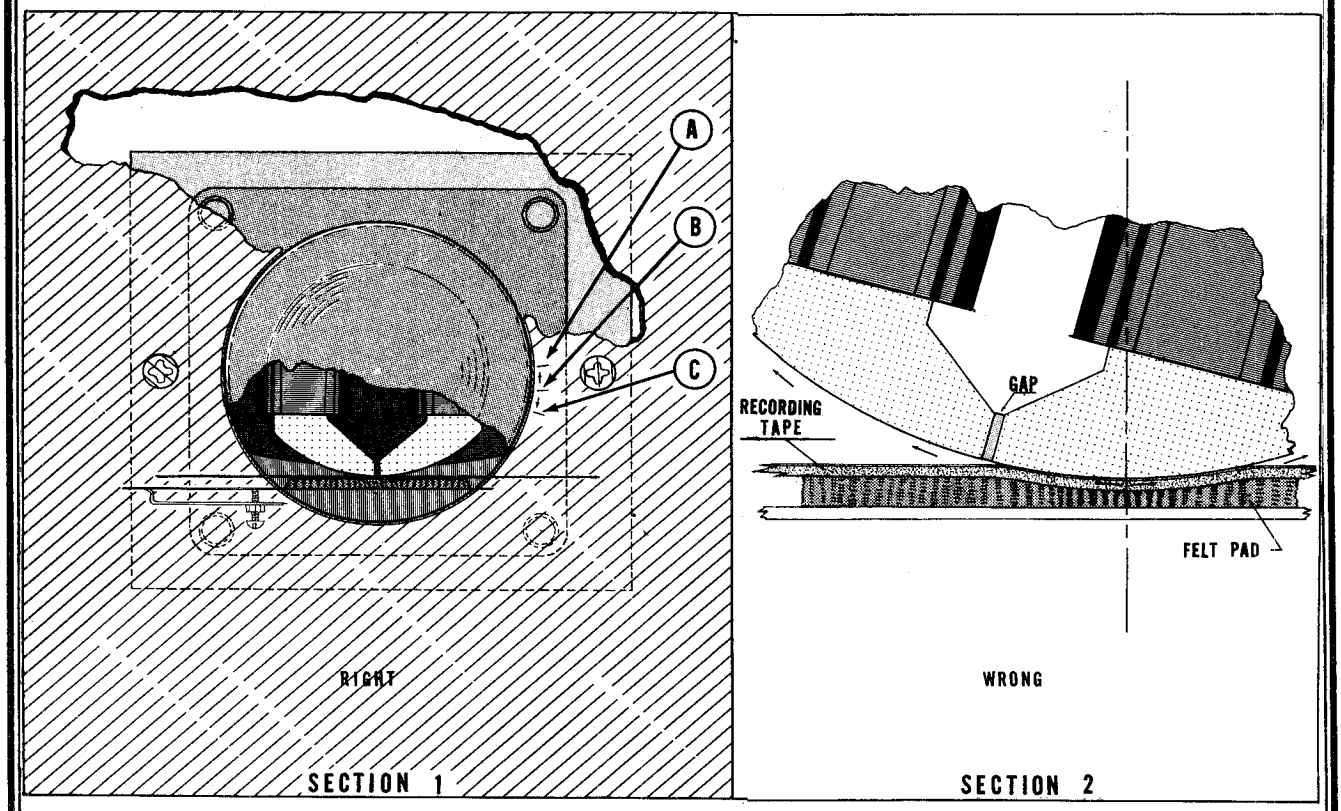

FIGURE 8—RECORD-PLAY HEAD ADJUSTMENT

(b) The screw nearest the erase head (E-20).
(c) The screw (H-221) between the capstan spindle and the right-hand ribbon guide (O-65).

7. Adjust the head for hum cancellation as outlined in the following paragraph.
8. Tighten all screws completely.

Adjustment of Record Play Head for Minimum Hum and /or Maximum High Frequency Response

Excessive hum during any pause in the recording while the unit is in the play-back position may be caused by magnetic lines of force being radiated from sources such as the motor, power transformer, filter choke, etc., inductively creating an unbalanced voltage in the play-back head.

This condition may be corrected by reestablishing the balance by properly directing the magnetic lines of force through the two windings of the head. This is accomplished by slightly rotating the head either clockwise or counter-clockwise as the case may require.

To find the correct position:

1. Turn the power on and allow the tubes to warm.
2. Set the Amplifier Controls for play-back operation at full volume.
3. Remove the small trim covers.
4. Loosen the mounting screws (H-222) on either side of the record-play head (E-21) enough to allow the head to be rotated slightly.
5. Place the ribbon around the back side of the record-play head and the capstan drive spindle (0-78).
6. Turn the control knob to the "Play" position, control knob depressed and rotated clockwise in the direction of #3.
7. Rotate the record-play head in either direction until a point of minimum hum is found. NOTE: If the head requires excessive rotation to reduce the hum sufficiently to meet the dynamic range specification, the head should be replaced.
8. Tighten the screws to hold the head in this position.
9. Turn the control knob to the "off" position #1 to stop the reels. The cut-a-way of the head (Fig. 8) shows how the polepieces should contact the ribbon. If the head is rotated too far in either direction the gap will not contact the ribbon which will result in a lack of high frequencies or no signal at all being recorded or reproduced.

To check this condition:

10. Place a mark on the panel at point "B" of Figure 8 to identify the "minium hum" position of step 7. The mark should be made in line with the end edge of the opening in the record head.
11. Place a recorded portion of the ribbon through the record-play head (E-21) and the capstan drive spindle (0-78).
12. Turn the control knob again to the "Play" position.

13. Loosen the record-play head mounting screws (H-222) enough to rotate the head toward "A" or "C" while listening to the signal being reproduced by the ribbon.

When the position is found which allows the higher frequencies to be reproduced, place a second mark on the panel to identify this position. If this position does not coincide with the position of least hum, then a choice or a compromise position must be made.

14. Alternately tighten the screws to lock the head in the position chosen.

ERASE HEAD REPLACEMENT

1. Remove mechanical chassis from the unit.
2. Remove the mounting assembly by removing the three screws (H-225) which secure it to the chassis.
   (a) Cut lashing which holds the head cable to the capstan bracket.
3. Remove the mounting plate.

REPLACEMENT OF BELTS

Belts should be replaced whenever they show noticeable wear .When replacing either belt, check height of motor pulley to be sure that capstan drive belt is parallel to the panel. Under normal operation, rubber dust from the clutch belt will accumulate. This dust should be removed thoroughly from the mechanism.

REPLACEMENT OF TURNTABLE ASSEMBLY

1. Remove the "Tru-Arc" retaining ring, using No. 22 "Tru-Arc" pliers.
2. Lift the turntable assembly from the reel post. The assembly is divided into upper and lower cups.
3. Reassemble parts in order shown on page 23. Be sure the cups fit together with insides facing each other and indexed according to the notches and slots in their edges.

NOTE: If the reel guide pin is broken off, the reel post (O-203) must be replaced. If the pin is more than slightly bent it will be badly weakened by straightening. The post should be replaced.

4. Install the assembly on the reel post and replace the "Tru-Arc" retaining ring making sure it fits into the groove on the reel post, and that its sharper edge is up.

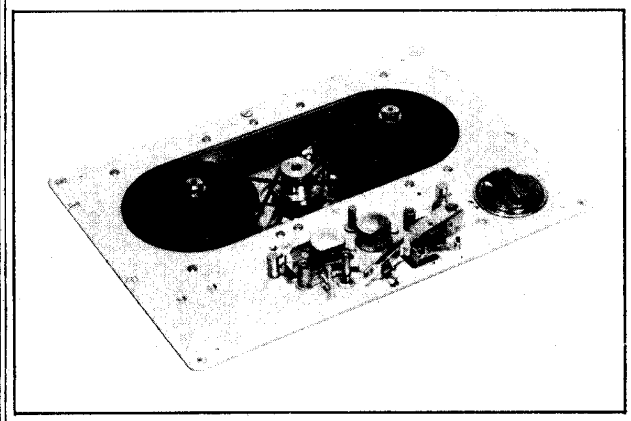

FIGURE 9—MECHANICAL CHASSIS, TOP VIEW

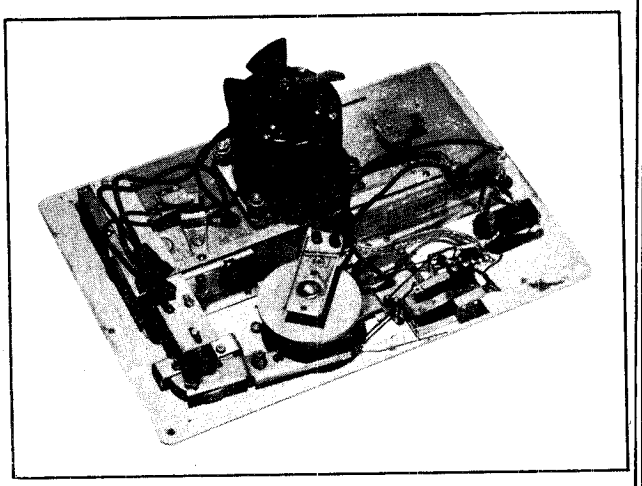

FIGURE 10—MECHANICAL CHASSIS, BOTTOM VIEW

REPLACEMENT OF CLUTCH ASSEMBLY

1. Remove the mechanical chassis from the unit.
2. Remove the turntable assembly.
3. Remove the clutch belt.
4. Remove the two screws (H-215) which mount the clutch lifter bracket assembly (A-21 and A-211). Slide the assembly out at one side being careful not to distort the clutch lifter spring attached to the bracket.
5. While holding the clutch raising lever in its extreme position, carefully remove the small "Tru-Arc" retaining ring (O-69) and washer (H-210) located at the lower end of the reel post. This requires the use of No. 0018 "Tru-Arc" pliers.
6. Lift out the reel post assembly being careful not to lose the clutch lifter pin (H-115). This allows the clutch and pulley to be lifted from the clutch bearing assembly.
7. The felt clutch is cemented to the upper face of the pulley and ground flat after assembling. Under normal conditions it should not require replacement, however, if damaged it is possible that pulley assembly (O-202) should be replaced.
8. If necessary, remove the clutch-pulley bearing assembly (O-204) by removing the hex nut (H-117) on lower panel of chassis. Replace any damaged or worn out parts.
9. Reassemble the clutch pulley, the reel post, and the lifter pin and install onto the clutch bearing.
10. Install the washer and "Tru-Arc" retaining ring on the lower end of the reel post.

ADJUSTMENT OF CLUTCHES

The clutches are adjusted and set at the factory and under normal conditions should not require readjustment.

If it becomes necessary to replace any part of the

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clutch assembly, readjustment becomes necessary and proper procedure is as follows:

The power should be turned off, a loaded reel placed on the supply turntable, and the control knob rotated from the neutral position #1, towards fast forward postion #3. As this is done the supply turntable should rise very slightly, not over 1/32 of an inch. If the turntable does not rise this amount, the locking nut (H-19) on the clutch adjusting screw (H-20) should be loosened with pliers or wrench, and the Allen screw turned in with a #5 Allen Wrench until this amount of lift is obtained.

The adjustment should then be relocked, and with the control in the fast forward position, the turntable should be lifted by taking hold of the reel post. Make certain that it still has vertical clearance when it is fully elevated and in position.

The loaded reel should then be moved to the take-up turntable, the control knob rotated towards the fast rewind position #2 and the reel observed for lift. Adjustments should be made as previously outlined.

When both reels are properly adjusted, and do not bind when they are engaged, the recorder should operate satisfactorily. If the recorder does not operate satisfactorily it is possible that:

(a) Clutch pads are dirty and require cleaning.

(b) Tape guides (O-67) and (O-209) have been bent and are causing too much drag on the tape.

REPLACEMENT OF MOTOR

1. Remove the mechanical chassis from the unit.
2. Remove the rubber belts.
3. Remove the toggle switch bracket (A-212) from the chassis.
   (a) Disconnect Motor Wire.
4. Disconnect motor wire from plug.
5. Remove the two binding head screws which mount the motor to the chassis.
6. Loosen the 2 Allen head set screw and remove the drive pulley from the motor shaft.
7. Remove the 4 hex nuts which mount the motor to the plate assembly (A-19).
8. To replace the rubber shock mounts (A-20): (a) remove the nuts holding the mounts in place. (b) remove the motor mounting plate (A-17) from the plate assembly. (c) remove the rubber mounts from the plate and intstall new ones. (d) install onto plate assembly and replace screws.

NOTE It is best to replace all four rubber mounts to assure proper balance of motor. Be sure to replace ground wire (W-3) to prevent electrical hum from motor.

9. Install new motor and reassemble onto chassis in reverse order.
10. After installation of rubber belt adjust the height of the drive pulley so that the capstan belt is parallel to the panel.
11. Adjust the position of the motor on the chassis to a point which causes least vibration of the drive belt and which gives the greater tension to the clutch belt.

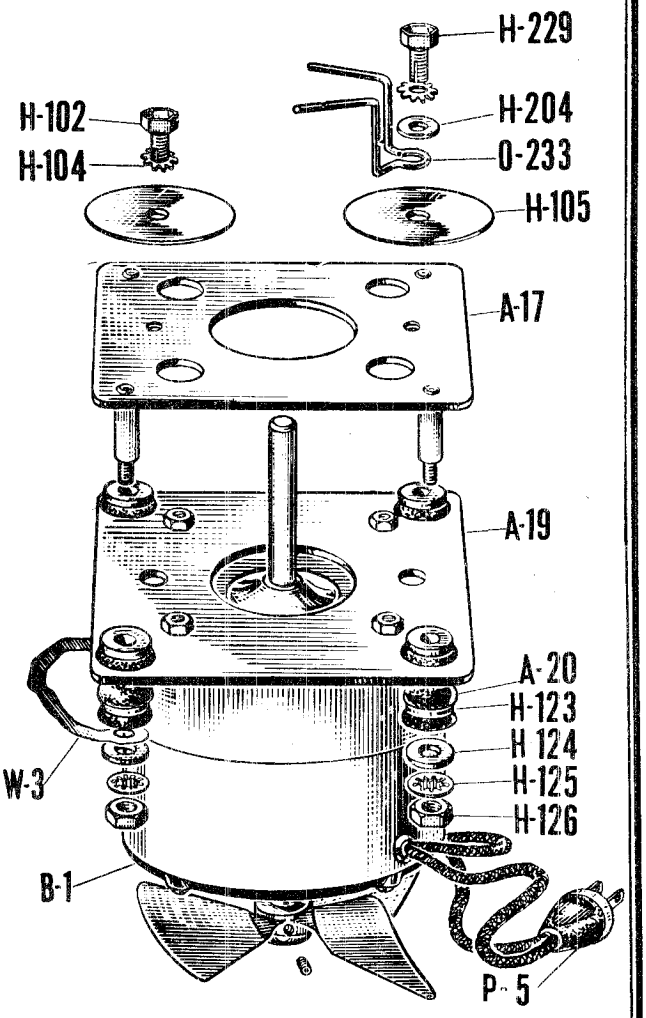

FIGURE 11—MOTOR ASSEMBLY

ADJUSTMENT OF THE MOTOR SWITCH BRACKET

The motor switch bracket (A-214) is used to accomplish two functions. It centers the control knob and clutch lever, and it regulates the motion of the clutch lever.

As little play as possible must be had between the switch and the bracket in the fast forward, fast reverse and off positions.

Rotate the control knob clockwise to the fast forward position #3 and slowly move it to the off (centered) position #1. If the bracket moves more than 1/64" to contact the face of the bat, it must be moved closer to the motor switch to take up this play. The same holds true for fast reverse, knob rotated counter clockwise in the direction of #2.

REPLACEMENT OF CAPSTAN ASSEMBLY

(1) Remove the mechanical chassis from the unit.

(2) Remove the capstan drive belt.

(3) Remove the two Allen head screws (H-133) on base.

(4) Carefully pull out the capstan assembly and base bracket (A-26) take care that the ball bearing (O-231) on the base of the capstan assembly is not lost.

(5) Replace parts and/or assemblies in reverse as outlines above.

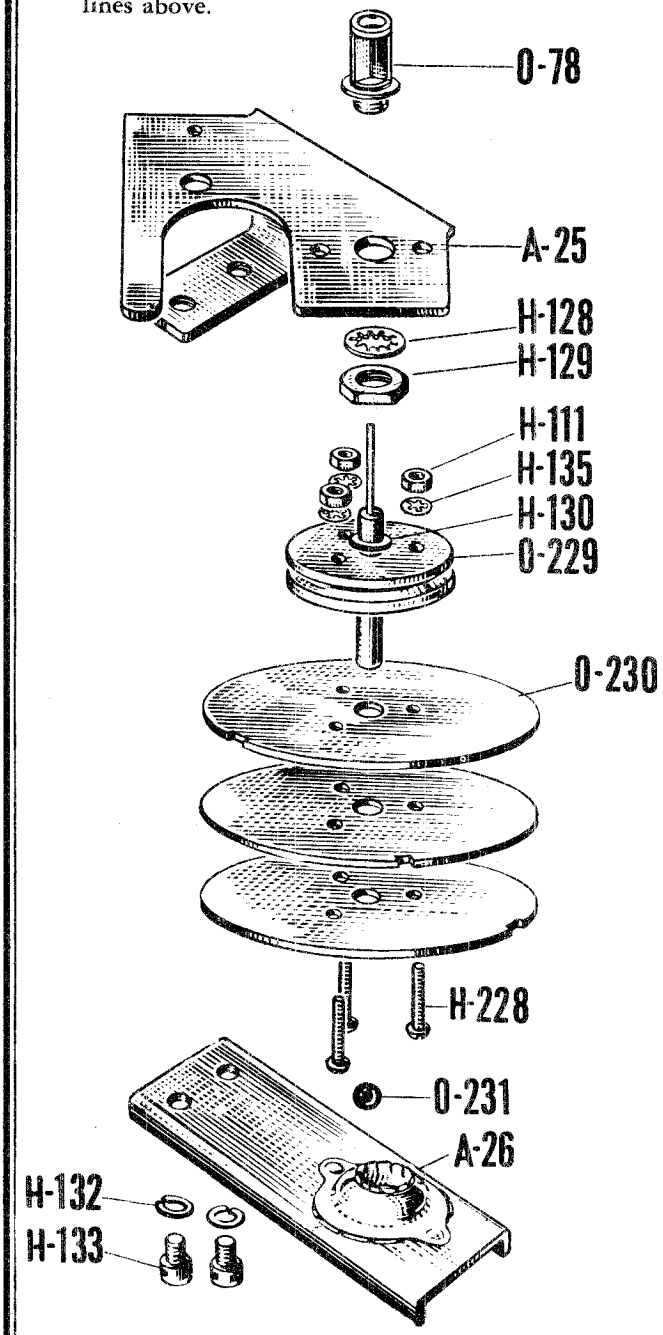

FIGURE 12—CAPSTAN ASSEMBLY

(a) When tightening the two Allen head screws, make certain that they are tightened alternately to avoid moving the bottom bracket away from its true center, thus applying a force perpendicular to the shaft of the capstan.

REPLACEMENT OF TAPE TRANSPORT CONTROL SPRINGS

Push a screw driver up through the slot of the cup assembly (O-216). Tap lightly and knob can be removed The control knob spring (O-213) will then be released (O-216). Remove the "Tru-Arc" retaining ring and washer, and the control shaft spring (O 214). When assembling, make sure that the turned edge of the control shaft spring falls into its square limit stop. Upon completion of assembly the knob should have as little play as possible in the vertical elevated position.

LUBRICATION

MOTOR—The Motor should be oiled once every three months with Number 20 SAE Oil. Caution. Do Not Over-Oil.

MECHANISM-All moving or sliding parts should be cleaned thoroughly of any dirt, common dust or rubber dust that may have accumulated. After cleaning, apply a thin coat of light oil to all sliding surfaces. Wipe off excessive oil. Do not allow oil to get onto the belts or the driving surfaces of the pulleys. The cam surface of the control arm and the cam follower should be greased periodically.

OILITE BEARINGS—The following are of this type and need very little lubrication.

1. Clutch Pulley Bearing
2. Capstan Spindle Bearing
3. Pressure Wheel Bearing.

SOUNDMIRROR VARIATIONS (BK-442, BK-443-P) 50 CYCLE

Aside from the standard line of "Soundmirror", Brush also furnishes units capable of operating on 50 cycles, (110, 150, 220, 250) volts.

These units will be designated as BK-442-1, BK 443-P-1 and will be identical in construction to the standard models of the BK-442 and BK-443 with the following exception:

1. Motor, 50 cycle, #207259.
2. Pulley, 50 cycle, #107248.
3. Transformer 50 cycle with taps for 110, 150, 220, 250 volts, #208369

To mount the above transformer:

(a) Bracket #107621-4.

(b) Brackets #106665 1 (two required).

Slow Speed (1 hour)

These units will be designated as BK-442-S and BK-443-PS and are identical in construction to the standard BK-442 and BK-443 P except

1 Slow Speed Motor pulley, #108357.

2. Slow Speed Capstan, #209800-101.

The amplifier is compensated by

(a) Shorting C-9 connections.

(b) C-17 and C-19 will be .004 mmf condenser #3-106094-5.

(c) C-10 should be 1 mmf condenser #2-106094-1.

Combination 50 Cycle Slow Speed

These units will be designated as BK-442-S-1 BK 443-PS-1 and are combination slow speed 50 cycle units and are identical to the BK 442 and BK-443-P with the following exceptions:

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1. Motor, 50 cycle #207259.
2. Motor Pulley, slow speed 50 cycle #109786.
3. Capstan, slow speed #209800-501.

Amplifier compensation:

(a) Shorting C-9 connections.
(b) C-17 and C-19 will be .004 mmf condenser #3-106094-5.
(c) C-10 should be 1 mmf condenser #2-106094-1.

CONNECTION OF THE SOUNDMIRROR TO A RADIO

The Brush Soundmirror may be electrically connected to any radio receiver. This is to be preferred to placing a microphone at the loudspeaker because of speaker distortions and room noises.

A simple direct connection can be made from the voice coil terminals of the radio input of the Soundmirror. Use the radio input jack of the Soundmirror. No shielding is needed.

No method is ideal for the so-called AC/DC receivers but the above method may be used.

These receivers are not isolated from the power lines and can be potential hazards if not carefully treated. The loudspeaker voice coil must be isolated completely from the remainder of the circuit. It may be necessary to use an isolation transformer.

If "professional" type recordings are desired, a radio technician should make the following recommended connections to the radio receiver. See Fig. 13. In these circuits recording volume control setting is independent of radio speaker volume. These circuits are not recommended for AC/DC type receivers Where Fig. 14 is used, it is possible in most cases to play back through the radio amplifier. Remove the plug from the microphone input jack and place it in the output jack of the Soundmirror, and operate the Soundmirror in the play position.

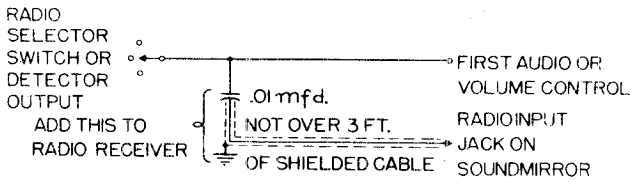


FIGURE 13—CONNECTION OF THE SOUNDMIRROR TO A RADIO

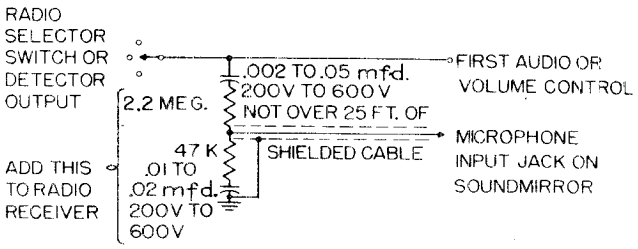


FIGURE 14—CONNECTION OF THE SOUNDMIRROR TO A RADIO

LIST OF MATERIAL

Symbol	Part Number	Description
A-1	206790-501	BOARD, speaker mounting: includes grille cloth and screen.
A-3	104215-501	BASE, microphone.
A-13	106827-2	BEADING, rubber.
A-17	106163-501	PLATE, motor shock mount.
A-19	106122	PLATE, motor mounting.
A-20	104213-4	MOUNT, vibration: rubber.
A-21	106407-501	BRACKET, clutch lifter: take up side.
A-25	206139	BRACKET, capstan drive.
A-26	106394-501	BRACKET, capstan; bottom bearing assembly.
A-200	108613-PL1	COVER assembly, head: Dark.
A-201	110326-PL1	COVER assembly, head: Light.
A-202	310255-501	COVER assembly, pressure wheel: Dark.
A-203	310311-501	COVER assembly, pressure wheel: Light.
A-204	310254-501	COVER assembly, panel: Dark.
A-205	310208-501	COVER assembly, panel: Light.
A-206	210094	BRACKET, pressure wheel; record head.
A-207	110147-501	KNOB, control: assembly, Dark.
A-208	110312-501	KNOB, control: assembly; Light.
A-209	110036	PLATE, erase head mounting.
A-210	110029	BRACKET, erase switch.
A-211	210180-501	BRACKET, clutch lifter: supply side.
A-212	110014	PLATE, switch mounting.
A-213	107998	PLATE, switch.
A-214	110032	BRACKET, switch actuator.
A-215	110327-PL1	PANEL, etched: assembly.
A-216	210133	SPACER, left side.
A-217	210134	SPACER, right side.
A-218	110162	BLOCK, wood: ventilator hold down.
A-219	10-108082-1	HANDLES, for Table Model.
A-220	206699	PANEL, control: embossed.
B-1	206322	MOTOR, drive: A.C. 115 V; 60 cycles; four pole; shaded pole induction type; includes cooling fan and set screw.

MODELS BK-442, BK-443P, BK-437, BK-437S, BK-439, BK-441

Symbol	Part Number	Description
B-2	207259	MOTOR, drive: A.C. 115 V; 50 cycles; four pole; shaded pole induction type; includes cooling fan and set screw.
B-11	206432-501	MOTOR assembly, 60 cycle; includes 60 cycle motor; B-1; and motor mounting assembly; motor mounting assembly is the same for 50 or 60 cycle motor.
B-12	107524-PL1	MOTOR assembly, 50 cycle; includes 50 cycle motor; B-2; and motor mounting assembly; motor mounting assembly is the same for 50 or 60 cycle motor.
E-6	104099-2	BOARD, terminal.
E-20	110098-501	ERASE HEAD, assembly; includes cable assembly and connecting plug.
E-21	310226-501	RECORD REPRODUCE HEAD Assembly: Includes cable assembly and connecting plug.
E-22	11528-35	LUG, soldering.
H-1	5-3219	GROMMET, rubber.
H-9		SCREW, self tapping: #10 x ¾" long; type "Z"; round head.
H-11	100511	CLAMP, cable.
H-17	106723	ESCUTCHEON; for 6E5 Volume indicator.
H-18	107185	NUT, reel clamp; Antique Bronze.
H-19		NUT, hex: #8-32 small pattern.
H-20		SCREW, set: #8-32 x ⅝" long; allen head; cup point.
H-101		SCREW, knurled thumb: #6-32 x ¼" long; Antique Bronze.
H-102		SCREW, machine: #10-24 x ⅜" long; Sems hex head.
H-103		SCREW, set: #8-32 x ¼" allen head; cup point.
H-104		WASHER, external lock: #10.
H-105	106120-1	WASHER, motor mounting.
H-107		NUT, hex: ⅜-32.
H-109		WASHER, internal lock; #6.
H-110	106454-1	NUT, speed: Tinnerman C-991-440; #4-40.
H-111		NUT, hex: #4-40.
H-112		SCREW, machine: #4-40 x ½" long; round head.
H-115	106117	PIN, clutch lifter.
H-116		WASHER, internal lock: ½".
H-117	106157	NUT, hex: ½-20 N. C. 2 thread.
H-123	106179	SPACER, vibration mounting.
H-124	106671	WASHER, plain: .172" I.D. x ½" O.D. x .049" thick.
H-125		WASHER, internal lock: #8.
H-126		NUT, hex: #8-32.
H-128		WASHER, internal lock: ⅜".
H-130	106173	SPACER, capstan drive: fibre, used when necessary.
H-132		WASHER, spring lock: #10.
H-133		SCREW, cap: # 10-32 x ⅜" long; socket head.
H-135		WASHER, internal lock: #4.
H-152		SCREW, wood: #6 x ½" long; flat head.
H-160		NUT, hex: #6-32.
H-200	107185-1	NUT, reel clamp: Chrome.
H-201		SCREW, knurled thumb: #6-32 x ¼" long: Chrome.
H-202		SCREW, machine: #4-40 x 3/16" long; slot B.H.; Antique Bronze.
H-203		SCREW, machine: #4-40 x 3/16" long; slot B.H.; Chrome.
H-204		WASHER, plain: #10.
H-205	108566	WASHER, shim.
H-206	1-104914	CLAMP, cable.
H-207		SCREW, #8 x½" long: P. K.; type "Z."
H-208		SCREW, machine: #6-32 x ⅜" long; round head.
H-209		SCREW, machine: #8-32 x ⅜" long; Sems hex head; elw.
H-210	108605	WASHER, shim.
H-211	110089	WASHER, plain: control shaft.
H-212		SCREW, machine: #4-40 x 5/16" long; filister head.
H-213		SCREW, machine: #4-40 x ⅜" long; flat head.
H-214		WASHER, plain: #4.
H-215		SCREW, thread cutting: #6-32 x ⅜" long; Sems hex head; elw.
H-216		SCREW, machine: #4-40 x 1" long; Philips flat head.
H-217		SCREW, machine: #8-32 x 5/16" long; Philips round head.
H-218		WASHER, internal lock: 15/32".
H-219		SCREW, #6 x ¼"; Thread cut; Type "1".
H-220	L-83	LUG, soldering.

MODELS BK-442, BK-443P, BK-437, BK-437S, BK-439, BK-441

Symbol	Part Number	Description
H-221		SCREW, machine: #6-32 x ¼" long; Sems hex head.
H-222		SCREW, machine: #6-32 x ⅜" long; Sems hex head.
H-223		SCREW, machine: #6-32 x ¼" long; filister head.
H-224		SCREW, machine: #6-32 x ¼" Philips flat head.
H-225		SCREW, machine: #6-32 x ⅜" Philips flat head.
H-226		WASHER, plain; #6.
H-227		SCREW, machine: #6-32 x ¼" long; Philips binding head.
H-228		SCREW, machine: #4-40 x ¾" Philips head.
H-229		SCREW, machine: #10-24 x ½" long; Sems hex head; type "1" thread cut ELW.
H-230		WASHER, external lock: #6.
H-231		WASHER, external lock: #8.
H-232		SCREW, Machine: #4-40 x ½" long; Philips round head; Antique Bronze.
H-233		SCREW, machine: #6-32 x ½" long; Philips flat head.
H-234		SCREW, machine: #6-32 x 1¾" long; Round head.
H-235		SCREW, machine: #8-32 x ⅜" long; Philips flat head.
H-236		SCREW, machine: #10-32 x ⅜" long; Philips round head.
H-237		SCREW, machine: #10-32 x ⅝" long; Philips flat head.
H-238		SCREW, wood: #4 x ⅜" long; Philips round head.
H-239		SCREW, wood: #6 x ¼" long round head.
H-240		SCREW, wood: #6 x ⅜" long; Philips round head.
H-241		SCREW, wood: #6 x 7/16" long; Philips round head.
H-242		SCREW, wood: #6 x ½" long; Philips round head.
H-243		SCREW, wood: #6 x 1⅜" long; round head.
H-244	110197	SCREW, machine: to fasten handle to case and recorder.
H-245	110196	SCREW, machine: to fasten base mounting plate.
J-20	210182-501	JACK assembly.
J-21	21421-2	JACK, midget.
LS-1	305975	SPEAKER; Chaudagraph: 3.2 ohms voice coil; Table Model.
LS-100	310792-501	SPEAKER assembly; includes speaker, transformer and cable assembly; Table Model.
LS-200	210165-501	SPEAKER assembly; includes cable assembly; Portable Model.
LS-201	308912	SPEAKER, R.C.A. accordion; Portable Model.
MI-5	211032-501	MICROPHONE, crystal: includes base, and cable assembly.
MI-6	200977-501	MICROPHONE, crystal: does not include base A-3.
MS-2	106129	PAD, pressure: record head.
MS-4	110075	PAD, pressure: erase head.
O-50	304838-501	REEL, Ribbon: Empty.
O-51	106516	RETAINER, thumb screw: flat washer.
O-52	104307-5	RING, retaining: "Truarc"; Cat. No. 5100-31; 281" I.D.
O-56	206148	CUP, clutch.
O-62	106472	PULLEY, motor drive: one half-hour recorder, 60 cycles.
O-64	104307-1	RING, retaining: "Truarc" No. 5100-25; .225" I.D.
O-65	106262	POST, ribbon guide.
O-67	206321	GUIDE, ribbon: right hand.
O-69	104307-6	RING, retaining: "Truarc" no. 5100-18; .170"-.164" I.D.
O-74	106143	SLEEVE, erase pin.
O-76	106340	BELT, rubber; clutch drive.
O-77	106339	BELT, rubber: capstan drive.
O-78	106364-501	BEARING, capstan spindle: sub-assembly.
O-83	106127	SHAFT, pressure wheel; record head.
O-84	106125	WHEEL, pressure; record head.
O-85	106128	SPRING, pressure wheel; record head.
O-200	206950	DISC, indexing.
O-201	210055-1	CUP, reel drive: reel support.
O-202	107980-501	PULLEY, clutch: sub-assembly.
O-203	109300-501	POST, reel: sub-assembly.
O-204	1-210072-501	BEARING assembly, clutch support.
O-205	108357	PULLEY, motor drive: one hour recorder 60 cycles.
O-206	107248	PULLEY, motor: one half hour recorder; 50 cycles.

MODELS BK-442, BK-443P, BK-437, BK-437S, BK-439, BK-441

Symbol	Part Number	Description
O-207	109786	PULLEY, motor: one hour recorder; 50 cycles.
O-208	210093-501	PRESSURE WHEEL assembly, tape pressure; record head.
O-209	210043	GUIDE, ribbon: left hand.
O-210	110056-501	ARM assembly, erase head pressure.
O-211	110076	SPRING, pressure arm.
O-212	110078	SPRING, pressure wheel bracket.
O-213	110039	SPRING, control knob.
O-214	110030	SPRING, control shaft.
O-215	104307-10	RING, retaining. "Truarc" No. 5100-34; .304" .311" I.D.
O-216	110058-501	CUP assembly, control.
O-217	110061-501	SHAFT assembly, control.
O-218	110028	CLAMP, control mounting.
O-219	110027	SPRING, leaf erase switch.
O-220	110016	PIN, erase switch actuating.
O-221	104644-2	RING, retaining: Waldes Kohinoor; Type "E" No. 5133-12; .094" I.D.
O-222	110057-501	CONTROL ARM assembly.
O-223	110052	SPRING, erase actuator.
O-224	110046	ARM, switch disabling.
O-225	206460-501	CAPSTAN, drive. assembly includes spindle, spindle bearing, flywheel, pulley, lower bearing and mounting bracket, one-half hour recorder.
O-226	209823-501	CAPSTAN, drive: assembly includes spindle, spindle bearing, flywheel, pulley, lower bearing, and mounting bracket, one hour recorder
O-227	208190-501	CAPSTAN, drive: sub-assembly with plates for one half-hour recorder.
O-228	209800-501	CAPSTAN, drive: sub-assembly with plates for one hour recorder.
O-229	108189-501	CAPSTAN, drive sub-assembly includes shaft and pulley for one-half or one hour recorder.
O-230	108192	DISCS, flywheel: for all types of recorders.
O-231	104636-1	BALL, steel: 1/8" diameter.
O-232	310090-501	CHASSIS assembly, mechanical: includes posts; clutch lifter lever; clutch lever.
O-233	207143	GUIDE, belt.
O-234	210199-501	PLATE assembly, right side.
O-235	210198-501	PLATE assembly, left side.
O-236	210192-501	SUPPORT assembly, right side.
O-237	210193-501	SUPPORT assembly, left side.
O-238	110026	GRILLE, speaker.
O-239	106697-1	GRILLE, cloth. for speaker.
O-240	111015	SPACER speaker transformer.
O-241	210189	GRILLE, ventilator.
O-242	206903	BACK, cabinet: Table Model.
O-243	210178	REEL, cord.
O-244	105785	HOLDER, microphone base.
O-245	110802-PL1	ADAPTER, microphone: to adapt microphone to floor stand.
O-246	104788	CLIP, microphone
P-2	110636	CONNECTOR, male contact: 2 prong.
P-5	106765	CONNECTOR, male. 4 prong; does not include shell P-11.
P-11	106764	SHELL; for connector P-5.
S-20	110086	SWITCH, erase; includes mounting screws.
S-21	110059-501	SWITCH assembly tape brak
S-22	110111	SWITCH, toggle.
U-5	110203-PL1	AMPLIFIER, assembly: Portable Model; does not include power supply U-6.
U-6	310209-501	CHASSIS, assembly power supply: complete, Portable Mod
U-7	110250-PL1	AMPLIFIER, A.F.: Record reproducer amplifier chassis wired, complete with tubes, Table Model.
U-8	110347-PL1	RECORDER assembly mechanical chassis, rotary knob: Table Model.
U-9	110206-PL18	RECORDER assembly, mechanical chassis; Portable Model.
W-3	106515	STRAP, ground.
W-10	108672-1	CABLE, pow eliptical used o earlier models, has been replaced on later models by a circular power cable #1111/8-1. Not interchangable.
W-11	111178-1	CABLE, power circular used on later models (replaces elip power cable #1086 1-1 Not interchangeable).
151	309039-501	CABINET: f housing comple recorder/reproducer mechanism and amplifier: Table Model
251	510194	CASE, carrying, for mounting amplifier and recorder mechanism; includes cover.
601	2-103468-2	KNOB, control. for amplifier controls.

SYMPTOM	CAUSE	REMEDY
POOR FREQUENCY RESPONSE	1. Accumulation of dirt on ribbon, residue on record/play head.	1. Clean head.
	2. Too much or too little bias. This can be caused by the frequency varying from the desired 40 Kc.	2. Replace faulty component.
	3. Defective component in compensating network.	3. Replace.
RIBBON SPEED TOO SLOW	1. Pressure pads on record and erase head—excessive pressure.	1. Readjust.
	2. Rewind clutch misadjusted causing it to be engaged.	2. Readjust.
	3. Capstan flywheel shaft binding.	3. Clean capstan and realign.
	4. Motor shaft binding in bearings.	4. Loosen bearings and oil or replace motor.
	5. Capstan badly worn.	5. Replace.
WOW AND FLUTTER	1. Pressure wheel defective, binding, or rubbing on capstan bearing housing.	1. Replace defective wheel. Remove source of binding (check wheel for possible source), also check alignment of pressure spring against shaft. See "Adjustment of Roller Pressure", Page 7.
	2. Excessive pressure of pressure pad against record/play head.	2. Readjust—See "Adjustment of Ribbon Tension" Page 7.
	3. Binding motor shaft bearing.	3. Replace motor.
	4. Binding capstan lower bearing.	4. Replace capstan drive assembly.
	5. Binding reel-post bearing.	5. Clean or replace bearing or reel-post.
	6. Damaged capstan drive belt.	6. Replace belt.
	7. Bent capstan.	7. Replace capstan drive assembly.
RIBBON BREAKS AT CAPSTAN SPINDLE	1. Too little pressure on head pads.	1. Adjust pressure pads.
	2. Dirty capstan spindle.	2. Clean.
	3. Worn capstan spindle.	3. Replace.
	4. Tape guide post bent.	4. Align to right angle with panel.
	5. Pressure wheel worn.	5. Replace.
FAILURE TO MOVE TAPE WITH POWER ON	1. Tape not properly threaded thru tape break switch.	1. Thread tape properly.
	2. Fuse blown.	2. Replace.
	3. Clutch misadjusted.	3. Adjust.
	4. Capstan drive belt worn.	4. Replace.
	5. Defective motor switch.	5. Replace.
	6. Defective motor.	6. Replace.
	7. Defective tape break switch.	7. Replace.
	8. Tape break switch not adjusted properly.	8. Adjust.
	9. Switch disabling arm bent.	9. Adjust.
NO ERASE AND THE EYE DOES NOT OPERATE	1. Erase button not depressed	1. Press
	2. Erase switch not functioning	2. Adjust
	3. Defective record play switch S1	3. Replace
	4. Erase actuater spring bent	4. Adjust by bending or replace
INSUFFICIENT OR NO ERASE, EYE OPERATES	1. Dirty head	1. Clean
	2. Faulty 6SN7 V3	2. Replace
	3. Faulty Component in V3 circuit	3. Replace

	4. Faulty Erase head	4. Replace
	5. Insufficient pressure on erase head pad.	5. Adjust
DOES NOT RECORD, EYE FUNCTIONS	1. Shorted Head	1. Replace
	2. Faulty wiring to record head	2. Correct Wiring
	3. C 26 open	3. Replace
	4. Faulty Contact on S1	4. Clean or replace
DOES NOT RECORD, EYE DOES NOT FUNCTION	1. Erase button not pressed	1. Press
	2. Erase switch not functioning	2. Adjust
	3. Defective record play switch S1	3. Replace
	4. Erase actuater spring bent	4. Adjust by bending or replace
	5. Faulty 1st stage 6J7 or Component	5. Replace
	6. Faulty 2nd stage 6SJ7 or Component	6. Replace
DISTORTION IN PLAYBACK, MONITOR OK	1. Worn Head pad on record head	1. Replace
	2. Insufficient pressure on head	2. Adjust V
	3. Leaky C 26	3. Replace
	4. Flutter	4. Clean capstan or replace if worn
DISTORTED RECORDING	1. Insufficient or no bias	1. Check tube V3 and components in associated circuit.
HIGH HUM	1. Defective tubes or ground connections.	1. Replace or rewire accordingly.
	2. One side of filament shorted to ground.	2. Check Pilot lamp holder and associated wiring.
	3. Open grid circuit.	3. Rewire.
	4. Microphonic tube.	4. Replace defective tube.
MICROPHONICS	1. Microphonic 6J7 tube V-1	1. Select non-microphonic tube and replace.
WEAK OR NO OUTPUT	1. Defective fuse, power cord or plug.	1. Replace
	2. Poor contacts or wiring connections on output plug.	2. Clean contacts or replace wire.
	3. Defective tubes.	3. Replace.
	4. Defective cord or resisitors.	4. Replace.
	5. Defective output transformer or speaker.	5. Replace.
	6. Open playback head.	6. Replace.
	7. Dirty pole pieces of playback head.	7. Clean.
	8. Defective selector switch contacts.	8. Clean or replace.
	9. Defective power transformer.	9. Replace.
FAILURE OF CAPSTAN TO PULL RIBBON	1. Capstan spindle-shaft binding in lower bearing.	1. Replace capstan drive assembly.
	2. Broken or weak capstan drive belt.	2. Replace belt.
	3. Capstan spindle jammed with accumulated ribbon residue on bearing.	3. Clean throughly.
	4. Roller pressure insufficient.	4. See "Adjustment of Roller Pressure" Page 7.
FAILURE TO TAKEUP RIBBON OR WINDS TO LOOSELY ON TAKEUP REEL	1. Clutches misadjusted.	1. Readjust—See "Adjustment of Clutches" Page 9.
	2. Ribbon guides misadjusted.	2. Readjust—See "Adjustment of Ribbon Guides", Page 7.
	3. Clutch belt slipping.	3. Clean motor drive pulley with carbon-tetrachloride. Reposition motor to tighten belt. If unsatisfactory, replace belt.

VOLTAGE AND RESISTANCE CHART

These measurements are from indicated Pin to Ground. Voltages are plus unless otherwise indicated, and are at 117 Volts, 60 cycle. K indicates value of resistance times 1000. Remove line connection when measuring resistances.

TUBE	POSITION	MEASURE	PIN 1	2	3	4	5	6	7	8
V-1	PLAY	VOLTAGE	0	30*	100	35	0	—	30*	1.1
		RESISTANCE	0	22 K	500 K	2.2 meg.	0	22 K	22 K	2200
6J7***	RECORD	VOLTAGE	0	30*	95	37	0	—	30*	1.1
		RESISTANCE	0	22 K	500 K	2.2 meg.	0	22 K	22 K	2200
V-2	PLAY	VOLTAGE	0	30*	0	0	3.5	120	30*	110
		RESISTANCE	0	22 K	0	1 meg.	390	45 K	22 K	150 K
6SJ7	RECORD	VOLTAGE	0	30*	0	0	3	100	30*	120**
		RESISTANCE	0	22 K	0	1 meg.	390	45 K	22 K	150 K
V-3	PLAY	VOLTAGE	0	0	0	0	0	0	30*	30*
		RESISTANCE	220 K	open	22 K	220 K	open	22 K	22 K	22 K
6SN7	RECORD	VOLTAGE	—0xx	300x	0	—3x	300x	0	30*	30*
		RESISTANCE	220 K	100 K	K	220 K	100 K	0	22 K	22 K
V-4	PLAY	VOLTAGE	0	160	6	0	30	1.2	30*	30*
		RESISTANCE	470 K	150 K	2200	220 K	300 K	2200	22 K	22 K
6SN7	RECORD	VOLTAGE	0	155	6	0	30	1.1	30*	30*
		RESISTANCE	470 K	150 K	2200	25 K	300 K	2200	22 K	22 K
V-5	PLAY	VOLTAGE	0	30*	310	325	0	0	30*	19
		RESISTANCE	0	22 K	100 K	100 K	470 K	open	22 K	390
6V6	RECORD	VOLTAGE	0	30*	300	315	0	0	30*	17
		RESISTANCE	0	22 K	100 K	100 K	470 K	open	22 K	390
V-6	PLAY	VOLTAGE	30*	0	0	0	0	30*	—	—
		RESISTANCE	22 K	open	2.2 meg.	open	0	22 K	—	—
6E5	RECORD	VOLTAGE	30*	30	—¾	310	0	30	—	—
		RESISTANCE	22 K	1 meg.	2.2 meg.	100 K	0	22 K	—	—
V-7	PLAY	VOLTAGE	—	350	—	325 a.c.	—	325 a.c.	—	350
		RESISTANCE	22 K	100 K	22 K	100 K	open	100 K	open	100 K
5Y3	RECORD	VOLTAGE	—	330	—	310 a.c.	—	310 a.c.	—	330
		RESISTANCE	22 K	100 K	22 K	100 K	open	100 K	open	100 K

NOTES

*—6.3 volts a.c. between pins so marked—4.5 volts a.c. on 6J7 pins 2 to 7.

**—70 volts at 40 kc.

***—Grid Cap—130 ohms play—1 meg. record.

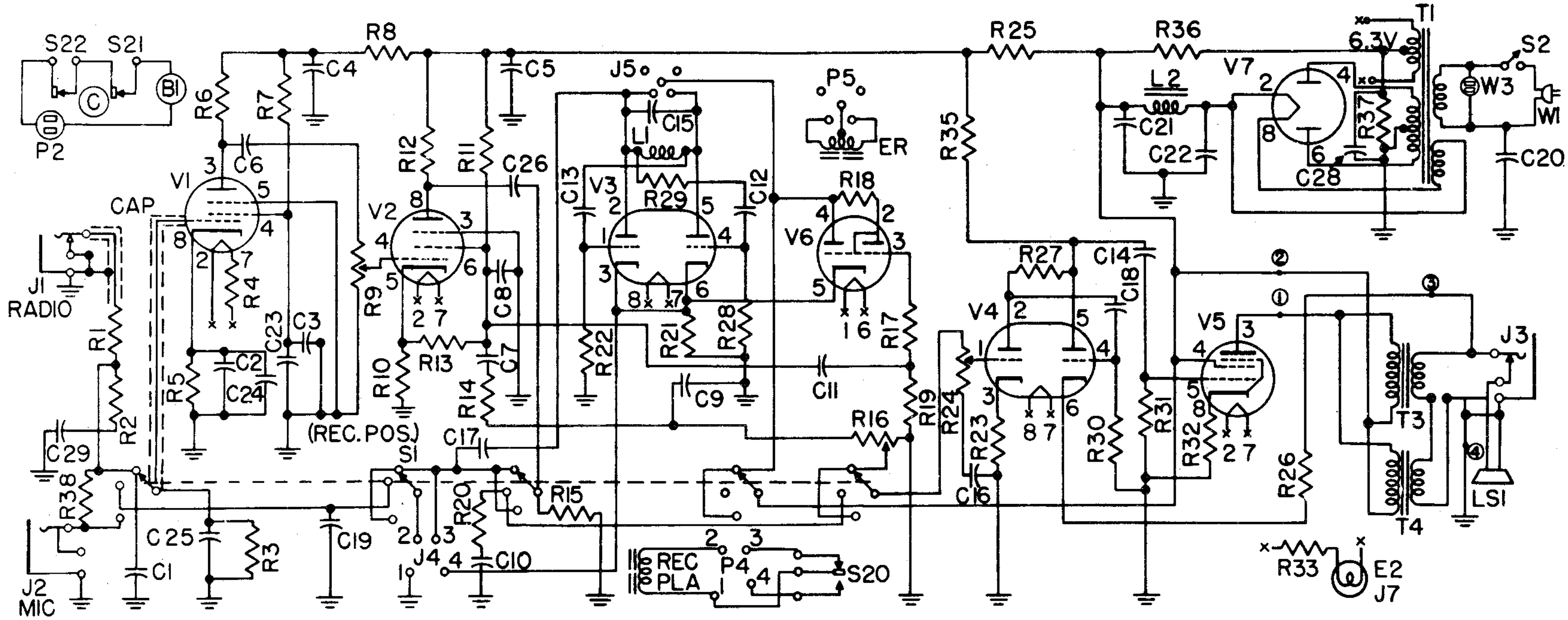
x—80 volts at 40 kc.
xx—25 volts at 40 kc.

Signal measurements: Line 117 volts, 60 cycles. Record position 0.2 volts, 300 cycle signal radio input, V-3 removed. Measured with electronic a.c. voltmeter (½ meg. input).

Location	Signal Strength	Location	Signal Strength	Location	Signal Strength	Location	Signal Strength
Radio input . .	0.2 Volts	V-2 Plate-Pin 8 . .	1. Volt	V-4 Pin 5 . . .	9 Volts	V-5 Pin 3 . . .	130 Volts
V-1 Grid Cap . .	.005 Volts	V-2 Screen-Pin 6 .	5. Volts	V-4 Pin 1 . . .	9 Volts	Voice Coil-output .	2.8 Volts
V-1 Plate-Pin 3 . .	0.7 Volts	V-6 Pin 3 . . .	3. Volts	V-4 Pin 2 . . .	23 Volts		
V-2 Grid-Pin 4 . .	0.7 Volts	V-4 Pin 4 . . .	0.8 Volts	V-5 Pin 5 . . .	23 Volts		

MODEL BK-442

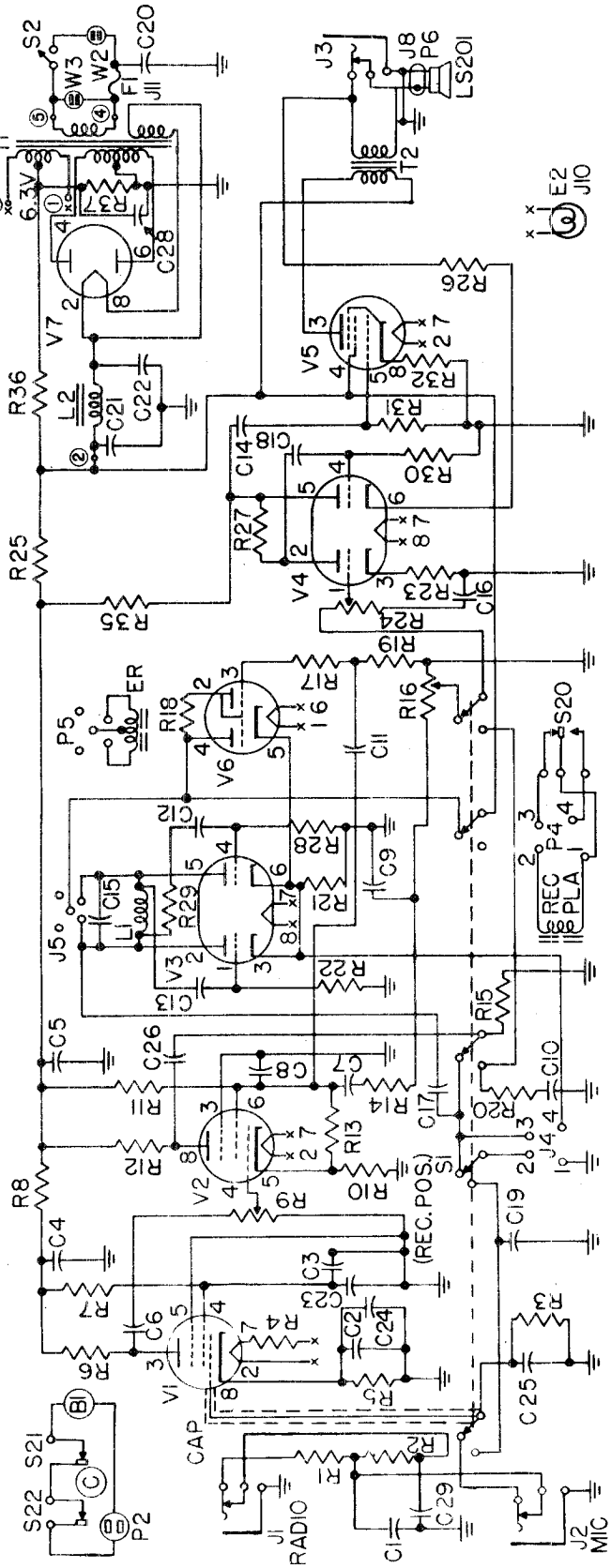
MODEL BK-442 SCHEMATIC



SYM.	DESCRIPTION	PART NUMBER
B-1	MOTOR	206322
C-1	.001 MFD.	3-106093-3
C-2	20-20-20 MFD., 450-450-25 V.	103253
C-3	.05 MFD.	2-106094-2
C-4	20-20-20 MFD., 450-450-25 V.	103253
C-5	20-20-20 MFD., 450-450-25 V.	103253
C-6	.005 MFD.	3-106093-4
C-7	.05 MFD.	2-106094-2
C-8	.001 MFD.	3-106093-3
C-9	.001 MFD.	3-106093-3
C-10	.05 MFD.	2-106094-2
C-11	.05 MFD.	2-106094-2
C-12	.0001 MFD.	1-109354-3
C-13	.0001 MFD.	1-109354-3
C-14	.005 MFD.	3-106093-4
C-15	.001 MFD.	1-106972-5
C-16	.005 MFD.	3-106093-4
C-17	.002 MFD.	2-106093-6
C-18	.005 MFD.	3-106093-4
C-19	.002 MFD.	2-106093-6
C-20	.002 MFD.	106100-6
C-21	20-20 MFD., 450-450 V.	102711
C-22	20-20 MFD., 450-450 V.	102711
C-23	.001 MFD.	1-106972-5
C-24	.001 MFD.	1-106972-5
C-25	50 MMFD.	1-107461-2
C-26	.02 MFD.	3-106093-7
C-28	.05 MFD.	1-109348-5
C-29	.03 MFD.	3-106093-8
J-1	JACK	21421-2
J-2	JACK	21421-2
J-3	JACK	21421-2
J-4	SOCKET, WAFER-4 CONTACT	103730
J-5	SOCKET, 5 CONTACT	107470
J-6	SOCKET, 4 CONTACT	106730
J-7	SOCKET, PILOT LAMP	107340
L-1	COIL, OSCILLATOR	103865
L-2	CHOKE, FILTER	200925
LS-1	SPEAKER, MAGNETIC	305975
P-1	PLUG, 4 PRONG	106765
P-2	CONNECTOR, MALE-2 PRONG	110636
P-4	PLUG	106765
P-5	PLUG	107469
R-1	1 MEG. 1/2 W.	3-106771-3
R-2	22 K. 1/2 W.	3-106771-7
R-3	1 MEG. 1/2 W.	3-106771-3
R-4	5 1 W. (OR 4.7 OR 5.1)	1-106005-3
R-5	2.2 K. 1/2 W.	3-106771-2
R-6	470 K. 1/2 W.	1-107989-9
R-7	2.2 MEG. 1/2 W.	3-106771-8
R-8	22 K. 1/2 W.	3-106771-7
R-9	1 MEG. POTENT.	103469
R-10	390 1/2 W.	3-106771-5
R-11	47 K. 1 W.	2-106772-3
R-12	47 K. 1 W.	2-106772-3
R-13	47 K. 1/2 W.	2-106771-10
R-14	100 K. 1/2 W.	3-106771-12
R-15	220 K. 1/2 W.	3-106771-1
R-16	25 K. POTENT.	103469-2
R-17	220 K. 1/2 W.	3-106771-1
R-18	1 MEG. 1/2 W.	3-106771-3
R-19	2.2 MEG. 1/2 W.	3-106771-8
R-20	4.7 K. 1/2 W. ALT. 103713-22	103806-18
R-21	22 K. 1/2 W.	3-106771-7
R-22	220 K. 1/2 W.	3-106771-1
R-23	2.2 K. 1/2 W.	3-106771-2
R-24	100 K. POTENT.	106762-1
R-25	2.2 K. 1 W.	3-106772-4
R-26	2.2 K. 1/2 W.	3-106771-2
R-27	220 K. 1/2 W.	3-106771-1
R-28	220 K. 1/2 W.	3-106771-1
R-29	22 K. 1/2 W.	3-106771-7
R-30	470 K. 1/2 W.	103806-12
R-31	470 K. 1/2 W.	103806-12
R-32	390 1 W.	2-106772-5
R-33	5 1 W.	1-106005-3
R-35	47 K. 1 W.	2-106772-3
R-36	220 K. 1/2 W.	3-106771-1
R-37	22 K. 1/2 W.	3-106771-7
R-38	1 MEG. 1/2 W.	3-106771-3
S-1	SWITCH, SELECTOR	106746-3
S-2	SWITCH, PART OF R-24	
S-20	SWITCH, ERASE	110086
S-21	SWITCH ASSEM., TAPE BREAK	110059-501
S-22	SWITCH, TOGGLE-S.P.D.T.	110111
T-1	TRANSFORMER, POWER	204902
T-3	TRANSFORMER, OUTPUT	200923
T-4	TRANSFORMER, OUTPUT	200923
V-1	TUBE, ELECTRON 6J7	7075
V-2	TUBE, ELECTRON 6SJ7	105205
V-3	TUBE, ELECTRON 6SN7	103185
V-4	TUBE, ELECTRON 6SN7	103185
V-5	TUBE, ELECTRON 6V6	102709
V-6	TUBE, ELECTRON 6E5	105206
V-7	TUBE, ELECTRON 5Y3	102705
W-1	CORD, POWER	206923
W-3	CONNECTOR, FEMALE-2 CONTACT	104765

MODEL BK-443

MODEL BK-443 SCHEMATIC

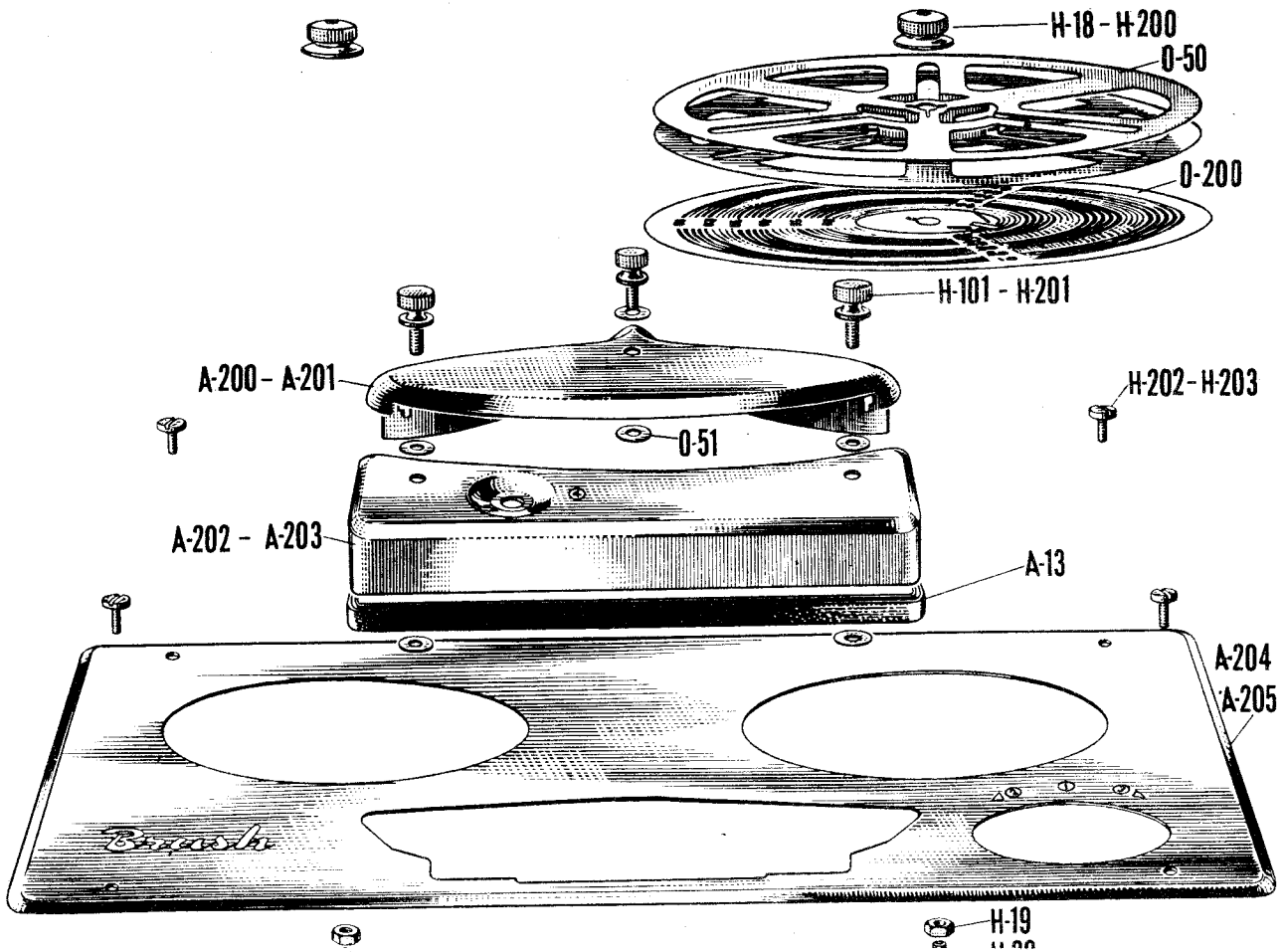


SYM.	DESCRIPTION	PART NUMBER
B-1	MOTOR	206322
C-1	.001 MFD.	3-106093-3
C-2	20-20-20 MFD., 450-450-25 V.	103253
C-3	.05 MFD.	2-106094-2
C-4	20-20-20 MFD., 450-450-25 V.	103253
C-5	20-20-20 MFD., 450-450-25 V.	103253
C-6	.005 MFD.	3-106093-4
C-7	.05 MFD.	2-106094-2
C-8	.001 MFD.	3-106093-3
C-9	.001 MFD.	3-106093-3
C-10	.05 MFD.	2-106094-2
C-11	.05 MFD.	2-106094-2
C-12	.0001 MFD.	1-109354-3
C-13	.0001 MFD.	1-109354-3
C-14	.005 MFD.	3-106093-4
C-15	.001 MFD.	1-106872-5
C-16	.005 MFD.	3-106093-4
C-17	.002 MFD.	2-106093-6
C-18	.005 MFD.	3-106093-4
C-19	.002 MFD.	2-106093-6
C-20	.005 MFD.	106100-6
C-21	20-20 MFD., 450-450 V.	102711
C-22	20-20 MFD., 450-450 V.	102711
C-23	.001 MFD.	1-106872-5
C-24	.001 MFD.	1-106872-5
C-25	50 MMF.	1-107461-2
C-26	.25 MFD.	3-106093-7
C-28	.05 MFD.	2-106094-2
C-29	.03 MFD.	3-106093-8
E-2	LAMP, PILOT	105710-1
F-1	FUSE	102625-9
J-1	JACK	21421-2
J-2	JACK	21421-2

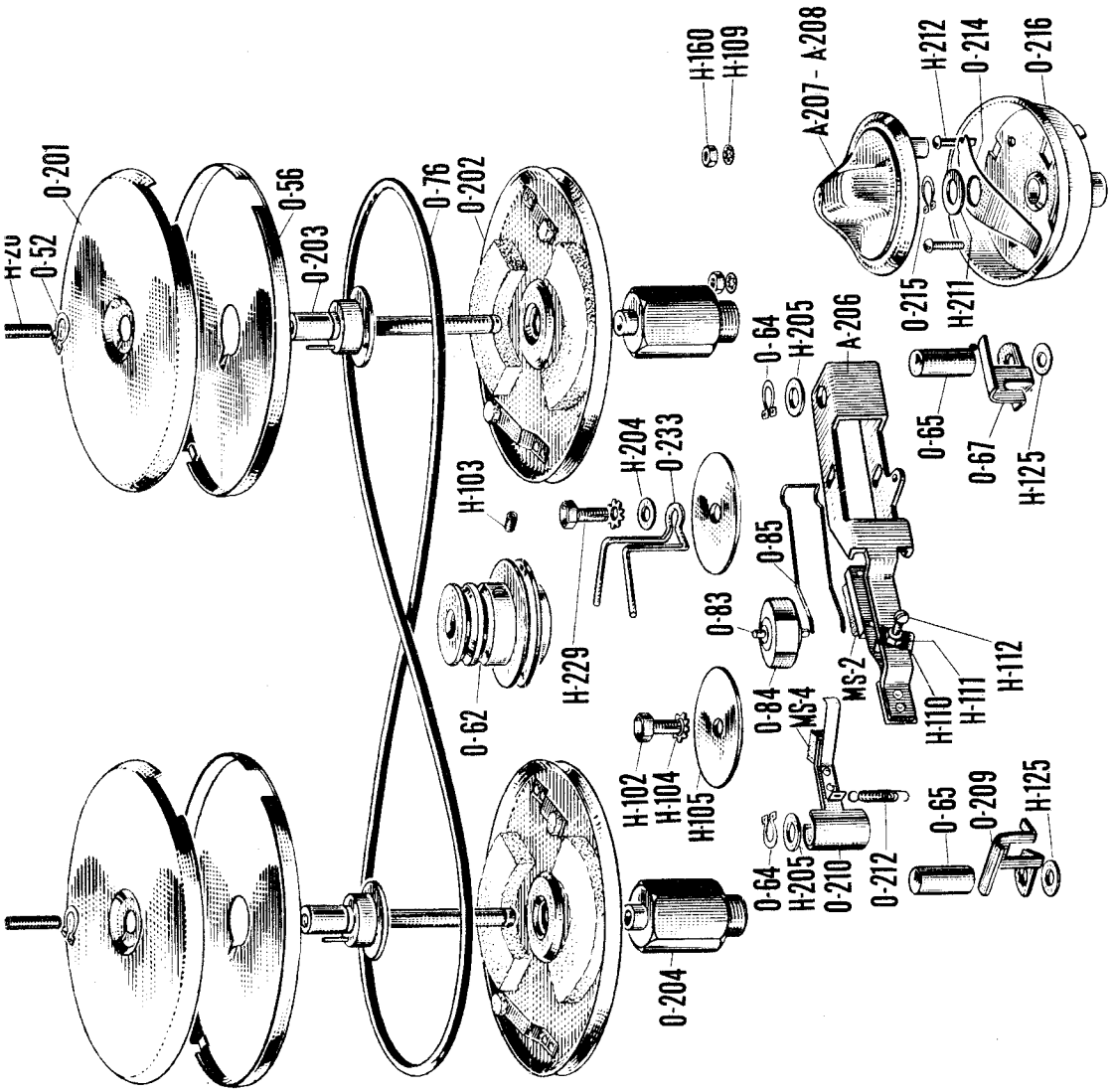
SYM.	DESCRIPTION	PART NUMBER
J-3	JACK	21421-2
J-4	SOCKET, WAFER-4 CONTACT	106730
J-5	SOCKET, 5 CONTACT	107470
J-8	CONNECTOR	104546
J-10	HOLDER, INDICATOR LAMP	110352
J-11	HOLDER, FUSE	107147
L-1	COIL, OSCILLATOR	103865
L-2	CHOKE, FILTER	200925
LS-201	SPEAKER, MAGNETIC	308912
P-1	PLUG, 6 PRONG	104212-3
P-2	CONNECTOR, MALE-2 PRONG	110536
P-4	PLUG	106765
P-5	PLUG	107469
P-6	PLUG	106738-5
R-1	1 MEG. 1/2 W.	3-106771-3
R-2	22 K. 1/2 W.	3-106771-7
R-3	1 MEG. 1/2 W.	3-106771-3
R-4	5 1 W. (4.7 OR 5.1)	1-106005-3
R-5	2.2 K. 1/2 W.	3-106771-2
R-6	470 K. 1/2 W.	1-107989-9
R-7	2.2 MEG. 1/2 W.	3-106771-8
R-8	22 K. 1/2 W.	3-106771-7
R-9	1 MEG. POTENT.	103469
R-10	390 1/2 W.	3-106771-5
R-11	47 K. 1 W.	2-106772-3
R-12	47 K. 1 W.	2-106772-3
R-13	47 K. 1/2 W.	2-106771-10
R-14	100 K. 1/2 W.	2-106771-12
R-15	220 K. 1/2 W.	3-106771-1
R-16	25 K. POTENT.	103469-2
R-17	220 K. 1/2 W.	3-106771-1
R-18	1 MEG. 1/2 W.	3-106771-3
R-19	2.2 MEG. 1/2 W. ALT. 103806-18	3-106771-8

SYM.	DESCRIPTION	PART NUMBER
R-20	4.7 K. 1/2 W.	103713-22
R-21	22 K. 1/2 W.	3-106771-7
R-22	220 K. 1/2 W.	3-106771-1
R-23	2.2 K. 1/2 W.	3-106771-2
R-24	100 K. POTENT.	106762-1
R-25	2.2 K. 1 W.	3-106772-4
R-26	2.2 K. 1/2 W.	3-106771-2
R-27	220 K. 1/2 W.	3-106771-1
R-28	220 K. 1/2 W.	3-106771-1
R-29	2.2 K. 1/2 W.	3-106771-2
R-30	470 K. 1/2 W.	103806-12
R-31	470 K. 1/2 W.	103806-12
R-32	390 1 W.	2-106772-5
R-35	47 K. 1 W.	2-106772-3
R-36	220 K. 1/2 W.	3-106771-1
R-37	22 K. 1/2 W.	3-106771-7
S-1	SWITCH, SELECTOR	106746-3
S-2	SWITCH, PART OF R-24	
S-20	SWITCH, ERASE	110086
S-21	SWITCH ASSEM., TAPE BREAK	110059-501
S-22	SWITCH, TOGGLE-S.P.D.T.	110111
T-1	TRANSFORMER, POWER	204902
T-2	TRANSFORMER, OUTPUT	206913
V-1	TUBE, ELECTRON 6J7	7075
V-2	TUBE, ELECTRON 6SJ7	105205
V-3	TUBE, ELECTRON 6SN7	103185
V-4	TUBE, ELECTRON 6SN7	103185
V-5	TUBE, ELECTRON 6V6	102709
V-6	TUBE, ELECTRON 6E5	105206
V-7	TUBE, ELECTRON 5Y3	102705
*W-2	CONNECTOR, MALE-2 CONTACT	108673
W-3	CONNECTOR. FEMALE-2 CONTACT	104765

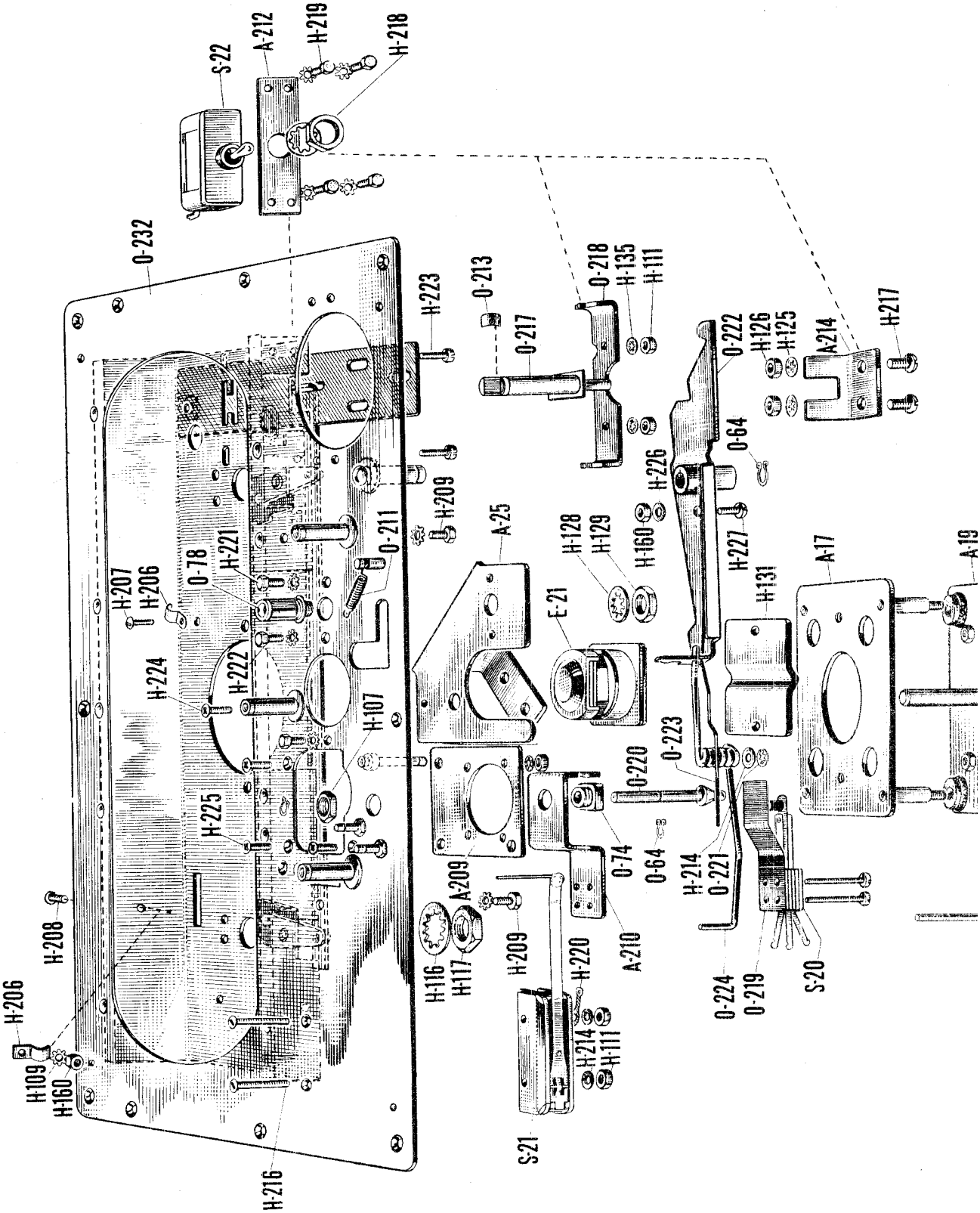
*W-2 Elliptical power socket has been replaced in later models with a circular receptacle #111180 (cables not interchangeable).

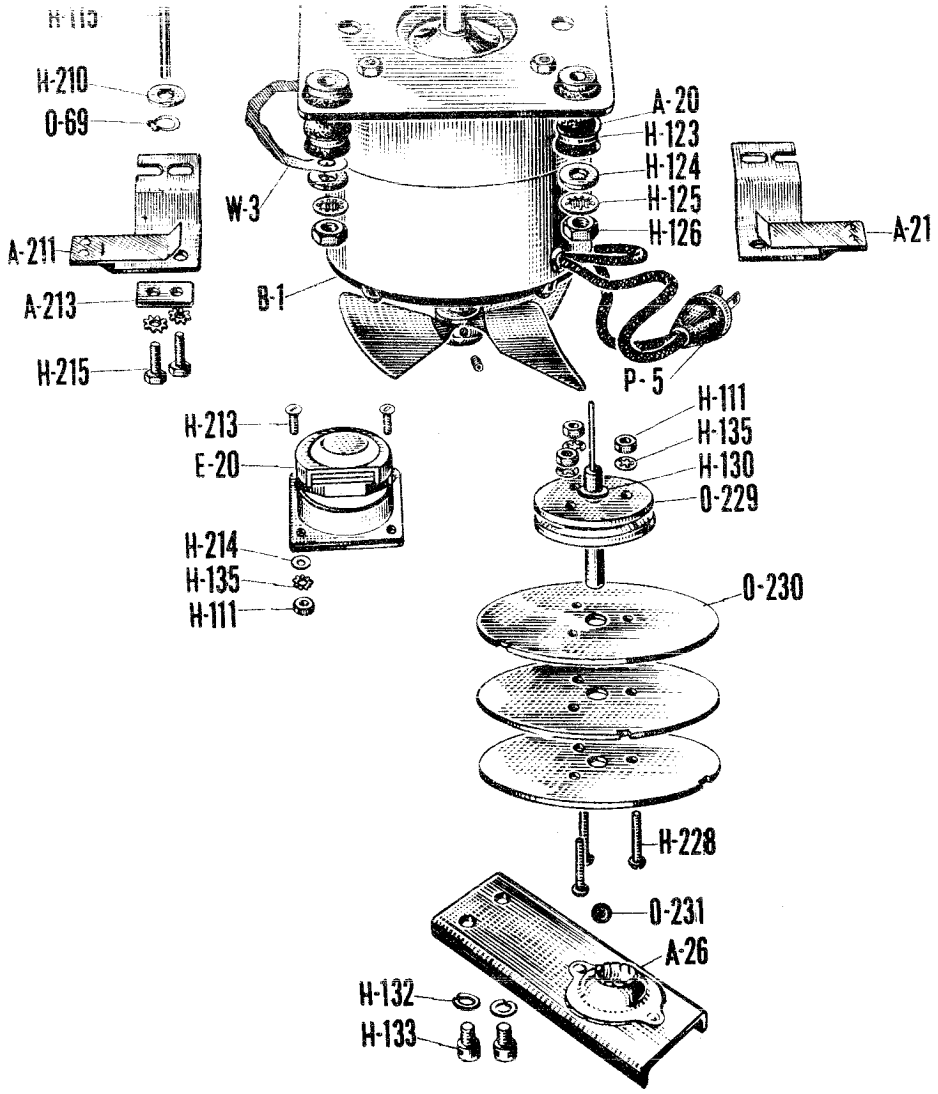

H-18 - H-200
O-50
O-200
H-101 - H-201
A-200 - A-201
H-202 - H-203
O-51
A-202 - A-203
A-13
A-204
A-205
H-19

MODELS BK-442, BK-443F, BK-437, BK-437S, BK-439, BK-441

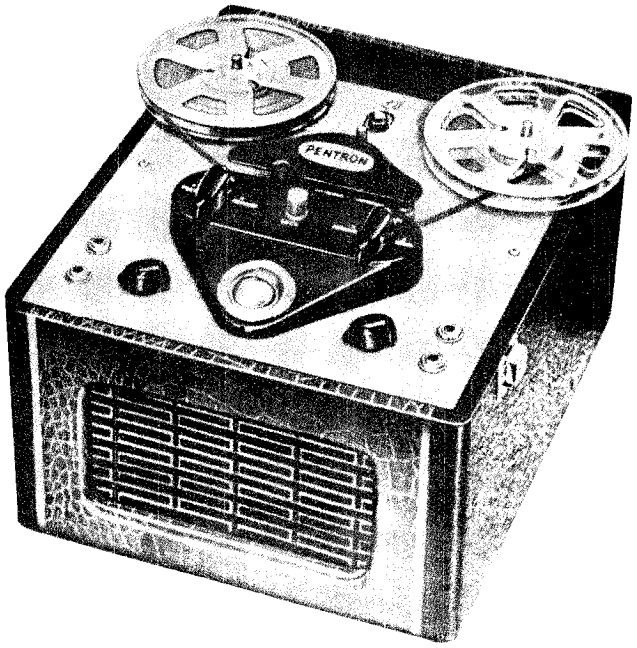


MODELS BK-442, BK-443P, BK-437, BK-437S, BK-439, BK-441





MECHANICAL CHASSIS, EXPLODED VIEW



The Pentron tape recorder is an instrument for making high fidelity recordings of music or speech on magnetic tape. Realistic reproduction of the recordings is provided by a self-contained, high power amplifier and speaker.

A brief description of the operating components follows. It is recommended that the prospective operator use this to familiarize himself with their operation before attempting to use the instrument.

TAPE — The Pentron recorder uses ¼" wide Magnetic Recording Tape with Type A winding. Type A winding simply means that the magnetic coating or dull side of the tape is wound facing in. Type B tape (dull side facing out) can be changed to Type A for use on this machine by merely rewinding with a half twist.

Either plastic or paper recording tape can be used. For best results, use a red oxide tape, preferably plastic. Since the Pentron recorder is very easy on tape, it is quite practical to use the higher priced plastic tape. Recordings can be played back and tape re-used many thousands of times without noticeable change in performance.

For use on this machine tape may be wound on either the popular 7" reel (1200 feet) or any smaller size reel.

Tape can be spliced by bringing the ends together (not lapped) and applying a small piece of transparent scotch tape to the shiny side on plastic tape or to the grey side on paper tape.

Always keep tape clean and store preferably in humidor cans, much the same as you would movie film.

CAPSTANS — There are two Capstans which control the speed of the recorder. The small Capstan which carries the tape past the heads at a speed of 3¾" per second, (one hour playing time in one direction on a 1200' reel), or the larger Capstan which moves the tape at 7½" per second, (one-half hour playing time in one direction on a 1200' reel). The smaller Capstan is permanently built into the machine and should not be removed unless service is required. The larger Capstan is a sleeve which can be slipped over the smaller Capstan and tightened effectively by turning its knurled head a few turns in a clockwise direction. MASTER CONTROL KNOB MUST BE IN "IDLE" POSITION, MACHINE MUST BE TURNED OFF, AND MOTOR RELEASE PIN MUST BE IN THE "IN" POSITION SO THAT CAPSTAN CANNOT BE PUT ON TOO TIGHTLY. Otherwise difficulty will be experienced in removing the Capstan. To remove the large Capstan, the motor must be turned OFF, the motor release pin in the OUT position, and with the Master Control Knob in the IDLE position, proceed to unscrew the Capstan. The initial loosening can be accomplished by grasping the knurled portion of the Capstan and giving it a quick twist in a counter-clockwise direction. If capstan is difficult to remove, grasp right hand reel spindle and push firmly toward rear of case at same time turning capstan counter-clockwise.

The smaller or slow speed Capstan is used for economic long period playing. The reproducing qualities are about the same as that of a very good AM radio broadcast.

The larger or high speed Capstan is recommended where best high fidelity is required particularly on exceptionally fine music, the reproducing qualities being equivalent to that of a very fine FM radio broadcast.

A recording made at high speed must be played back at high speed and similarly, a recording made at slow speed must be played back at slow speed.

DUAL TRACKS TWO CHANNEL — After a reel of tape has been recorded, the reel with the tape will be on the left hand spindle. To record on the second channel, turn the reel over and place it on the right hand spindle. It will then be in position for recording or playing back on the second track. On completion of the second track, you are then ready to repeat playing of the first track without rewinding. Switching of the reels selects the right track.

POWER SUPPLY — This unit operates only on 110 Volt, 60 Cycle, AC current. Use of any other supply directly into the unit will result in serious damage to the Amplifier section.

MECHANICAL INTERLOCK — An automatic mechanical interlock, not visible from outside, makes it impossible to actuate one control knob while the other is being used. Therefore, do not attempt to force the knobs.

TONE CONTROL — The Tone Control also contains the master switch which turns the amplifier and mechanism OFF and ON. The click of this switch can be heard when this Control Knob is turned to the extreme counter clockwise position.

The Tone Control decreases the high frequency response when turned clockwise. It is automatically disconnected during recording. Therefore, when recording from a radio be sure the tone control on the radio is set for maximum treble. These highs may be subdued with the Tone Control on Recorder during playback.

VOLUME CONTROL — This controls the volume for both playing and recording. For recording, the Volume Control should be set according to the reactions on the Volume Indicator Eye.

EXTERNAL AMPLIFIER JACK — To use your tape recorder with an external amplifier simply connect the external amplifier to the proper jack. The VOLUME and TONE controls on the recorder should be turned completely clockwise. The recorder will then operate through the external amplifier. Use the volume and tone controls on the external amplifier for proper adjustment.

EXTERNAL SPEAKER JACK—When an external speaker (3 voice coils) is connected to your recorder the internal speaker is automatically disconnected and the entire output will be through the external source. For privacy of playback a set of high impedance earphones can be plugged into this jack.

RADIO JACK — For recording or enjoying any radio program, plug your radio tuner in the Radio Jack, using other controls in the conventional manner for recording or listening. The radio jack will also take the output of any external high fidelity, high impedance pick up.

MOTOR RELEASE PIN — When this pin is pulled to the OUT position, the motor is engaged with the flywheel. When it is in the IN position the motor and flywheel are disengaged.

Always leave the Pin in the IN position when the machine is not in use. This prevents bumps or dents in the rubber surface of the flywheel which result in rough operation.

OPERATION

MASTER CONTROL KNOB — When this knob is turned to the PLAY position, the machine will reproduce the program recorded on the tape.

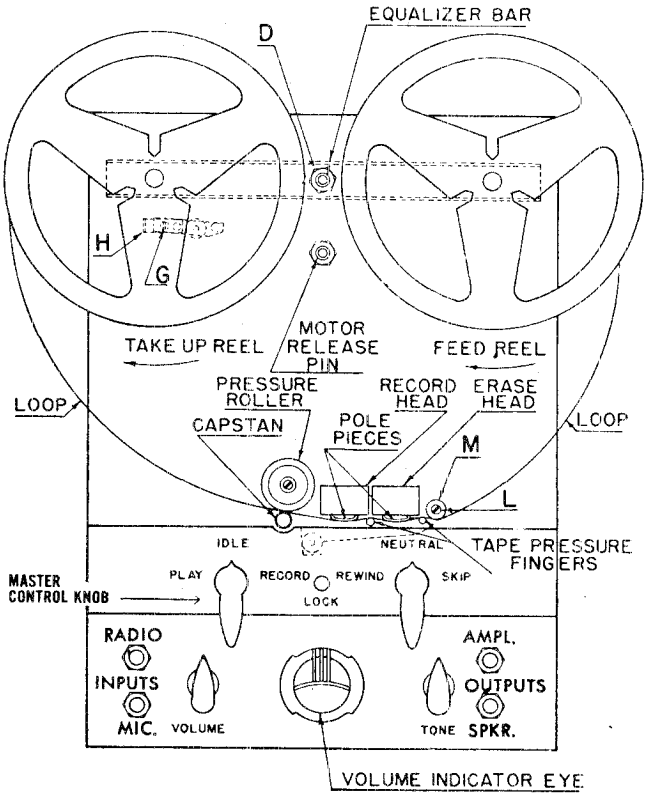


FIGURE - 1

When turned to the RECORD position, the machine will record whatever material that is desired. This position cannot be gone into without first pressing the RED

Lock Button. This is a safety feature which prevents accidental erasure of the recorded program. When turned to the IDLE position the tape will stand still, unless it is desired to rewind or skip.

REWIND AND SKIP KNOB — With the Master Control Knob in the IDLE position, turning this knob toward the REWIND position will cause the tape to rewind on the Feed Reel at any desired speed up to a top speed of 187 inches per second. Similarly, by reversing the knob and turning it toward the SKIP position you can reach the desired spot within a matter of seconds.

Switching the direction of this control knob will act as a very effective brake in cutting down the speed of the reels and it is recommended that this method be used where fast stopping is necessary. However, it is better for the mechanism if this fast-braking is used moderately.

NEVER GO FROM FAST REWIND INTO PLAY OR RECORD WITHOUT FIRST BRINGING THE REELS TO A STOP. FAILURE TO COMPLY WITH THIS MAY RESULT IN UNROLLED AND POSSIBLY TORN TAPE.

LOCK BUTTON — When this button is pushed, the machine is switched from a reproducer to a recorder. It thus erases whatever passes in front of the Erase Head whether the machine is playing, rewinding or recording. It must be depressed manually and it will stay down when the Master Control Knob is turned to RECORD. This makes it possible to make new recordings on tape which already has undesirable recordings on it and it can be held down manually when the Master Control Knob is in the PLAY position. This makes it a most desirable feature for spot erasing or dubbing in on pre-recorded tape. This can be done so rapidly that words can be erased and new ones added with split second accuracy.

VOLUME INDICATOR EYE — This is intended for use during recording. Ideal recording volume level is attained when the loudest portions of the signal just cause the eye to close. If too high a level is used, distortion will occur; too low a level will result in relatively higher background noises.

THREADING — Refer to Figure 1. Place an empty reel on the Take Up Reel Spindle (left hand spindle).

Place a reel of tape on the Feed Reel Spindle (right hand spindle) so that it unwinds clockwise. Be sure that both reels are engaged with the drive pins on the spindles. Bring the end of the tape over to the Take Up Reel and take up several turns of tape. A pencil or similar object is useful in holding the tape against the hub while making these preliminary turns. Now pick up the loop of tape between the reels and drop it into the slot in front of the Recording Head and between the Capstan and Pressure Roller. Make sure the tape is all the way down in the slot.

REPRODUCING OR PLAYING BACK RECORDED TAPE — Place reel of tape on machine. Plug into 110 Volts, 60 Cycle, AC receptacle and turn Tone Control Knob clockwise to switch ON position. Allow a few moments for the Amplifier to warm up as you would on a radio set. Now turn the Master Control Knob to PLAY and adjust the Volume and Tone Controls to suit. Do not press the RED Lock Button unless you wish to erase.

RECORDING—Using Microphone — Plug Microphone into the Mic. Jack. Set up the rest of the machine as you would for PLAY but do not turn the Master Control Knob as yet. It is generally advisable to set the volume level before starting the recording. To do this, hold down the Lock Button and adjust the volume control while a sample program is going on. (The tape is standing still.) Now you are ready to record. Start recording by turning the Master Control Knob to RECORD. The position of the microphone is important. For recording voice, the distance from the source to the microphone should be kept as small as possible for best results. In recording music, greater distances are desirable because the room acoustics usually improve the music.

SERVICE

GENERAL — The Pentron tape recorder was engineered and developed to give excellent performance over a long period of time. It is, of course, expected that there will be occasional tube failures as with radio and television but this will be at a minimum.

The machine should be kept clean and any accumulation of dust from the tapes should be blown or brushed away from the Heads or around the Capstan. The faces for the Pole Pieces in the Heads can be cleaned by wiping them with a cloth dampened with Carbon Tetrachloride.

LUBRICATION — This machine is equipped with special oil impregnated bearings on all wearing surfaces and will never need lubrication during its entire lifetime.

ADJUSTMENTS — To take unit from case, remove 4 screws from the bottom side and lift unit out.

All adjustments on this unit are of a permanent nature and have been set precisely at the factory, therefore, they should need no further setting. If the unit requires

readjustment, the following procedure will put the unit in operating condition. This outline covers a complete readjustment of all parts and all may not be required in every case. In the event that only individual adjustments are required, these can be made by following the applicable instructions.

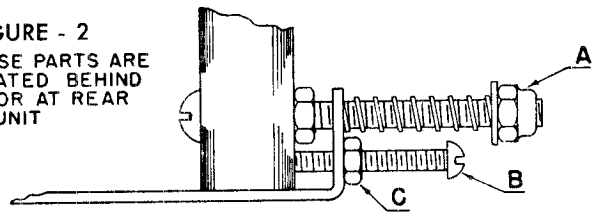


FIGURE - 2
THESE PARTS ARE LOCATED BEHIND MOTOR AT REAR OF UNIT

ADJUSTING MOTOR DRIVE — The motor drive is adjusted by the turning of screw B (Fig. 2). The correct amount of engagement is determined by stopping the large capstan with the finger while it is running in the play position. When this becomes rather difficult to do, there is sufficient engagement to insure proper operation. Loosening screw B increases engagement; tightening screw B decreases engagement.

Do not adjust screw B beyond proper engagement as this will place unnecessary and excessive load on the motor which might result in distortion and wows. After adjustment has been made with screw B, lock in place with nut C.

Nut A has been adjusted in the factory and ordinarily need not be touched. If for any reason, sufficient engagement cannot be obtained by adjusting screw B, turn Nut A several revolutions clockwise. Before replacing unit in the case, loosen the large capstan. To do so, it may be necessary to hold the flywheel located at the lower end of the capstan shaft.

TRACTION OR "DRAG" ON REEL SPINDLES—Loosen Screw D (Figure 1) to move Equalizer Bar forward or backward. With Control Knob in IDLE position and with an equal amount of tape on each reel move the Equalizer Bar back until a slight amount of drag is noticeable on each reel spindle. Check by drawing a small loop of tape from each reel. These loops should stay immobile. If the reels take up the slack at this point, the amount of drag is too great and should be relieved very slightly.

Should the tape have a tendency to wind up or creep onto the Take-Up Reel while making the above adjustment, correction can be made by maneuvering the Nuts EE and FF (Figure 3) backwards on the Tie Bar. These parts are located on the underside of the Top Mechanism Plate and below the Feed Reel.

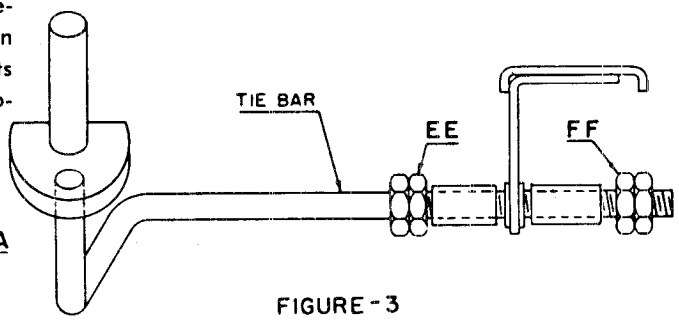


FIGURE - 3

TAKE UP ON TAKE UP REEL — Take up adjustment on the Take Up Reel is required if when the Control Knob is placed in the PLAY or RECORD position, a loop of tape feeds out before the Take Up Reel starts turning, or if the Tape Pressure Fingers in front of the Heads are not engaged with the tape before the Take Up Reel starts turning.

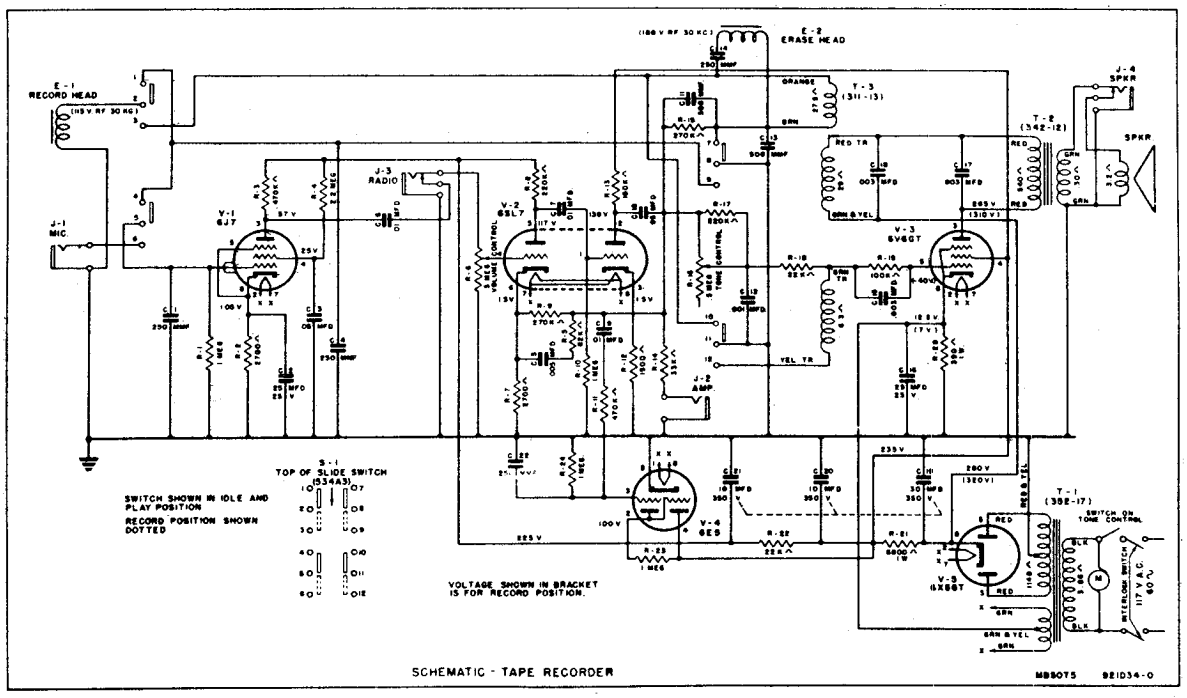
This adjustment is accomplished by loosening screw G (Figure 1) and moving bar H towards the Equalizer bar for decreasing the time required for the Take Up Reel to start turning and, of course bar H must be moved away from Equalizer Bar to increase the time.

TAPE PRESSURE FINGER ADJUSTMENT — For most satisfactory results the tape should lay across the full face of the Pole Pieces. Too little coverage of the Pole Piece face will result in indistinct recordings and reproductions. Too much pressure will be accompanied by increased drag and unnecessary wear on the tape. The Tape Pressure Fingers are properly adjusted when the tape is depressed approximately 1/16" from the front face of the Pole Piece. This is accomplished by loosening Screw L (Figure 1) and moving Post M to the desired location.

HINTS

MONITORING — When recording from an external source, (such as FM or AM tuners, phono pickup) the program may be heard by plugging earphones into the amplifier jack.

FLAT SPOT — Flats may develop on the flywheel if the motor release pin is not pushed in (according to direction) while machine is not in use. To remedy this condition, set the machine in play position and let run until flats are removed.



PARTS LIST

Qty. Per Unit	Part Number	Description
1	899-3	Flat Belt (Fly Wheel to Take-up Reel)
1	899-2	Flat Belt (Motor Pulley to Feed Reel)
1	711-B-57	Motor Mounting Plate
1	964-A-58	Capstan Bearing
1	714-A-110	Capstan (3.75" per second)
1	714-A-111	Capstan (7.5" per second)
1	714-A-113	Motor Release Pin
1	964-A-40	"Play-Record" Cam Assembly
1	964-A-27	Fly Wheel with Tire
1	943-B-4	Record Head
1	943-B-5	Erase Head
1	714-A-82	Adjusting Nut "D" (Equalizer Bar)
1	711-A-193	Head Bracket
1	714-A-41	Motor Pulley
1	711-A-195	Spring Anchor Disk
1	713-A-3	Tie Rod
1	964-A-25	Pressure Roller Assembly
1	712-A-8	Spring (Interlock Bar)
1	712-A-10	Spring (Take-up Pulley—Feed Reel)
1	712-A-5	Spring (Take-up Bar—Take-up Reel)
1	712-A-6	Spring (Pressure Roller Slider)
2	712-A-9	Sleeves (Tie Bar)
1	964-B-7	Equalizer Bar and Pulley Assembly
1	964-A-72	Record Pole Piece
1	964-A-73	Erase Pole Piece
1	367-C-2	Motor
1	534-A-3	Slide Switch
1	345-A-12	Speaker
1	556-1	Eye Tube Socket, 6 Prong (Steatite-Type)
1	558-A-4	Floating Octal Tube Socket
2	558-A-2	Octal Tube Socket
1	352-17	Power Transformer (T-1)
1	342-12	Output Transformer (T-2)
1	311-13	Oscillator Transformer (T-3)
2	552-1	Jack (Phone)
4	111-10521	Resistor, 1 Meg ½ Watt (R-1, R-10, R-23, R-24)

Qty. Per Unit	Part Number	Description
2	111-27221	Resistor, 2700 Ohms ½ Watt (R-2, R-7)
2	111-47421	Resistor, 470 K Ohms, ½ Watt (R-3, R-11)
1	111-22521	Resistor, 2.2 Meg ½ Watt (R-4)
1	111-82321	Resistor 82 K, ½ Watt R-5)
1	124-A-50413-7	Volume Control .5 Meg Audio Taper (R-6)
2	111-22421	Resistor 220 K Ohms, ½ Watt (R-8, R-17)
2	111-27421	Resistor 270 K Ohms, ½ Watt (R-9, R-12, R-15)
2	111-10421	Resistor 100 K Ohms, ½ Watt (R-13, R-19)
1	111-15221	Resistor 1500 Ohms, ½ Watt (R-14)
2	111-22321	Resistor 22000 Ohms, ½ Watt (R-18, R-22)
1	126-A-50413-4	Tone Control .5 Meg Audio Taper (R-16, with switch)
1	111-68231	Resistor 6800 Ohms, 1 Watt (R-21)
1	111-39131	Resistor 390 Ohms, 1 Watt (R-20)
1	285-5064	Lytic 30-10-10 MFD. 350V (C-19, C-20, C-21, C-16, 25 MFD. 25V)
1	273-2561	Lytic Tubular 25 MFD. 25V (C-2)
1	263-1024	Condenser Tubular, .001 MFD. 400V (C-12)
2	263-3024	Condenser Tubular, .003 MFD. 400V (C-5, C-15, C-17)
1	232-3024	Condenser Mica .003 MFD. 400V (C-18)
3	263-1034	Condenser Tubular .01 MFD. 400V (C-6, C-7, C-9)
2	263-5034	Condenser Tubular .05 MFD. 400V (C-3, C-10)
4	232-2515-2	Condenser Mica 250 MMF. 500V (C-1, C-4, C-8, C-14, C-22)
2	232-5015	Condenser Mica 500 MMF. 500V (C-13, C-14)

SECTION 1
GENERAL

INTRODUCTION

SCOPE OF MANUAL

This booklet is written for the express purpose of guiding the repairman in the servicing of Revere Tape Recorders. When Revere Tape Recorders are brought in for servicing, a complete disassembly, inspection, repair and reassembly is recommended.

Such servicing should be done with a thorough understanding of this Service Manual in order to maintain the high quality workmanship originally built into each recorder. In the long run, this will reduce service call-backs and result in greatest customer satisfaction.

MODELS COVERED

This manual covers the following models of the Revere Tape Recorder:

T-100 (105-120 V, 60 cps)
TR-200 (105-120 V, 60 cps)
TS-300 (105-120 V, 50 cps)
TS-301 (210-240 V, 50 cps)

SPECIFICATIONS

POWER CONSUMPTION

Power consumption is 100 watts.

WEIGHT

Weight of the recorder is approximately 25 pounds.

RECORDING MEDIUM

Recorders are furnished with Tape No. 111, plastic backing, made by Minnesota Mining and Manufacturing Company. Any equivalent magnetic-recording tape having the following specifications may be substituted: paper or plastic base, 1/4 inch wide, magnetic-oxide coated, "A" wind, five-inch reel capacity.

TAPE SPEED

Recording or playback tape speed is 3.75 inches per second.

Playing time is one hour using a five inch reel with manual turnover (1/2 hour per side).

RAPID TAPE TRANSPORT

Rapid Forward Speed: approximately ten times normal playing speed, accomplished without disturbing or re-threading the tape.

Rewind: approximately 30 times normal playing speed; 600 feet of tape may be rewound in approximately one minute without disturbing or re-threading the tape.

INPUT CONNECTIONS

Two jacks on the rear of the recorder permit microphone input at 220,000 ohms (suitable for signals from minus 90 VU to minus 30 VU), and radio-phonograph input at one megohm (suitable for signals from minus 3 VU to plus 30 VU).

OUTPUT CONNECTIONS

Normal playback output is through a 5x7-inch elliptical, built-in, permanent magnet, dynamic speaker. Extension speaker jack on the back of the recorder permits output to any external speaker system having a 3.2 ohm impedance.

RECORD-PLAYBACK HEAD

Recorder is equipped with Shure Brothers, Inc. Model TR-5 head.

DRIVE MOTOR

Four pole, shaded-pole motor is rated at 1/80 horsepower.

MICROPHONE

Controlled reluctance dynamic microphone, rated 52 db below one-volt-per-dyne-per-square-centimeter is furnished.

RADIO ATTACHMENT CORD

Attachment cord with input plug and speaker clips permits connection of recorder to external input or output.

ERASURE

Erasure of saturated 400 cps signal by high frequency erase head exceeds 55 db.

MODELS T-100, TR-200,
TS-300, TS-301

FREQUENCY RESPONSE

POSITION TONE CONTROL	FREQUENCY RESPONSE
↑ Treble	±3 db, 100-7500 cps
Normal	±3 db, 60-6500 cps (-10 db at 50 and 7000 cps)
↓ Bass	±3 db, 50-3500 cps

DISTORTION

Amplifier distortion at low levels is less than 2 per cent total harmonic content. At 5 watts (maximum undistorted output) distortion is 8 per cent at 1000 cps.

Tape distortion at nominal recording level is less than 3 per cent; at maximum recording level, it is less than 10 per cent.

SIGNAL TO NOISE RATIO

Ratio exceeds 45 db at normal recording level.

TUBE COMPLEMENT

1 - 6SJ7
1 - 6K6-GT
1 - 6V6-GT
2 - 6J7
1 - 6X5-GT (Rectifier)

OPTIONAL ACCESSORIES

The following accessories are available as optional equipment:

Ear phone set (single ear type with special Revere plug).

Microphone extension cord (extends microphone lead 15 feet).

Microphone stand (Shure Brothers, Inc.).

CONTROLS AND INDICATORS

(Controls and indicators are illustrated in Figure 1.)

PILOT LAMP

Indicates power on-off condition.

FUNCTION SWITCH

Permits selection of recording, playback, rewind and stop operations.

RAPID-FORWARD LEVER

Engages drive mechanism for rapid forward speed.

ON-OFF, VOLUME CONTROL

Turns recorder on and off; controls volume of input and output signals.

TONE CONTROL

Governs tone quality of output signal.

INSTANT STOP ARM

Starts and stops tape instantaneously.

RECORDING LEVEL INDICATOR

Dual-level neon indicator shows nominal recording level (two per cent distortion) and overload recording level (eight per cent distortion).

TIME-FOOTAGE INDICATOR

Shows elapsed time in terms of minutes and feet of tape.

RECORD SAFETY BUTTON

Prevents accidental erasures by controlling movement of Function switch to RECORD position.

OPERATING INSTRUCTIONS

Operating procedures are printed here for convenient reference. For complete detailed instructions, see Operating Instructions, a booklet furnished with every Revere Tape Recorder.

PRELIMINARY OPERATIONS

For all operations, place recorder in condition as follows:

(1) Turn Function switch to STOP.

(2) Turn On-Off switch to ON.

(3) Thread tape from left-hand reel through head slot to right-hand reel with dull side of tape against head (facing toward rear of recorder).

Recorder is now in readiness for any sequence of operations as described below.

TO RECORD

(4) Connect MICROPHONE or PHONO-RADIO jack (on back of recorder) to appropriate input signal source.

(5) Depress Record Safety button.
(6) Turn Function switch to RECORD position corresponding to type of input in use (MICROPHONE or PHONO-RADIO).
(6a) For machines equipped with an Instant Stop arm: A preliminary adjustment of the Volume control, using a sample signal, should be made while holding the recording tape at a standstill with the Instant Stop arm. For best recording level, adjust Volume control so that one-half section of the Recording Indicator glows for average input signal.
(7) Start recording.

NOTE

If Tape Recorder being serviced is not equipped with Instant Stop arm, immediately adjust Volume control so that approximately one-half of Recording Indicator glows on average signal.

TO REWIND

(4) Turn Function switch to REWIND.

TO PLAYBACK

(4) Turn Function switch to PLAY.
(4a) To reach a desired section of tape quickly, Rapid Forward lever may now be actuated, resulting in accelerated forward motion of tape.
(5) Adjust Volume control and Tone control.

TO SHUT-OFF

To cease any recorder operation, turn Function switch to STOP. Then turn ON-OFF switch to OFF.

NOTE

Always store recorder with Function switch in STOP position.

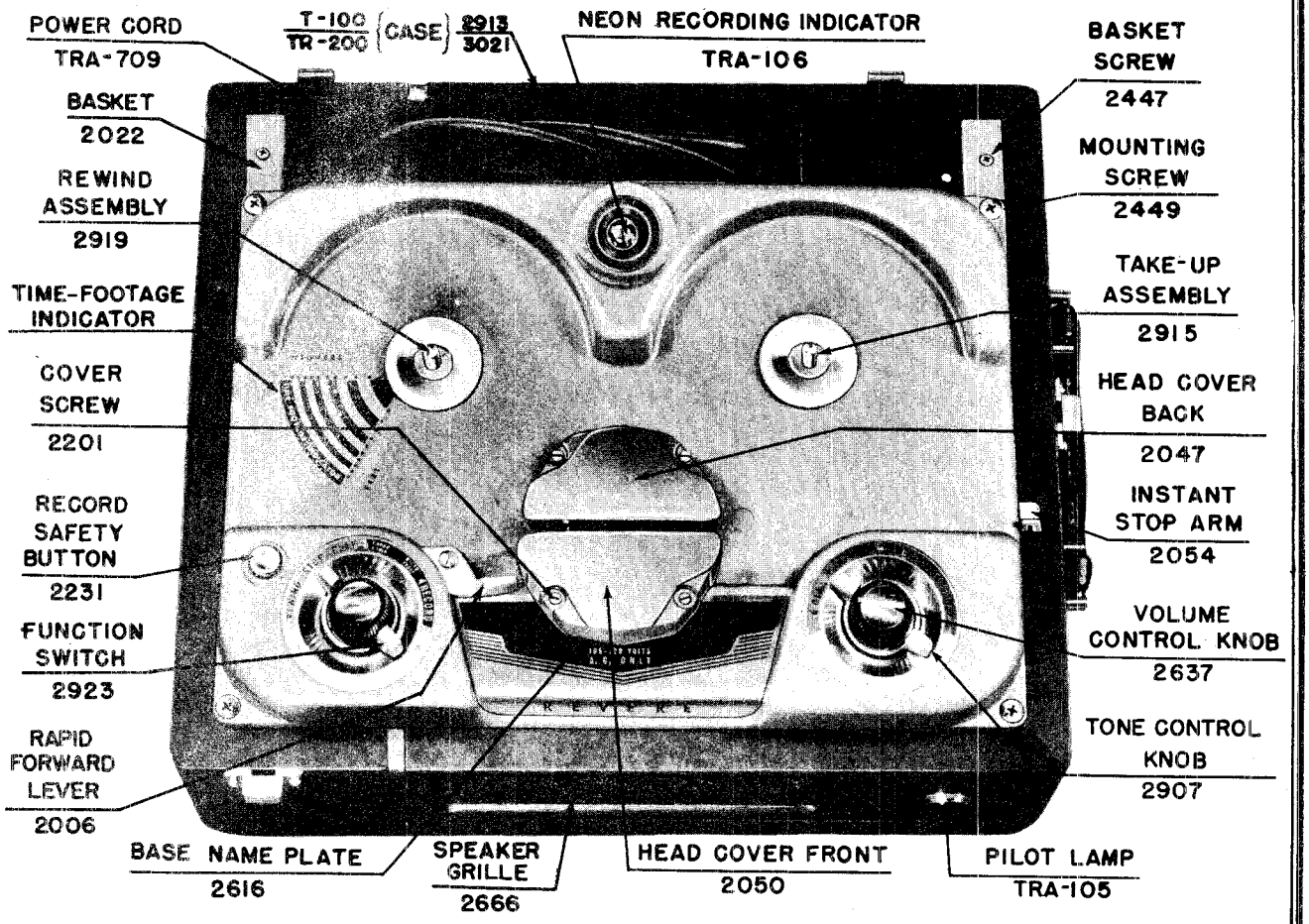


FIG. 1 - Revere Tape Recorder Controls and Indicators.

MODELS T-100, TR-200,
TS-300, TS-301

SECTION 2
SERVICING MECHANICAL SYSTEM

TROUBLE SHOOTING

The following trouble-shooting methods are general guides to quick isolation of mechanical difficulties.

NOTE

All friction drive surfaces should be cleaned with carbon tetrachloride. Because of their precision tolerances and critical surface finishes, all worn mechanical parts should be replaced with new factory-supplied parts.

Trouble	Possible Cause	Remedy
A-Weak Volume.	(1) Dirty head.	Remove front head cover, clean head with carbon tetrachloride or alcohol.
	(2) Worn or missing pressure pad.	Replace pad (Fig. 2); fasten with household cement.
	(3) Wrong type of tape.	Use tape as specified in Section 1.
	(4) Reversed tape wind.	Use "A" type wind (dull side of tape facing head laminations, see Fig. 2).
B-No Erase.	(1) Erase pressure pad missing.	Replace pad (Fig. 2); fasten with household cement.
	(2) Defective electrical components.	See Section 3.
C-No Sound.	(1) Head plug and/or tubes out of socket.	Insert head plug in socket. Insert tubes in sockets.
	(2) Defective electrical components.	See Section 3.
D-Tape Slippage.	(1) Excessive take-up.	See Section 2, Take-up Assembly.
	(2) Oil on capstan or pressure roller.	Clean capstan and pressure roller with carbon tetrachloride.
	(3) Smooth driving surface on capstan.	Replace with new capstan (#2910).
	(4) Excessive drag on storage reel.	Adjust rewind brake as explained in Section 2, Rewind Brake Adjustment.
	(5) Insufficient tension of pressure roller against capstan.	Replace pressure roller spring (Fig. 11).
E-Drive Irregularities.	(1) Binding flywheel due to insufficient clearance between flywheel shaft and bearing.	Replace flywheel assembly (#2910, Fig. 7) and flywheel bearing (#2209, Fig. 11).
	(2) Irregularities in surface of rubber idler.	Replace idler.
	(3) Binding pressure-roller bearing.	Clean bearing surface. Replace pressure roller if necessary.
	(4) Smooth surface on flywheel rim.	Replace flywheel.
	(5) Oil on drive surfaces.	Clean capstan, pressure roller, flywheel, idler, motor pulley, take-up, and rewind pulley with carbon tetrachloride.
	(6) Excessive motor vibration.	Fan blade out of balance; replace. Tighten mounting screws. Replace defective motor.
F-Insufficient Take-up.	(1) Oil on clutch plate.	Clean with carbon tetrachloride.
	(2) Weak clutch spring.	Check for correct "free" length (21/32" to 23/32", Fig. 8).

Trouble	Possible Cause	Remedy
G-Slow Rapid-Forward Speed.	(1) Oil on clutch plate.	Clean with carbon tetrachloride.
	(2) Rewind brake out of adjustment.	Refer to Section 2, Rewind Brake Adjustment.
	(3) Insufficient clearance between reel and back head cover.	Adjust for sufficient clearance.
H-Tape Spill.	(1) Improper brake and cam adjustment.	Refer to Section 2, Knockout Cam and Brake Adjustments.
I-Defective Instant Stop Brake.	(1) Instant stop spring out of adjustment.	Refer to Fig. 11.
J-Slow Rewind.	(1) Take-up brake and cam out of adjustment.	Refer to Section 2, Knockout Brake and Cam Adjustments.
	(2) Eccentric out of adjustment.	Refer to Section 2, Eccentric Adjustment.

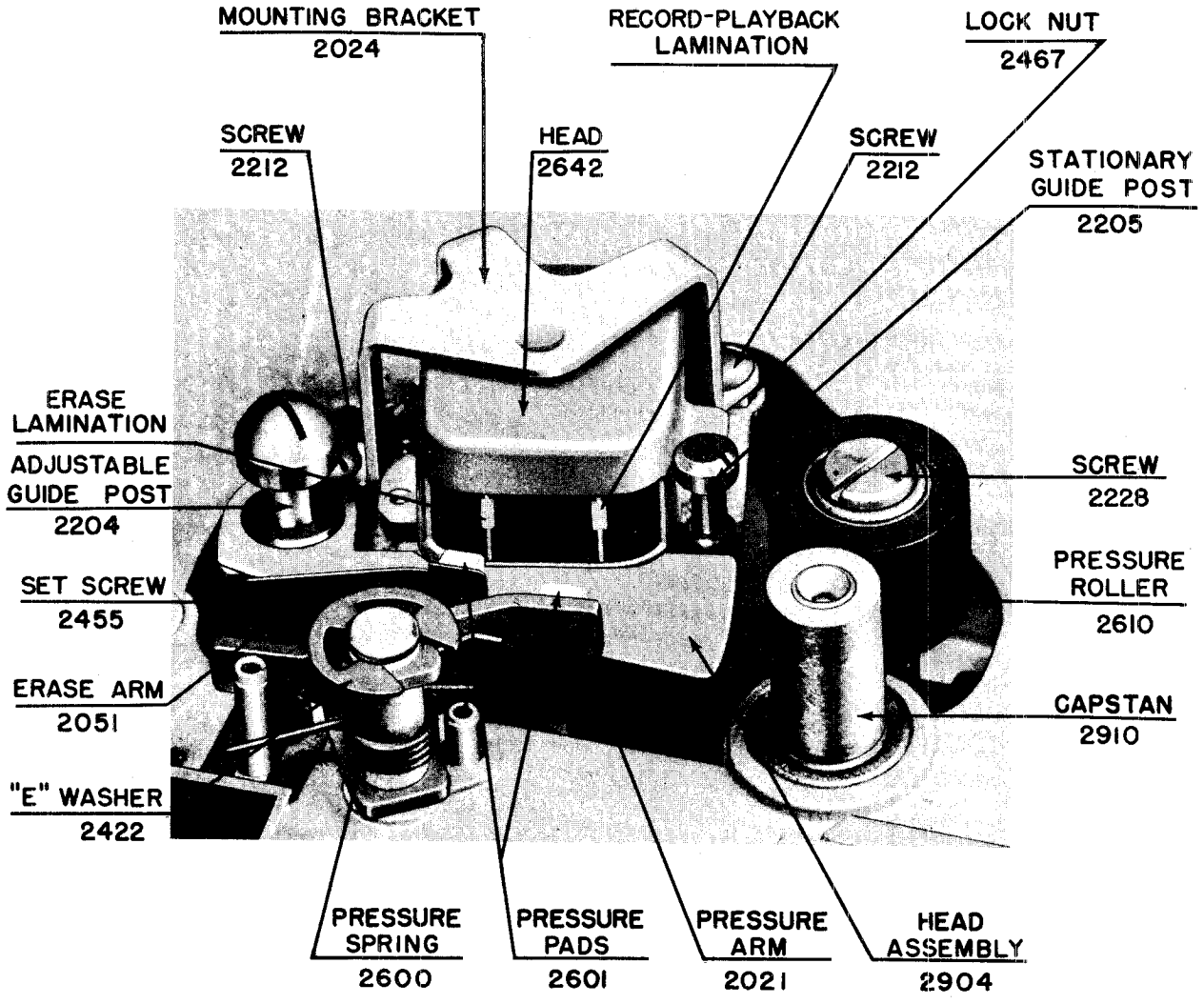


FIG. 2 - Recorder with Head Covers Removed Showing Head Mechanism.

MODELS T-100, TR-200,
TS-300, TS-301

REPAIR PROCEDURE

It is recommended that this section be thoroughly understood before any work is begun. Mechanical assemblies can then be easily serviced in the step-wise fashion indicated and with reference to the illustrations.

HEAD REPLACEMENT

If recording head has been proven defective, the following step-wise procedure should be followed:

(1) Remove head covers.

(2) Remove mounting bracket #2024 (note assembly of #2212 screws and #2467 lock nuts, see Fig. 2).

(3) Remove head wire leads from clips on under side of top casting and remove head plug from socket.

(4) Place Function switch in PLAY position and remove head wiring and plug through clearance in casting.

(5) Return Function switch to STOP position.

(6) The tape guide post #2204 will have to be re-aligned with the position of the head. This is accomplished by loosening set screw #2425 and adjusting the guide for maximum signal output using a 1000 cycle head alignment tape.

REMOVING RECORDER FROM CASE

(1) Place tape recorder on table or bench. Remove all literature and spare parts from basket. Remove basket screws (#2447) and mounting screws (#2449, see Fig. 1).

(2) Lift basket from case.

(3) Slide mechanism to rear of case (about 1/4 inch) and lift out.

REMOVING AMPLIFIER FROM MECHANISM

(1) Removal: Place machine face down in wooden rack (see Fig. 3). Remove only truss head screws shown in illus-

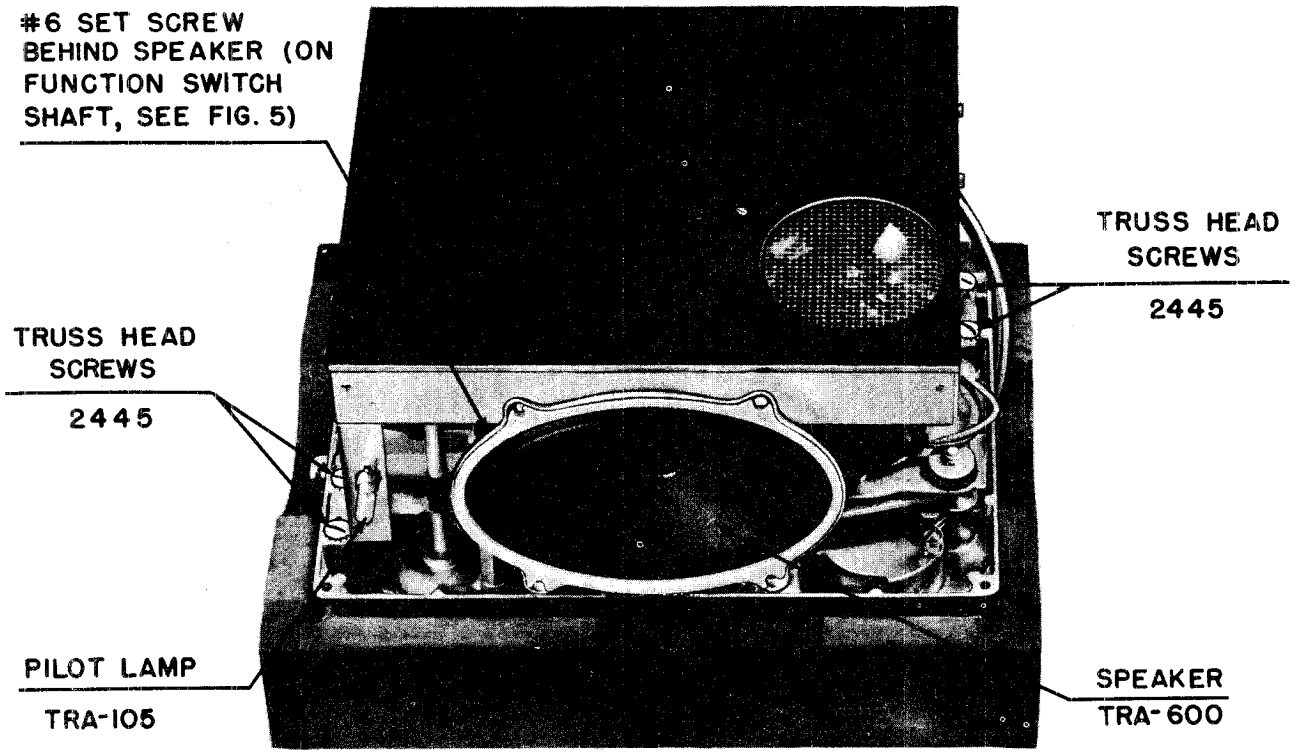


FIG. 3 - Bottom View of Recorder with Case Removed.

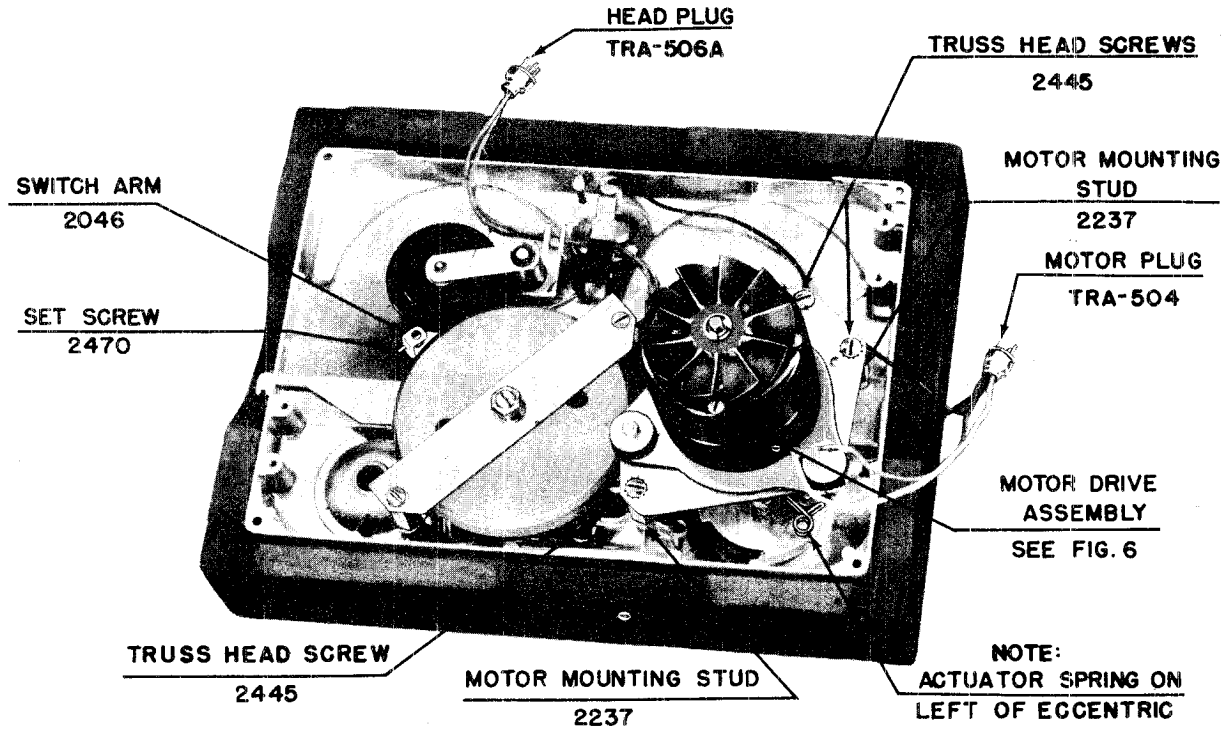


FIG. 4 - Bottom View of Recorder with Case and Amplifier Removed.

tration. Disconnect head and motor plugs from amplifier (see Fig. 4). Turn Function switch to REWIND position. Loosen set screw on switch arm (#2046). Return Function switch to STOP position. Remove amplifier from mechanism.

(2) Assembly (see Fig. 3): Place mechanism face down in wooden rack. Position amplifier above mechanism. Insert Function switch shaft through switch arm (#2046) and into boss in body casting (see Fig. 10). Turn Function switch to REWIND position; tighten switch-arm set screw against flat on switch shaft. Return Function switch to STOP position. Replace truss head screws (#2445) through amplifier mounting bracket. Replace head and motor plugs.

NOTE

Function switch should be in STOP position to remove pressure from rubber drive surfaces.

MOTOR DRIVE ASSEMBLY

NOTE

It is advisable that pulley spring (#2664) and eccentric (#2253) remain in their original positions.

Recorders built for 50 cycle operation have clip (#2053) mounted on right side of actuator (#2033) as viewed in Fig. 6.

(1) Disassembly: (See Fig. 4). Remove truss head screws (#2445). Lift motor free from motor mounting studs (#2237).

CAUTION

Do not damage fan blades.

(2) Inspection: (See Fig. 6). Check motor shaft for free rotation. Inspect idler wheel for wear. Check actuator (#2033) for free rotation on lower motor

bracket (#2901) bearing surface. Inspect motor pulley for wear.

(3) Repair: If motor shaft binds, tap motor with rawhide hammer. If this fails to allow free motor shaft rotation, replace motor.

Replace worn idler wheel. Replace worn motor pulley.

(4) Reassembly: Assemble motor assembly in sequence as shown in exploded view (Fig. 6). Check position of actuator spring (#2617) as noted in Fig. 4.

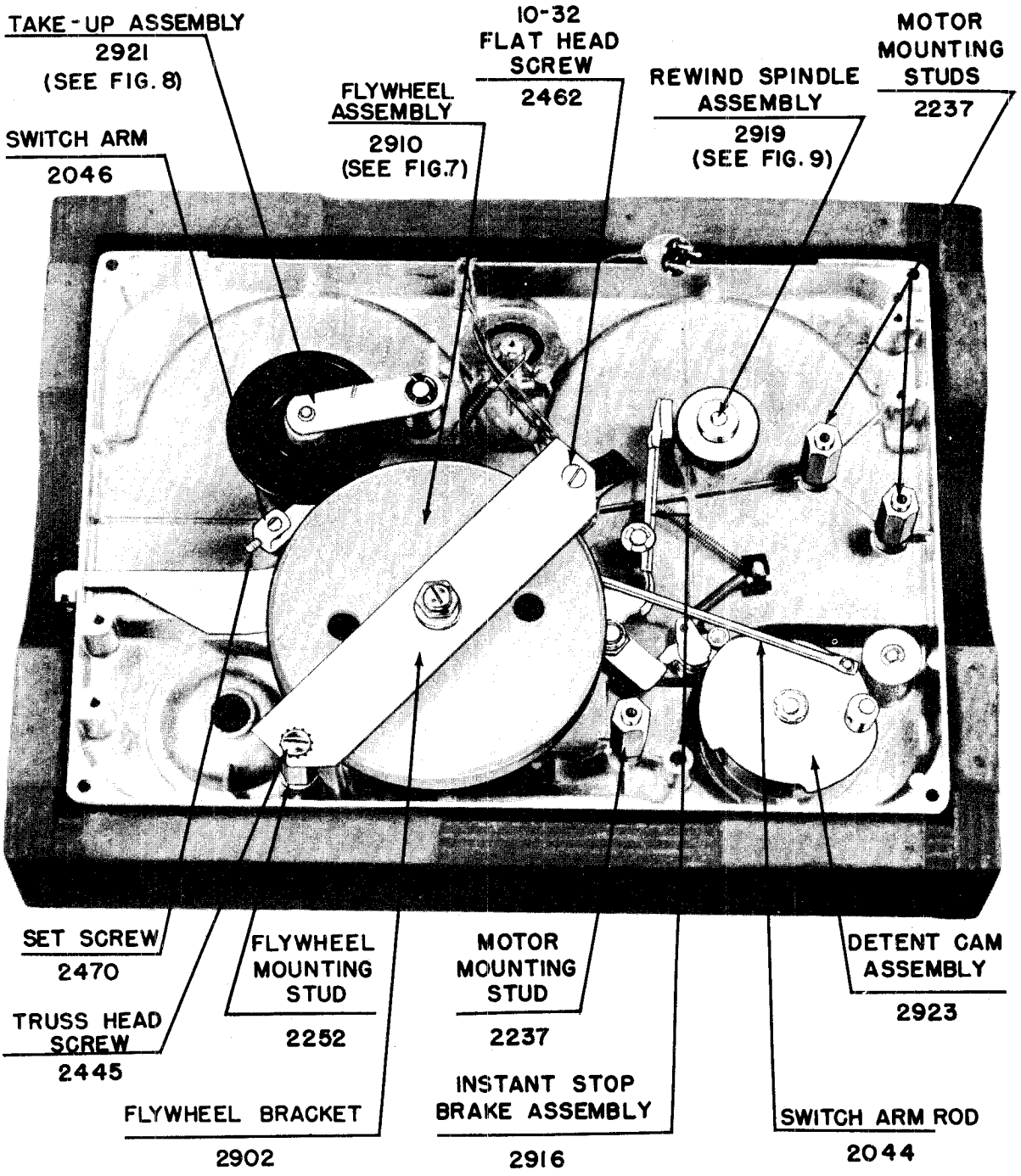


FIG. 5 - Bottom View of Recorder after Removing Motor Drive Assembly.

MODELS T-100, TR-200, TS-300, TS-301

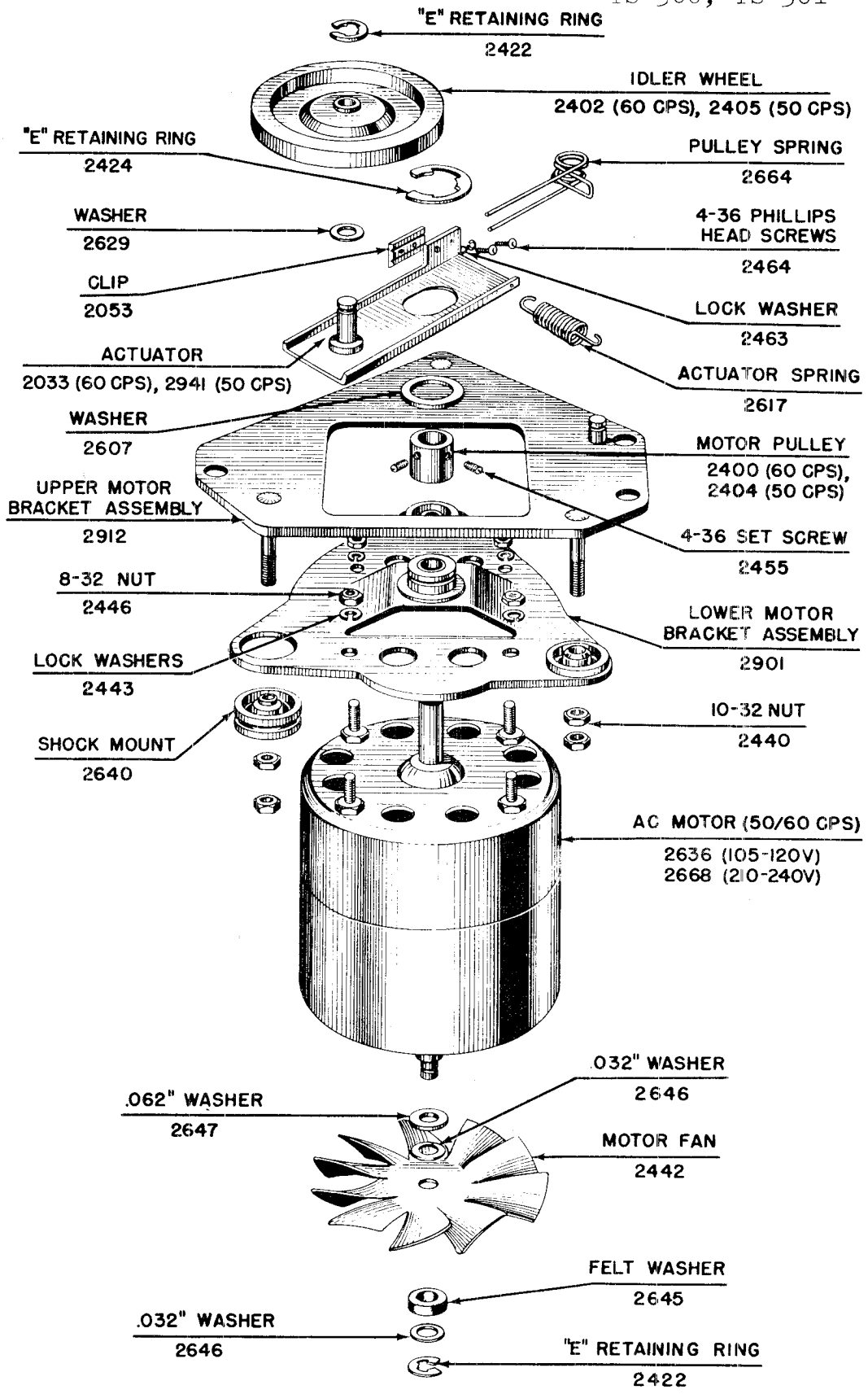


FIG. 6 - Exploded View, Motor Drive Assembly.

MODELS T-100,
TR-200, TS-300,
TS-301

FLYWHEEL ASSEMBLY

(1) Disassembly: (See Fig. 7.) Remove screws (#2462) and (#2445) from flywheel bracket. Lift bracket (#2902) from studs (#2252). Lift thrust ball (#2431) and thrust disc (#2042) from thrust socket.

(2) Inspection: Inspect thrust ball (#2431), thrust disc, (#2042) and flywheel (#2910) surfaces for burrs and wear.

(3) Repair: Replace worn parts. Capstan bearing (Fig. 11) should be replaced if capstan shaft circumference indicates wear.

(4) Reassembly: Lubricate thrust ball (#2431) and socket with Andox "B" Grease. Lubricate capstan shaft with Stan-Oil No. 75. Assemble parts in order shown in Fig. 7. Set thrust adjusting screw (#2229) to allow flywheel 3/64 inch vertical play along capstan shaft axis. Tighten loc. nut (#2232).

TAKEUP ASSEMBLY

(1) Disassembly: (See Fig. 8.) Disconnect ends of arm spring (#2615). Remove "E" retaining rings (#2422 and #2423). Lift assemblies from stud (#2224) and spindle assembly (#2915).

(2) Inspection: Inspect take-up wheel (#2926) rubber surface, felt pad, and clutch plate (#2040) for wear. Check clutch spring (#2650) for correct free length (21/32 inch to 23/32 inch).

(3) Repair: Replace worn parts. Clean takeup pulley and clutch plate with carbon tetrachloride.

(4) Reassembly: Reassemble parts in specified relation (see Fig. 8). Be sure brake assembly (#2932) moves freely about stud (#2224). Clip arm spring (#2615) to arm assembly (#2917) and brake assembly (#2932).

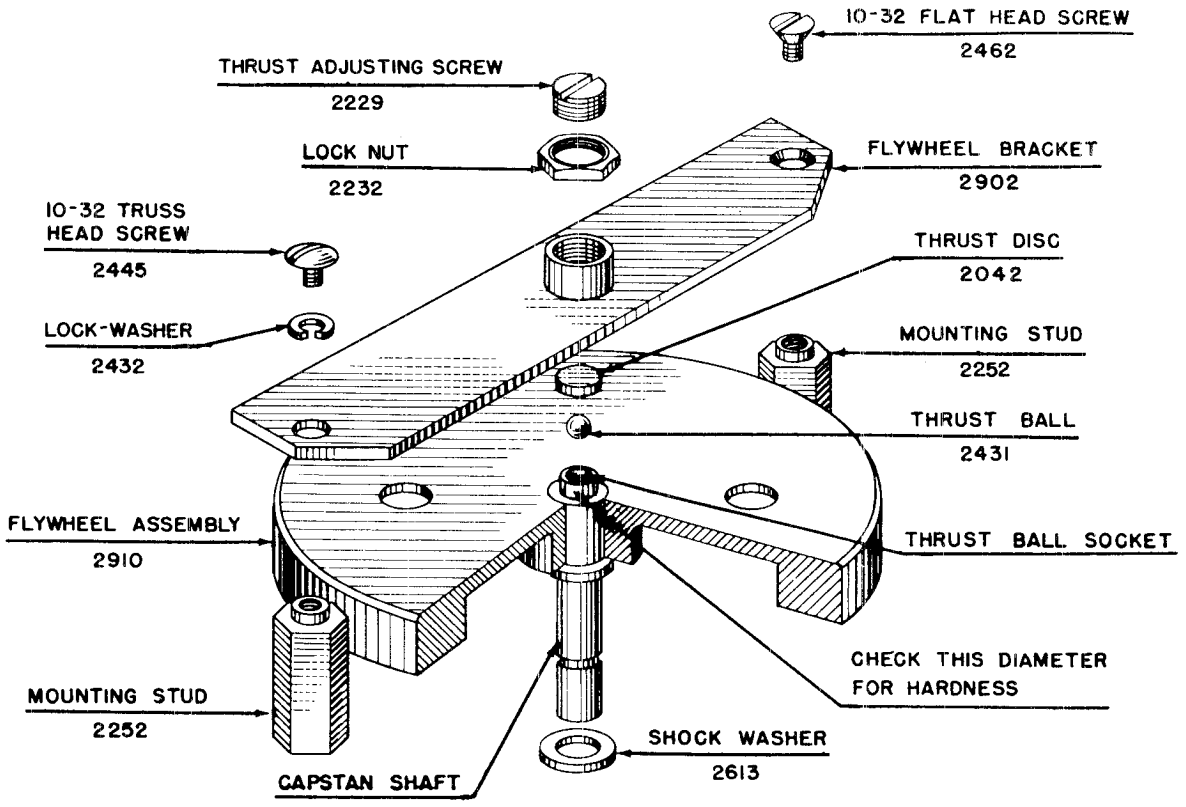


FIG. 7 - Exploded View, Flywheel Assembly.

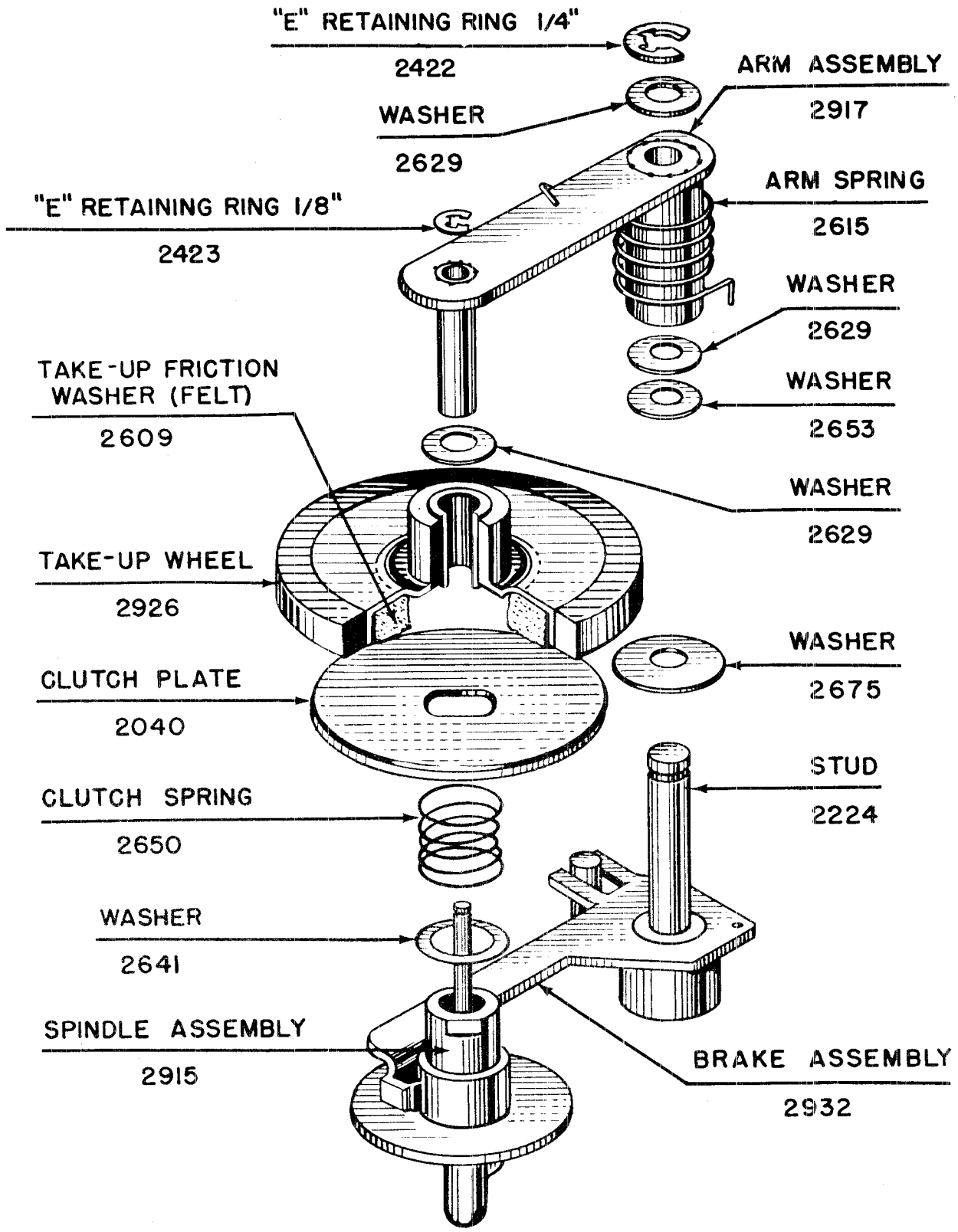


FIG. 8 - Exploded View, Takeup Spindle Assembly.

MODELS T-100, TR-200,
TS-300, TS-301

REWIND ASSEMBLY

(1) Disassembly: (See Fig. 9.) Loosen set screws (#2429). Lift rewind pulley assembly (#2403), karropak washer (#2654) and felt washer (#2658) from rewind shaft assembly (#2919). Slip rewind shaft assembly (#2919) out of bearing (#2612).

(2) Inspection: Check rewind pulley (#2403) surface, rewind shaft (#2919) and bearing (#2612) for wear.

(3) Repair: Replace worn parts.

(4) Reassembly: Grease rewind shaft (#2919) with ANDOX "B" Grease. Assemble as shown in Fig. 9. Tighten set screws (#2429) against flats of rewind shaft (#2919), allowing 1/64 inch play along axis of shaft.

KNOCKOUT CAM AND BRAKE ADJUSTMENTS

Fig. 10 illustrates further adjustments and checks which must be made. The following step-wise procedure is necessary.

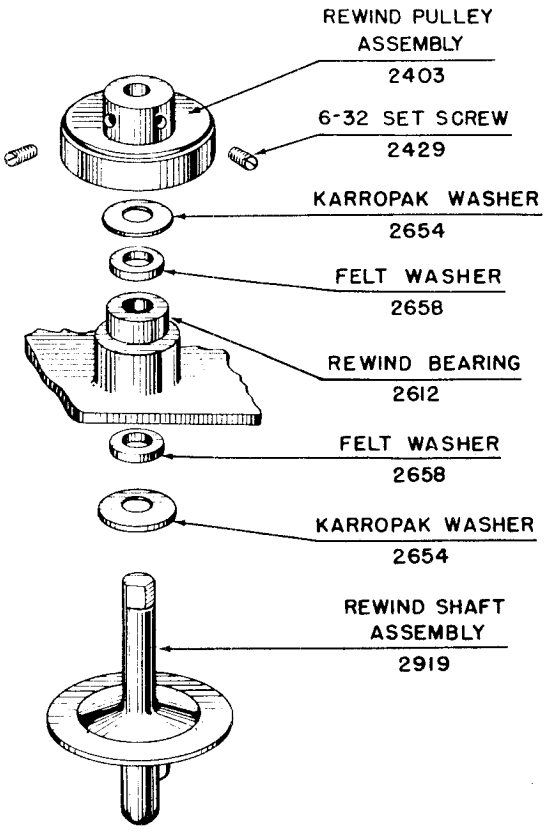


FIG. 9 - Rewind Assembly.

(1) With Function switch in REWIND position, be sure set screw is clamped against flat on Function switch shaft.

(2) With Function switch in PLAY position, adjust for 3/32 inch clearance between clutch knockout cam (#2933) and takeup arm assembly (#2917).

(3) With Function switch in REWIND position, adjust ear for .015 inch clearance between shoe of brake assembly (#2932) and shaft of takeup spindle assembly (#2915).

Upon completion of steps 1 through 3, the following steps indicate proper operation.

(4) With Function switch in PLAY and RECORD position, takeup wheel (#2926) should contact flywheel and takeup spindle assembly (#2915) should be disengaged from shoe of brake assembly (#2932).

(5) With Function switch in STOP position, brake assembly (#2932) should engage takeup spindle assembly (#2915) and takeup wheel should be disengaged from flywheel.

(6) With Function switch in REWIND position takeup wheel (#2926) should be disengaged from flywheel (#2910), and shoe of brake assembly (#2932) should be disengaged from takeup spindle assembly (#2915).

REWIND BRAKE ADJUSTMENT

Place Function switch in STOP position and adjust for 1/64 inch clearance between felt pad and shaft (see Fig. 11).

INSTANT STOP SPRING ADJUSTMENT

Place Function switch in PLAY position and adjust for 1/8 inch clearance as noted in Fig. 11.

ECCENTRIC ADJUSTMENT

Rotate eccentric (#2253, see Fig. 11) around its mounting pin to afford:

(1) Maximum power to rewind spindle with Function switch in REWIND position and,

(2) Maintain clearance between idler and motor pulley, with Function switch in STOP position.

NOTE

As viewed in Fig. 11, top flat surface of eccentric should be flush with end of its mounting pin.

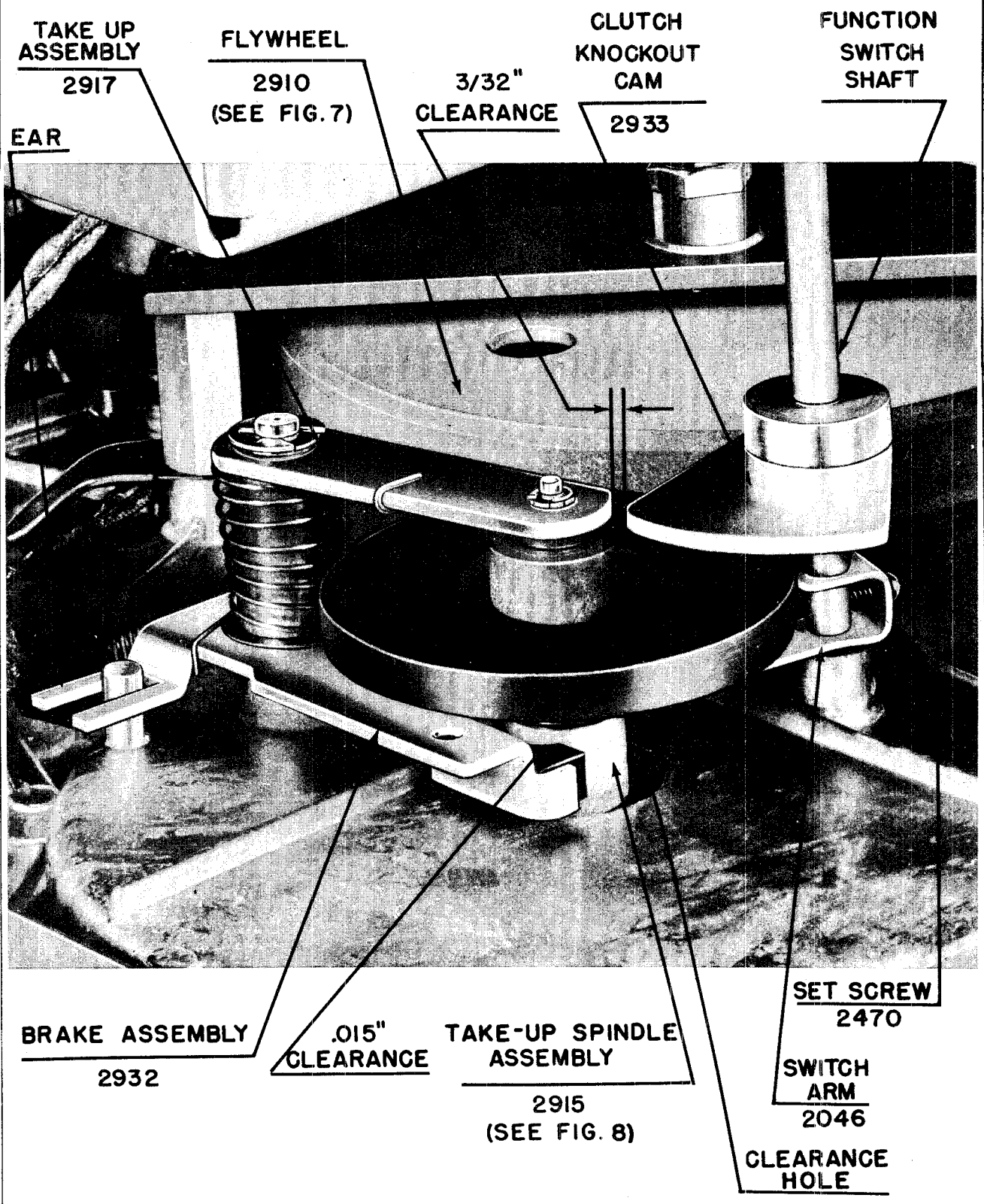


FIG. 10 - Knockout Cam and Brake Adjustments.

MODELS T-100, TR-200,
TS-300, TS-301

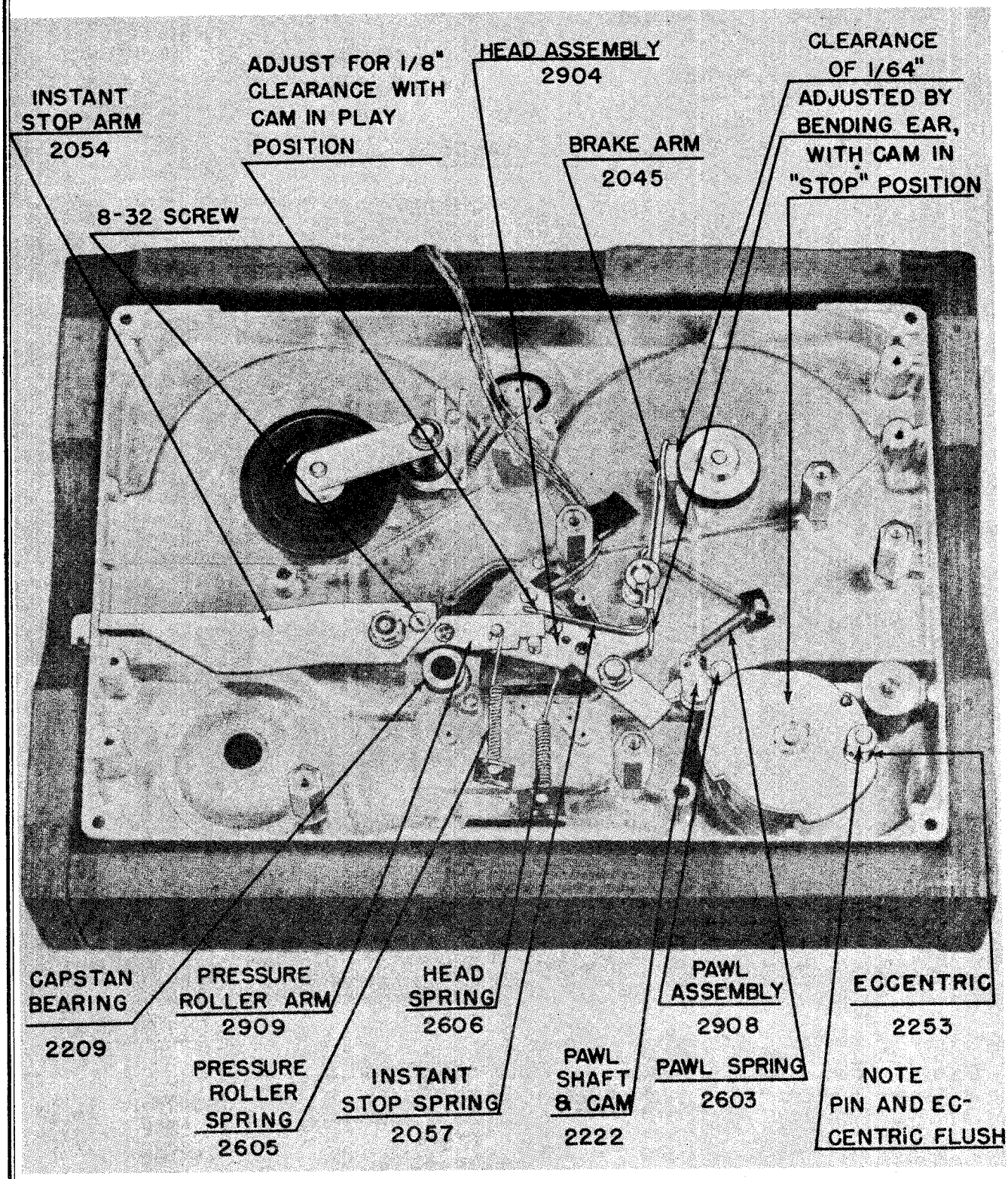


FIG. 11 - Bottom View of Recorder After Removing Flywheel Assembly.

MODIFICATIONS

Since the first Revere Tape Recorders were made, continued research has brought about improved features. The following paragraphs describe how any Revere Tape Recorder not already equipped with these improvements, can easily be modified to include them.

INSTANT STOP ARM

Recorders below Serial No. 15100 are not equipped with the Instant Stop arm; however, this feature can be added to these machines. Consult the factory for information.

MODIFIED CLUTCH BRAKE

An improved clutch-brake assembly can be installed on all machines below Serial No. 18600. Referring to Figure 12, procure and assemble parts as shown, enlarging clearance hole for takeup spindle assembly (see Fig. 10) to 1 inch diameter.

IMPROVED FLYWHEEL

Check shaft diameter noted in Figure 7. If this diameter is not "file hard", replace flywheel assembly (#2910) and capstan bearing (#2209).

MECHANICAL PARTS LIST

This parts list is tabulated with reference to the main mechanical groups. Individual parts listed are used only once except as otherwise stated.

ORDERING INFORMATION

To order any part listed below, specify part name and part number; preceed part number with "TR-". (Example: Top Mechanism Casting, TR-2001.)

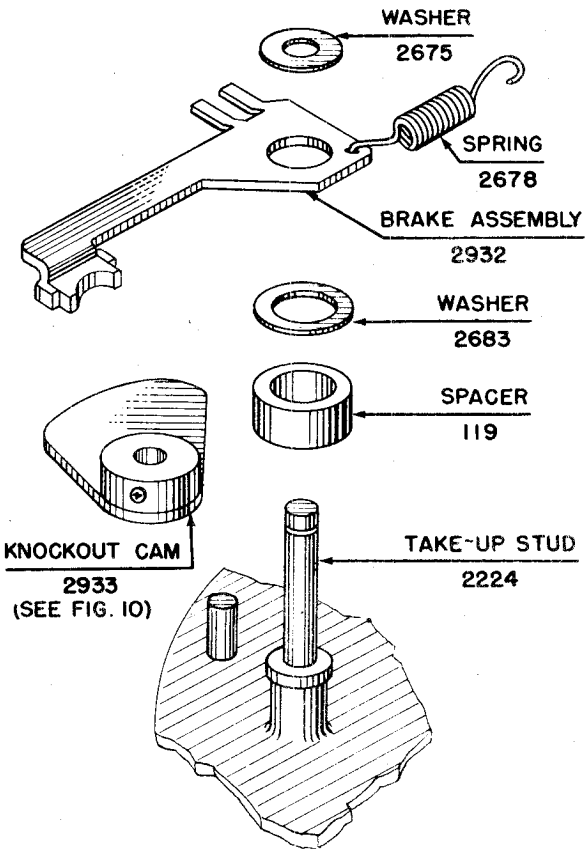


FIG. 12 - Clutch Brake Assembly.

MAIN CASTING GROUP (#2918)

2001	Top Mechanism Casting
2224	Take-up Swivel Stud
2612	Rewind Bearing
2239	Rapid Forward Brake Stud
2441	Rollpin
2675	Spacing Washer
2435	Rollpin
2458	Rollpin
2243	Rapid Forward Bushing
2209	Flywheel Bearing
2230	Pressure Roller Pivot Arm Stud
2227	Head Casting Pivot Arm Stud

HEAD ASSEMBLY GROUP (#2904)

2002	Head Casting
2024	Head Mounting Bracket
2026	Head Casting Guide
2031	Head Casting Pivot Arm
2055	Shim for Head Casting

MODELS T-100, TR-200, TS-300, TS-301

2204	Adjustable Record Tape Guide Post
2205	Stationary Record Tape Guide Post
2241	#5-40 Screw, Head Guide
2421	Tape Guide Set Screw, #4-36
2433	#6-32 x 5/16" Flat Head Screw (three used)
2631	Head Casting Arm Washer
2632	Head Casting Arm Washer
2642	Record Head, Shure Bros. Inc. Model TR-5
2455	Adjustable Record Tape Guide Set Screw

DETENT CAM ASSEMBLY (#2923)

2030	Detent Cam
2214	Detent Cam Hub
2216	Detent Pin Pulley Shifter
2220	Detent Pin Pawl Lock
2439	Groove Pin, Cam
2460	Detent Cam Groove Pin
2900	Detent Assembly, Switch-Nut-Washer

PAWL GROUP

2006	Rapid Forward Lever
2222	Pawl Shaft and Cam
2603	Pawl Tension Spring
2633	Pawl Shaft Washer
2639	Rapid Forward Washer
2908	Pawl Assembly

MOTOR GROUP

2422	"E" Retaining Rings (two used)
2402	Idler Wheel, 60 cycle
2405	Idler Wheel, 50 cycle
2424	"E" Retaining Ring
2629	Spacer Washer
2053	Spring Retaining Clip
2033	Actuator Arm
2903	Actuator Arm Assembly, 60 cycle
2941	Actuator Arm Assembly, 50 cycle
2664	Pulley Actuator Spring
2464	#4-36 Phillips Head Screw (two used)
2463	Lock Washer (two used)
2617	Actuator Spring
2607	Spacer Washer (two used)
2400	Motor Pulley, 60 cycle
2404	Motor Pulley, 50 cycle
2912	Upper Motor Bracket Assembly
2455	Screw (two used)
2446	#8-32 Nuts (four used)
2443	Lock Washers (four used)
2901	Lower Motor Bracket Assembly
2636	Motor, 50-60 cycle, 105-120 V
2668	Motor, 50-60 cycle, 210-240 V
2440	#10-32 Nuts (six used)
2647	Spacer Washer
2646	Spacer Washers .032" (two used)

FLYWHEEL GROUP

2462	#10-32 Flat Head Screw
2229	Thrust Adjusting Screw
2232	Lock Nut
2902	Flywheel Bracket
2445	#10-32 Truss Head Screw
2432	Lock Washer
2252	Flywheel Mounting Stud (two used)
2042	Thrust Disc
2431	Thrust Ball
2910	Flywheel Assembly
2613	Shock Washer

TAKE UP SPINDLE GROUP

2422	"E" Retaining Ring 1/4"
2629	Spacer Washers (three used)
2917	Take-up Swivel Assembly
2423	"E" Retaining Ring 1/8"
2615	Take-up Pulley Spring
2653	Spacer Washer
2926	Take-up Wheel Assembly
2675	Spacer Washer
2040	Clutch Plate
2650	Clutch Spring
2641	Take-up Bearing Spring Washer
2915	Spindle Assembly
2932	Brake Assembly
2678	Brake Spring
2609	Take Up Friction Washer (Felt)

REWIND SPINDLE GROUP

2403	Rewind Pulley
2429	#6-32 Set Screw (two used)
2654	Karropak Washer (two used)
2658	Felt Spacer Washer (two used)
2919	Rewind Shaft Assembly (two used)

SECTION 3
SERVICING ELECTRICAL SYSTEM

Each unit is tested at the factory for noise, hum, sensitivity, frequency response, power output and erase. Shipment, misuse, wear, and aging, all contribute to the need of service. It is the intention of this section to acquaint the serviceman with the characteristics of a normal operating unit and possible defects, so that his servicing problems can be reduced.

PRELIMINARY CHECKS

(1) Be sure all tubes are firmly seated in their sockets.

(2) Check voltages for valves given in Fig. 13 using a vacuum-tube voltmeter. These may vary from those given due to circuit variables and loadings.

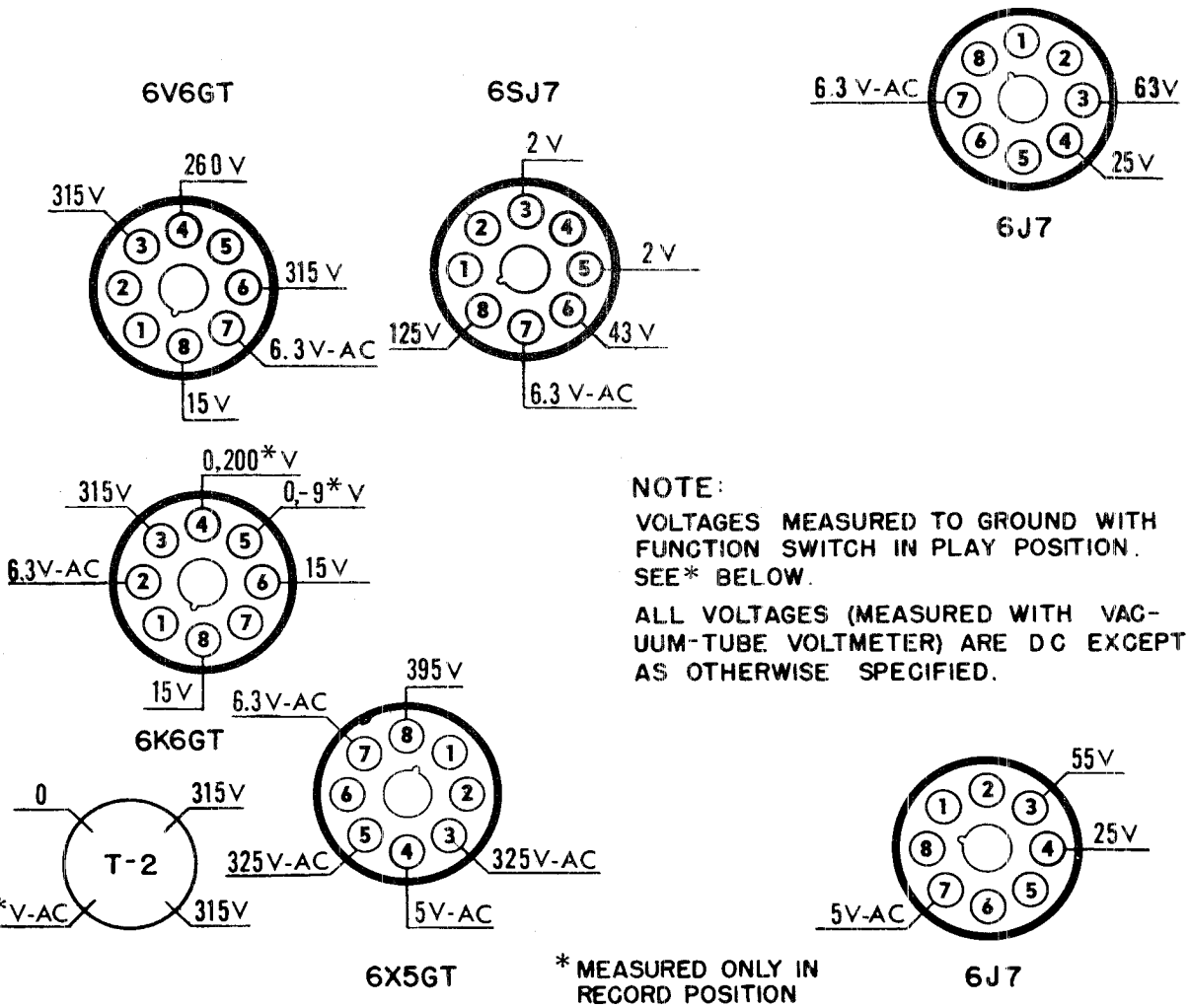


FIG. 13 - Socket-Pin Voltages.

MODELS T-100, TR-200,
TS-300, TS-301

NOTE

Neon lamp Recording-Level Indicator is biased with a DC potential in addition to audio-frequency signal voltage.

TEST TAPE

It is helpful to pre-record a tape with the following signals:

(1) Low intensity, 1000 cps for sensitivity checking.
(2) Nominal intensity, 120 and 5000 cps for frequency response.
(3) High intensity, 1000 cps for power output.
(4) Variable frequency for speaker rattle.

CONDENSERS-RESISTORS

Before checking condensers or resistors observe polarity of ohmmeter and allow tubes to cool.
(1) Condensers should be checked for DC leaks. (D.C. resistance should exceed 200 megohms.) Open condensers can only be checked by by-passing suspected condenser with a similar good one.
(2) Check for noisy resistors in input circuit by by-passing suspected resistor with .1 mfd condenser.

FUNCTION SWITCH

Control of major recorder operations is accomplished by operation of the Function switch.

FUNCTION SWITCH POSITIONS → / RECORDER COMPONENTS ↓	REWIND	STOP	PLAY	RECORD PHONO RADIO	RECORD MICROPHONE
Record-Playback Head (Fig. 14, 15) Connected to:			Amp. Input	Amp. Output	Amplifier Output
6K6 Tube (Erase)				X	X
1st 6J7 Tube; Compensating Network (Fig. 14)			X		
2nd 6J7 Tube; 6SJ7, 6V6, and 6X5 Tubes; Volume Control	X	X	X	X	X
Phono Jack	X	X		X	
Microphone Jack					X
Speaker	X	X	X	(Muted)	
Tone Control			X		

X = OPERATIVE CONDITION

Amplifier Operation Chart

CIRCUIT DIAGRAMS

A complete schematic circuit diagram is shown in Figure 16. In addition, Figures 14 and 15 show simplified circuits for the recorder head when the Function switch is in the PLAY and RECORD positions.

The coil L-1 is used for both recording and playing back signals on the tape. The .003 mfd. condenser, shunting L-1, resonates the coil thereby intensifying the higher audio frequencies. When the recorder is in RECORD position, L-2 is energized with a 25 kc erase signal. Frequency compensation occurs during playback only. See Fig. 14.

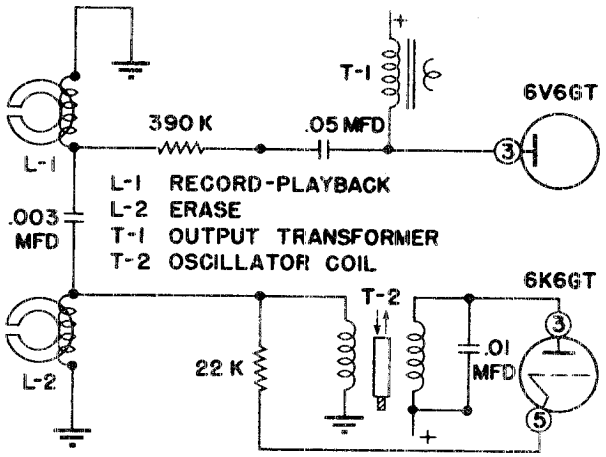


FIG. 15 - Recording Head Circuit.

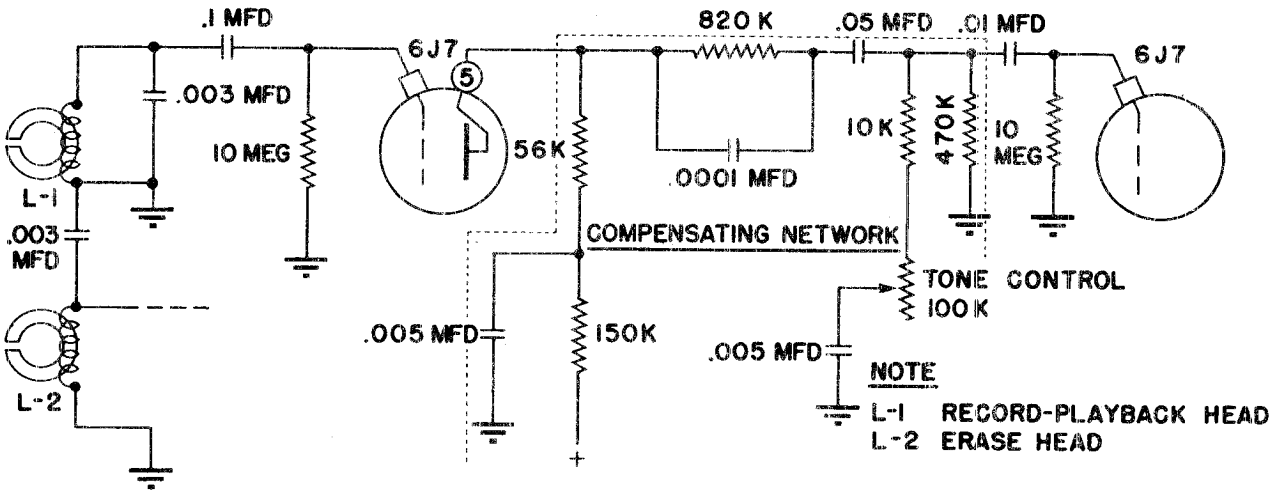


FIG. 14 - Simplified Playback Head Circuit.

TROUBLE SHOOTING

DEFECT	SYMPTOM	CHECK
A-Recorder Dead	(1) Pilot light and glass tubes dead with Off-On switch in ON position, motor inoperative.	Power cord or switch open.
	(2) Motor operates; glass tubes, pilot light dead.	Power-transformer primary or filament winding open.
	(3) Motor operates, glass tubes lighted.	Check 6X5 GT tube.
	(4) Burnt odor.	6X5 GT tube shorted (operate for 30 minutes after replacing tube to reveal transformer damage by excessive heating).
	(5) Burnt odor (AC unit connected to DC).	6X5 GT tube OK; check power switch and transformer primary for open.
	(6) Burnt odor (115 volt unit plugged into 230 volt supply).	6X5 GT tube shorted; electrolytic condenser, C-21, shorted; R-28 open; power-transformer primary open

MODELS T-100, TR-200,
TS-300, TS-301

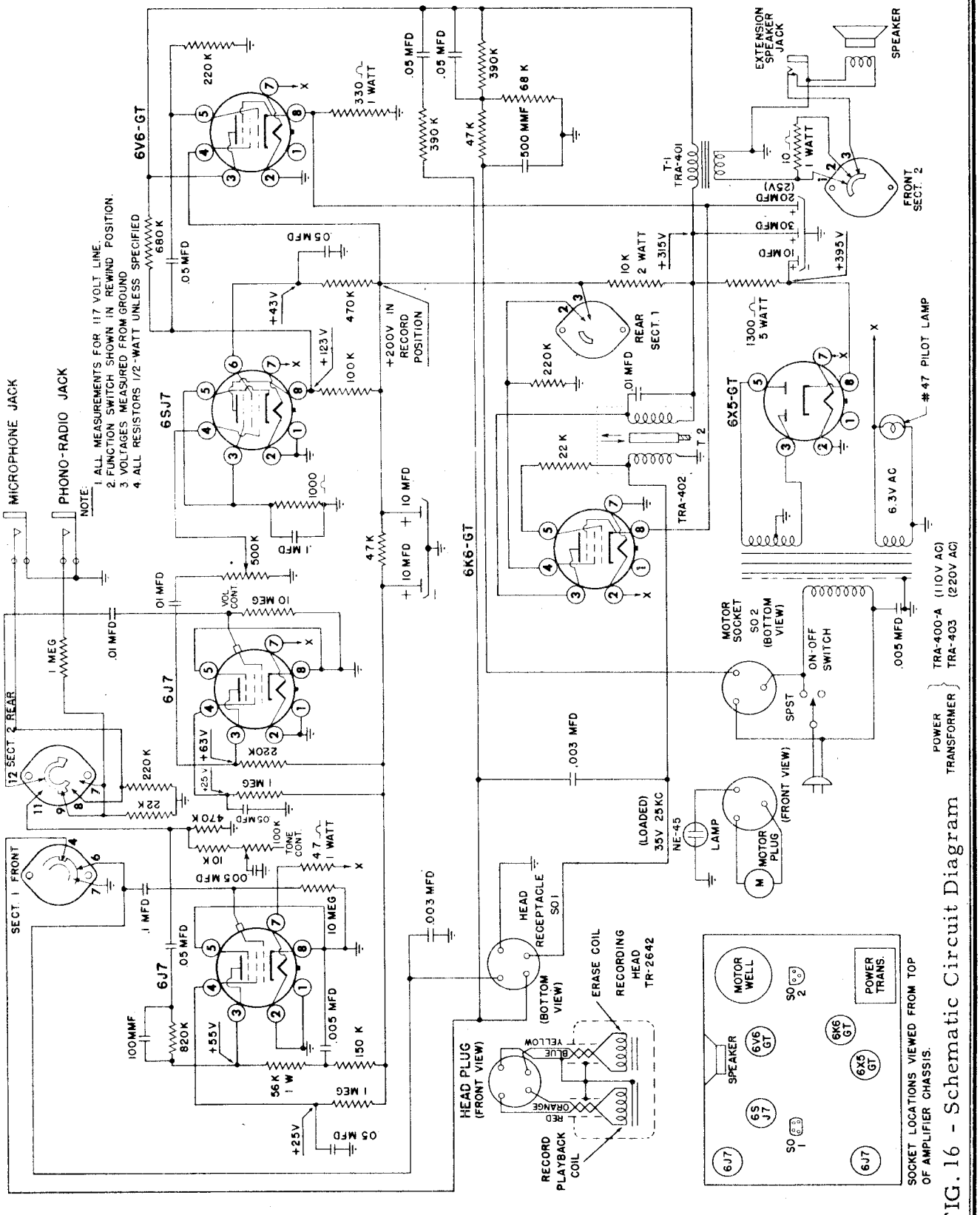


FIG. 16 - Schematic Circuit Diagram

DEFECT	SYMPTOM	CHECK
		(operate 30 minutes after repairing if transformer appears OK).
	(7) No sound from speaker. Glass tubes and pilot light operating; Recording Level indicator inoperative.	Defective tubes; open primary in T-1; open secondary, power transformer; C-5, C-8, C-10 open.
	(8) Recording Level indicator operates; no sound from speaker in PLAYBACK or RECORD; Extension Speaker jack dead.	Contacts on Function switch open; T-1 secondary open (check with Extension Speaker jack contacts open).
B-Dead Playback Only	Appears to operate properly in RECORD position; no sound in PLAYBACK. Recording Level indicator operating.	1st stage 6J7 tube defective; contacts in Function switch open; R-2, R-13, R-14 open; C-2, C-15 open.
C-Weak Playback Only	Operates properly in RECORD.	Check items immediately above (B); C-1 open.
D-Weak or Distorted Record	OK in PLAYBACK on a pre-recorded tape.	Check C-7 for leakage (remove head plug and check for DC Voltage on R-26). Erase not operating (check for 35 volts AC across secondary of T-2). Replace head plug; check for AC across both sides C-14.
E-Weak or Dead RECORD-PHONO	OK in MICROPHONE RECORD position.	Open phono circuit through switch. R-1, R-4, or radio attachment cord open.
F-Weak or Dead RECORD MICROPHONE	OK in PHONO RECORD.	Open microphone circuit through switch. Microphone or its cord defective.
G-Recording Level Indicator Inoperative	Records and plays properly but Recording Level indicator not operating.	Loose or defective indicator lamp. C-7 open.
H-Recording Level Indicator Always Glows	Not affected by Volume control.	Defective C-7.
I-Recording Level Indicator Glows on PLAYBACK Only	Affected by Volume control. Weak or distorted playback (parasitic oscillation).	Open C-13.
J-Tone Control Inoperative	No control of tone in PLAYBACK.	Open Tone control R-31. Open C-12. NOTE: Tone control operates only on PLAYBACK.
K-Records with Background Hum	Playback-hum high; lower on pre-recorded tape.	C-21 defective; cathode to filament leakage in 2nd stage 6J7, 6SJ7, 6V6 GT, or 6K6 GT tubes.
L-Hum On PLAYBACK Only	Falls off with decrease in Volume control level.	Cathode to filament leakage in 6J7 tube.
M-Microphonic	Dies out when volume level is reduced.	Tap 1st Stage, 6J7 tube, for indication. (Retain 1st stage microphonic tube as replacement in 2nd stage.)
N-Loss of High Frequencies in PLAYBACK	Pre-recording "boomy".	Check C-17.
O-Loss of Low Frequency in PLAYBACK	Pre-recording "tinny".	R-31, C-11, or C-12 open.
P-Noisy in PLAYBACK	(1) "Shot effect"; high frequency hiss.	R-13 noisy, R-31, C-11, or C-12 open.
	(2) Low frequency "rumble".	R-2 or R-14 noisy.
Q-No Erase	Records over previous recordings without erasing.	Defective 6K6 GT tube. First, remove head plug from SO-1 and check for AC voltage across secondary of T-2; replace head plug; check voltage again. C-9 open or shorted; T-2 shorted or R-5 open. NOTE: Adjust T-2 for 35 volts AC across L-2.

ELECTRICAL PARTS LIST

The electrical system parts list is keyed to the figures throughout this manual; circuit symbols as tabulated in this list represent the components similarly labelled in the figures. (For resistor and condenser locations, see Fig. 17.)

When ordering parts for the electrical system, specify circuit symbol (if one is given in the parts list), part number and part description. (Example: R1, TRA 302, 1 megohm, 20%, 1/2 watt.)

CIRCUIT SYMBOL	PART NO.	DESCRIPTION
	RESISTORS	
R1, R2, R3	TRA 302	1 megohm, 20%, 1/2 watt
R4, R5	TRA 309	22,000 ohm, 20%, 1/2 watt
R6, R7, R8, R9	TRA 305	220,000 ohm, 20%, 1/2 watt

CIRCUIT SYMBOL	PART NO.	DESCRIPTION
	RESISTORS - Continued	
R10, R11	TRA 300	10 megohm, 20%, 1/2 watt
R12	TRA 313	820,000 ohm, 10%, 1/2 watt
R13	TRA 318	56,000 ohm, 10%, 1 watt
R14	TRA 315	150,000 ohm, 10%, 1/2 watt
R15, R16	TRA 321	470,000 ohm, 20%, 1/2 watt
R17	TRA 307	10,000 ohm, 20%, 1/2 watt
R18, R19	TRA 317	47,000 ohm, 20%, 1/2 watt
R20	TRA 322	1,000 ohm, 20%, 1/2 watt
R21	TRA 308	10 ohm, 20%, 1 watt
R22	TRA 303	68,000 ohm, 20%, 1/2 watt
R23	TRA 312	330 ohm, 20%, 1 watt
R24, R26	TRA 301	390,000 ohm, 20%, 1/2 watt
R25	TRA 316	68,000 ohm, 10%, 1/2 watt
R27	TRA 311	10,000 ohm, 10%, 2 watt
R28	TRA 319	1,300 ohm, 10%, 5 watt
R29	TRA 304	4.7 ohm, 10%, 1/2 watt
R30	TRA 306	100,000 ohm, 20%, 1/2 watt
R31	TRA 320	Volume-Tone control
	CONDENSERS	
C1, C2, C3, C4, C5, C6, C7	TRA 203	.05 mfd, 400v, paper tubular
C8, C9, C10	TRA 205	.01 mfd, 400v, paper tubular
C11, C12	TRA 207	.005 mfd, 600v, paper tubular
C13, C14	TRA 204	.003 mfd, 600v, paper tubular
C15, C16	TRA 202	.1 mfd, 200v, paper tubular
C17	TRA 208	100 mmf, 10%, 500v mica
C18	TRA 209	500 mmf, 20%, 400v ceramic
C19	TRA 206	005 mfd, 1000v, paper tubular
C20	TRA 200	15-15 mfd, 350v, electrolytic
C21	TRA 201	10-30-25 mfd, 450-350-25v, electrolytic
	MISCELLANEOUS	
S1	TRA 511	Function Switch
T1	TRA 401	Output Transformer
T2	TRA 402	Oscillator Coil
	TRA 105	Pilot Lamp (#47)
	TRA 106	NE 45 Neon Recording Indicator Lamp
	TRA 400	Power Transformer, 105-120 volts
	TRA 403	Power Transformer, 210-240 volts
	TRA 512	Speaker Plug (Male)
	TRA 600	5x7 Speaker
	TRA 709	Power Cord Assembly
	TRA 801	Trimount Stud
	TRA 900	Chassis Assembly
	TRA 901	Radio Attachment Cord
	TRA 904	Microphone
	TRA 905	Microphone Extension Cord Jack (Female)
	TRA 906	Microphone Plug (Male)
	TRA 100	6V6 GT Vacuum Tube
	TRA 101	6X5 GT Vacuum Tube
	TRA 102	6J7 Vacuum Tube
	TRA 103	6K6 GT Vacuum Tube
	TRA 104	6SJ7 Vacuum Tube

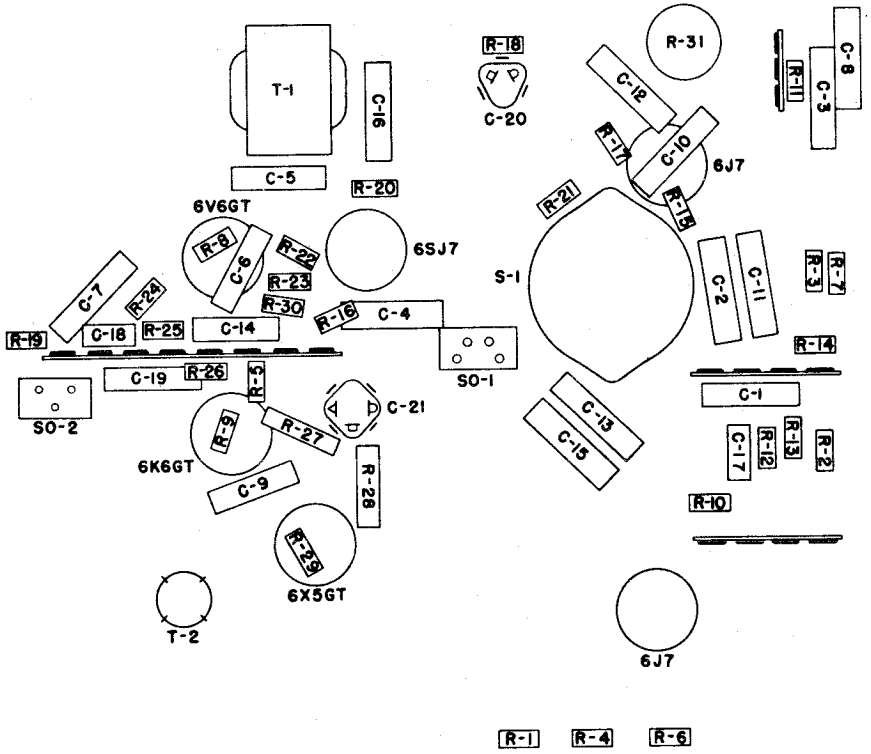
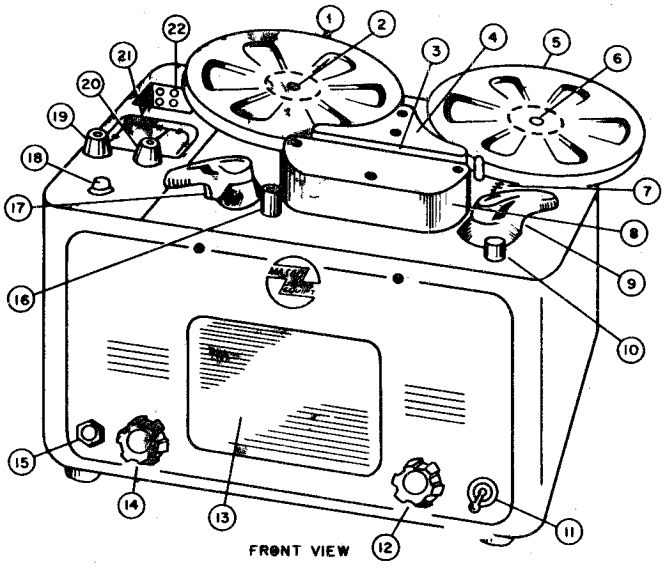


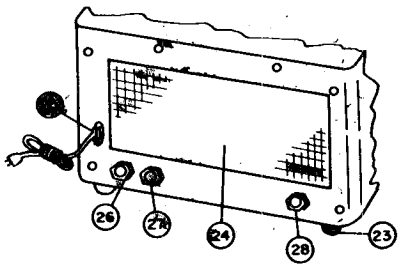
FIG. 17 - Electrical Component Locations, Bottom View of Amplifier.

MODELS D-37, D-37R,
DC-37R, LD-37, LD-37R

MASCO SOUND REEL DUAL SPEED DUAL-TRACK MAGNETIC TAPE RECORDER



FRONT VIEW



REAR VIEW

MARK SIMPSON
MODELS D-37, D-37R, DC-37R, LD-37, LD-37R

SPECIFICATIONS

POWER CONSUMPTION: 80 watts at 117 volts, 60 cps (Models D-37, DC-37, LD-37)
95 watts at 117 volts, 60 cps (Models D-37R, DC-37R, LD-37R)

POWER OUTPUT: 5 WATTS (to internal or external speaker)

HUM LEVEL: 50 db below full output

FREQUENCY RESPONSE: 80-8500 cps ±3 db at 7.50"/sec.
80-5000 cps ±3 db at 3.75"/sec.

SIGNAL-TO-NOISE RATIO: 45 db at 7.50"/sec. 40 db at 3.75"/sec.

ERASE AND BIAS FREQUENCY: 60 Kc

INPUTS: (1) Microphone-1 megohm impedance, .003 volts sensitivity
(1) Radio-Phono-0.5 megohm impedance, 0.4 v. sensitivity
(1) External Speaker, 8-16 ohm voice coil, 5 watts
(1) External Amplifier, 500 ohms, 1.7 volts to line or amplifier (any 500 ohm or high impedance radio-phono input may be used)

MONITORING: The EXTERNAL SPEAKER jack takes a phone-type plug and may be used with any headphones for HEADPHONE MONITORING simultaneously with recording. The INTERNAL SPEAKER may also be used for monitoring.

MONITOR SWITCH: On tone control

AMPLIFIER CONTROLS: (1) Volume; (1) Tone

SPEAKER: 6" PM. 3.2 ohm voice coil

PLAYBACK EQUALIZATION: Seperate for each speed

REWIND SPEED: 1200 feet in 3 minutes (approx.)

RECORDING VOLUME LEVEL INDICATOR: Neon bulb also acts as Pilot Light in "PLAYBACK"

TAPE TIME (with 1200' reel): 7.50"/sec. - 1 hr. dual track; 1/2 hr. single track
3.75"/sec. - 2 hrs. dual track; 1 hr. single track

TAPE: Any "A" wound tape (dull or coated side facing in toward hub of reel) may be used.

AMPLIFIER TUBES: (1) 12AX7 equalized tape playback pre-amplifier
(1) 6SL7GT dual purpose microphone voltage amplifier and intermediate amplifier.
(1) 6SN7GT dual purpose: recording head driver in "RECORD" output amplifier tube driver in "PLAYBACK"; monitor amplifier in "RECORD"

MODELS D-37, D-37R,
DC-37R, LD-37, LD-37R

(1) 6V6GT 60 Kc. Bias and erase oscillator in "Record", power output amplifier in "Playback".
(1) 6X5GT full wave rectifier

AM RADIO TUNER: (Models D-37R, LD-37R, DC-37R only); TUBES:
(1) 6BA6 RF amplifier
(1) 6BE6 Oscillator-converter
(1) 6SF7 IF amplifier and detector
(1) Selenium Rectifier

Radio ON-OFF Switch on radio tuner operates a seperate power supply for the tuner.

CALL OUT DIAGRAM LEGEND

1. SUPPLY REEL — Reels up to 7" in diameter may be used.
2. SUPPLY REEL SPINDLE — Threaded (6-32) to permit bolting down of reels.
3. TAPE SLOT — Can be used for attaching recording counter.
4. RECORD AND ERASE HEAD — Shure Type TR5H. Head mounts on head alignment pins and may be replaced without any special alignment tools. Head is kept firm by means of a felt pressure pad.
5. TAKE-UP REEL — 7", supplied with recorder.
6. TAKE-UP REEL SPINDLE — Threaded (6-32). Braking pressure is applied to this spindle shaft during "Rewind" to ensure even winding of tape and to prevent slippage.
7. ELAPSED TIME INDICATOR SCALES
8. CAPSTAN TURRET — Feeds tape at constant speed.
9. CONTROL LEVER No. 1-&2- position control:
   Position 1: Off-Stop tape - Rewind
   Position 2: Record - Playback
10. RECORD PUSHBUTTON — Used for recording at either speed. This button must also be depressed to ERASE
11. MAIN POWER SWITCH — Turns on amplifier and motor. If control levers are at OFF motor will idle with capstan disengaged.
12. TONE CONTROL AND MONITOR SWITCH — Continuous Treble attenuation type tone control. The control is not effective when recording, CORRECT tonal values being determined by the equalizing circuits. The MONITOR SWITCH, operated by the tone control, allows the user to listen while recording.
13. SPEAKER
14. VOLUME CONTROL — Used for adjusting the recording volume level and also for controlling the volume in "Playback"
15. MICROPHONE INPUT — Takes standard phone-type plug.
16. 3.75 SPEED CHANGE PUSHBUTTON — Used only when recording or playing back at 3.75"/sec.
17. CONTROL LEVER No. 2- a 3- position control:
   Position 1: Rewind
   Position 2: Off-Stop Tape
   Position 3: Record - Playback
18. VOLUME LEVEL INDICATOR AND PILOT LIGHT — Neon bulb acts as indicator of correct recording volume in "Record" and as pilot light at all other times.
19. TUNING CONTROL — For built-in AM radio (models with radio only).
20. RADIO ON-OFF SWITCH — Main power switch must be ON to permit radio to be operated (models with radio only).
21. RADIO DIAL
22. MICROPHONE STORAGE COMPARTMENT — (on models without radio only)
23. BUMPER FEET
24. REMOVABLE BACK — Perforated for ventilation and provided with safety interlock to automatically disconnect power when back is removed.
25. AC POWER CORD — For operation on 117 volts, 60 cycles AC only.

26. EXTERNAL SPEAKER AND MONITOR JACK Delivers full audio power to external 8-16 ohms speaker or headphones.
27. EXTERNAL AMPLIFIER OUTPUT
28. RADIO AND PHONOGRAPH INPUT Any radio, tuner or phonograph can be adjusted for use with this input.

TAPE RECORDER, RADIO TUNER, VOLTAGE AND RESISTANCE CHARTS

VOLTAGE MEASUREMENTS			
TUBE	6BA6	6BE6	6SF7
Pin #1	-0.85V DC	-2V DC	--
#2	0	0	-0.85V DC
#3	0	0	0.6V DC
#4	6.3V AC	6.3V AC	107 V DC
#5	94V DC	94V DC	-0.95V DC
#6	102V DC	60V DC	90V DC
#7	0.3V DC	0	6.3V AC
#8	-	-	0

All voltages to ground, measured with 20,000 ohm/volt meter.

RESISTANCE MEASUREMENTS			
TUBE	6BA6	6BE6	6SF7
PIN #1	3.2 meg.	15,000	0
#2	0	0.2	3.2 meg.
#3	0	0	270
#4	0.3	0.3	33,000
#5	28,000	28,000	520,000
#6	33,000	38,000	28,000
#7	150	4.7	0.3
#8	-	-	0

All resistances measured to ground.

INSTALLATION

This recorder is designed to operate from 105-125 volts 60 cycles AC. Operation on any other voltage or frequency may result in serious damage and/or improper operation and will void the guarantee. If in doubt consult your MASCO dealer or power company.

1. Insert the AC power plug into any 105-125 volt, 60 cycle AC socket.
2. Remove full reel of tape, empty take-up reel and microphone from storage.

OPERATION

Before reading the operating instructions, it is suggested that you familiarize yourself with the various controls and features of your recorder as described in the preceding pages.

TO RECORD FROM MICROPHONE

1. Make certain that CONTROL LEVERS No. 1 and 2 are at OFF.
2. Place MAIN POWER SWITCH TO ON
3. Place full reel of tape on the SUPPLY REEL SPINDLE so that the glossy side of the tape faces you and the reel will unwind counter-clockwise. Make certain that one of the slots in the hub of the reel engages the fin or key of the reel spindle.
4. Place the empty take-up reel on the TAKE-UP REEL SPINDLE, making sure that the reel slot engages the fin at the base of the spindle.
5. Unwind about 2 feet of tape from the Supply Reel. Drop the tape into the TAPE SLOT and run it in FRONT of the tape guide pin on the right of the RECORD HEAD housing.
6. Insert free end of tape into slot on take-up reel and rotate the reel counter-clockwise (to the left) for a few turns until the tape is engaged. BE SURE THAT THE GLOSSY SIDE OF THE TAPE FACES YOU. Rotate reel to take up slack.
7. By this time the neon-bulb PILOT LIGHT should be glowing steadily to indicate that the equipment is warmed up and ready to operate. Plug microphone into MICROPHONE INPUT.
8. Depress the RECORD PUSHBUTTON. While keeping the button depressed, rotate CONTROL LEVER No. 1 to "RECORD" position.
9. The PILOT LIGHT goes out as a result of the above operation and becomes the RECORDING VOLUME LEVEL INDICATOR. Hold the microphone firmly in the hand about 6 to 12 inches away from the mouth. While speaking into the

microphone in a normal tone of voice, rotate the VOLUME CONTROL clockwise until the neon bulb VOLUME LEVEL INDICATOR flickers occasionally. The VOLUME CONTROL should not be advanced to the point where the neon bulb glows continuously, to avoid distortion. IT IS RECOMMENDED THAT THE USER MAKE SEVERAL TEST RECORDINGS TO GAIN EXPERIENCE WITH THE PROPER SETTING OF THE RECORDING VOLUME LEVEL.

10 You may now Record. To listen to the recording being made, you may, at this point, turn on the internal SPEAKER by means of the MONITOR SWITCH on the TONE CONTROL, or you may plug in an external speaker (8 to 16 ohms voice coil) or headphones at the EXTERNAL SPEAKER jack. The TONE CONTROL setting has no EFFECT WHILE recording.

11. To Record at 7.50 inches per second (for hihg fidelity reproduction), rotate CONTROL LEVER No. 2 to RECORD position. The tape will begin to move and you may proceed to record.

12. To record at 3.75 inches per second. FIRST depress the 3.75 SPEED CHANGE PUSHBUTTON, and while keeping this BUTTON FIRMLY DEPRESSED, ROTATE CONTROL LEVER No. 2 to RECORD POSITION. You may now proceed to record.

To Record from External Radio, Phonograph, Tape or Wire Recorder

1. The output of any radio, radio-tuner, phonograph, tape or wire recorder may be connected through a suitable cable to the RADIO-PHONOGRAPH INPUT. An output of 0.5 volts or more is required. The necessary modifications can be made by any competent radio serviceman.
2. Recording is accomplished in the same manner as described under "TO RECORD FROM MICROPHONE."

To Record from Built-In Radio (Models D-37R, DC-37R, LD-37R)

a. Prepare machine for recording as under "INSTALLATION" and paragraphs 1 through 8 of "TO RECORD FROM MICROPHONE", except that microphone is not plugged in.
b. Turn on MONITOR SWITCH on TONE CONTROL.
c. Turn RADIO SWITCH TO "ON".
d. Tune in desired station. The hank of antenna wire supplied should be extended about the room or may be connected to an external antenna.
e. Adjust RECORDING VOLUME LEVEL INDICATOR (NEON BULB) by means of the VOLUME CONTROL for correct recording level, as in paragraph 9 under "TO RECORD FROM MICROPHONE" and proceed to record as described in that section.

To Record on the Second Track

Having recorded one track of an entire reel, to record on the second track merely lift the full TAKEUP reel, turn it upside down and place it on the SUPPLY REEL SPINDLE. Place the empty reel on the TAKEUP REEL SPINDLE. Rethread and continue to record as under "TO RECORD FROM MICROPHONE".

To Stop Tape

To stop Tape at any time, always operate Control Lever No. 2 FIRST to STOP TAPE position, then turn CONTROL LEVER No. 1 to STOP TAPE Position.

To Rewind

a. Stop tape as above.
b. Put CONTROL LEVER No. 1 into REWIND POSITION.
c. Put CONTROL LEVER No. 2 into REWIND POSITION.
d. Turn VOLUME CONTROL to minimum.

To Change Tape Speeds while Recording

1. Stop tape by operating CONTROL LEVER No. 2 only to STOP TAPE position.
2. If you were recording at 7.50 inches per second and desire to change to 3.75, FIRST depress the 3.75 SPEED CHANGE PUSHBUTTON, and, while keeping this button depressed, turn CONTROL LEVER No. 2 to RECORD position.
3. If you were recording at 3.75 inches per second, to change to 7.50 simply turn CONTROL LEVER No. 2 back to RECORD position.

To Play Back Tape Recordings

a. Follow the procedures under "INSTALLATION" in paragraphs 1 through 7 of "TO RECORD FROM MICROPHONE" except that microphone is not plugged in.
NOTE: Recordings made at 3.75 inches per second MUST BE PLAYED BACK AT THE SAME SPEED, and similarly for recordings made at 7.50 inches per second.
b. Rotate CONTROL LEVER No. 1 to PLAYBACK position.
c. Rotate CONTROL LEVER No. 2 to PLAYBACK position.
d. Adjust VOLUME AND TONE CONTROLS for suitable loudness and desired tone quality.

Changing the Tape Speed or Stopping Tape during PLAYBACK is accomplished in the same manner as during RECORD.

Erasing of Tape - is accomplished in the same manner as recording, except that nothing is recorded. Erasing occurs automatically when RECORDING NEW MATERIAL ON TAPE WHICH WAS PREVIOUSLY USED.

SERVICE AND MAINTENANCE

Care of Tape

The storage and care of tape is important. Reels of tape should be stored where they will not be subjected to extremes of temperature and humidity. Rewind tape once before using when it has been stored 6 months or longer. It is recommended that new reel of tape be rewound once before recording.

Cleaning the Capstan and Recording Head is important after reasonable use. Dirt and slight gum deposits from the tape gradually accumulate on the recording head and rubber capstan. The recording head and capstan may be reached for cleaning by removing the two Phillips-head screws from the RECORD AND ERASE HEAD HOUSING and gently lifting off the housing cover. Cleaning is accomplished by means of a cloth dipped in carbon tetrachloride (obtainable from radio parts suppliers, hardware stores, drug stores, etc.)

Service

Proper care of your recorder will result in excellent service for years to come. Follow these simple rules:

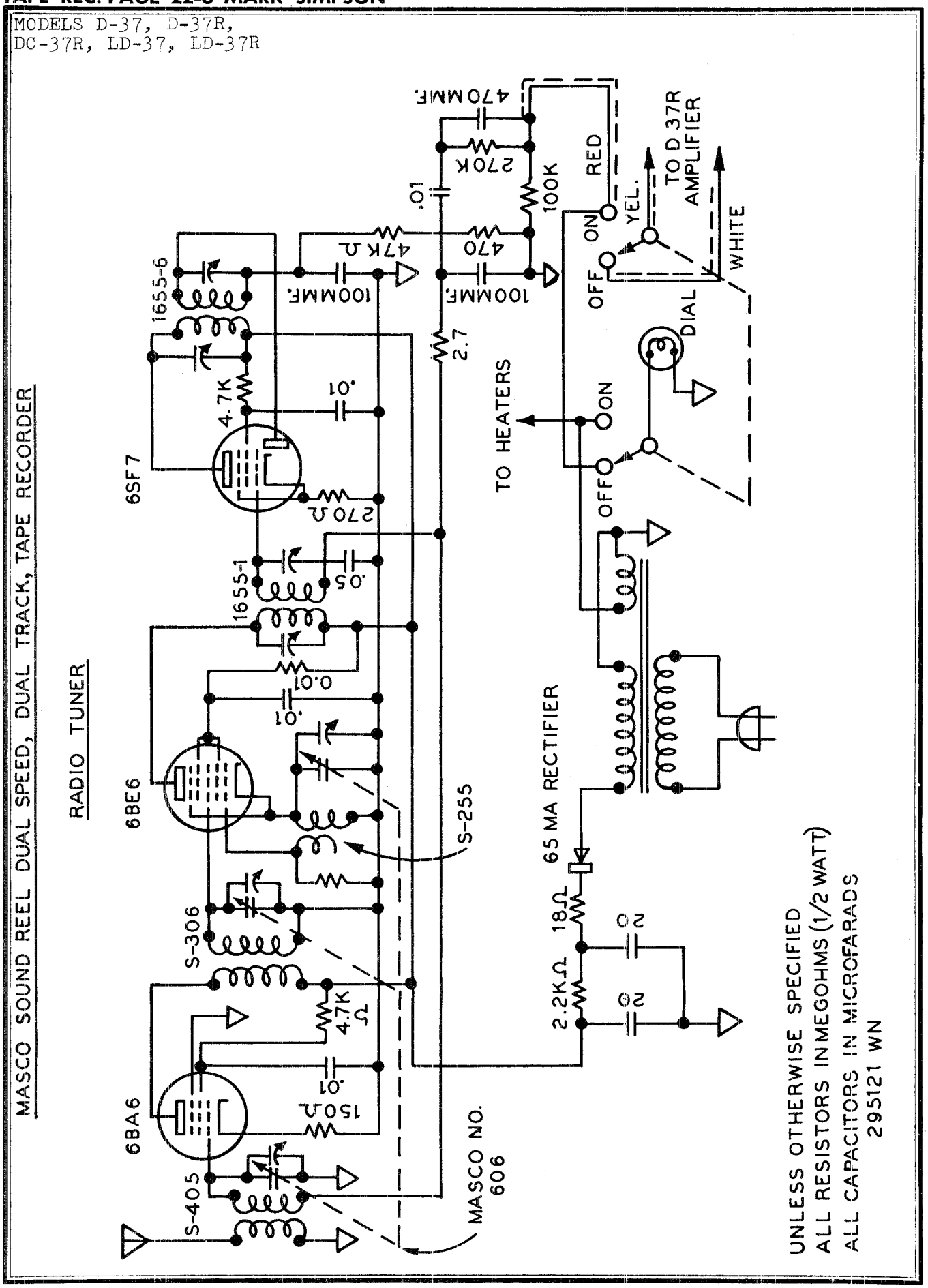
NEVER OIL your recorder. Surfaces which are subject to wear are provided with oil-less bearings sealed for a lifetime operation.

THIS EQUIPMENT SHOULD BE SERVICED ONLY BY QUALIFIED TECHNICIANS. DO NOT remove the top plate of the mechanism. Doing so will VOID the warranty.

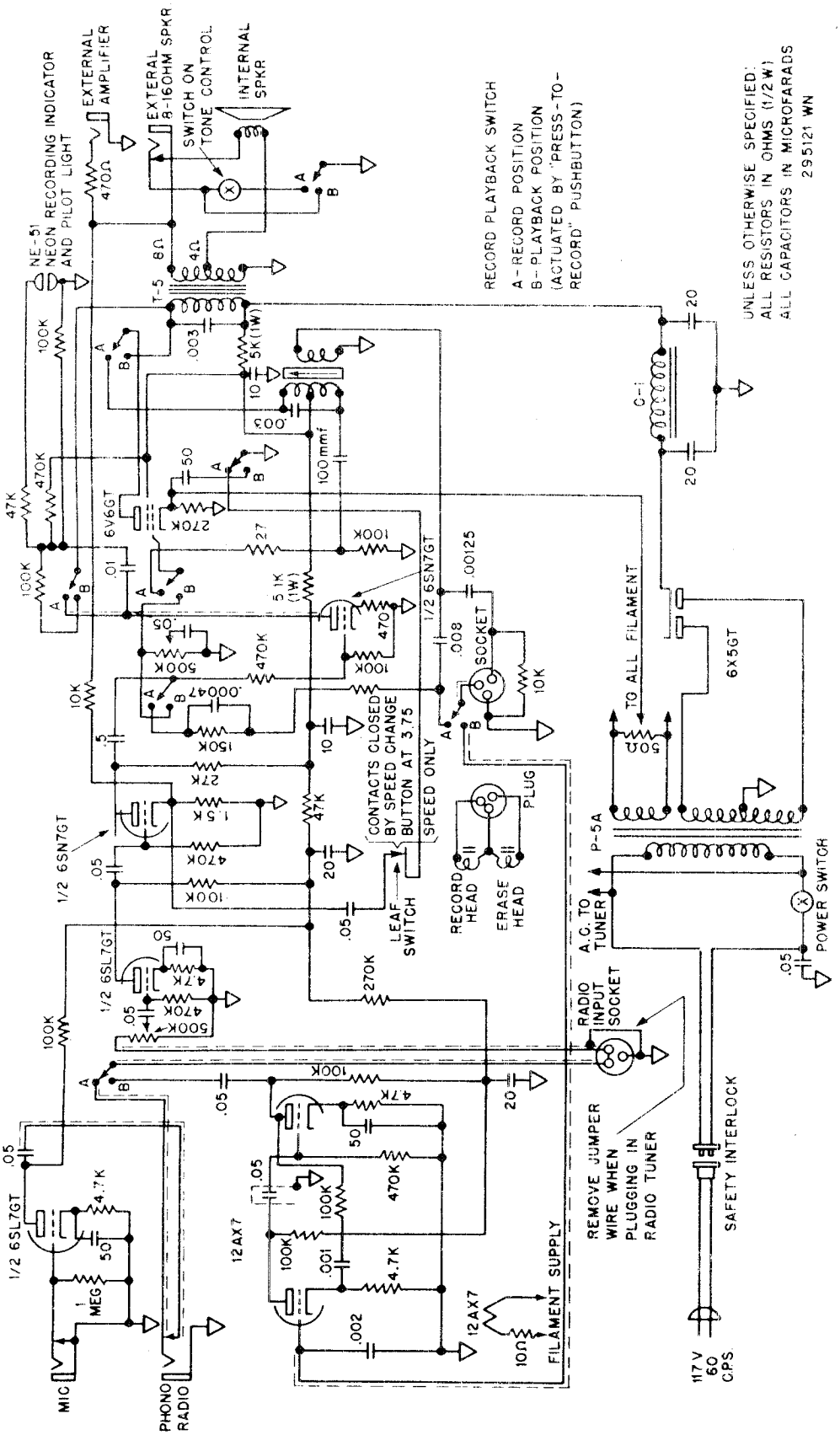
FOR BEST RESULTS: When beginning to record or playback, always use the right-hand CONTROL LEVER No. 1 FIRST. When stopping tape, always use the left-hand CONTROL LEVER No. 2 FIRST.

MAKE SURE ALL CONTROLS ARE IN OFF POSITION BEFORE LEAVING YOUR RECORDER.

MODELS D-37, D-37R,
DC-37R, LD-37, LD-37R



MODELS D-37, D-37R,
DC-37R, LD-37, LD-37R



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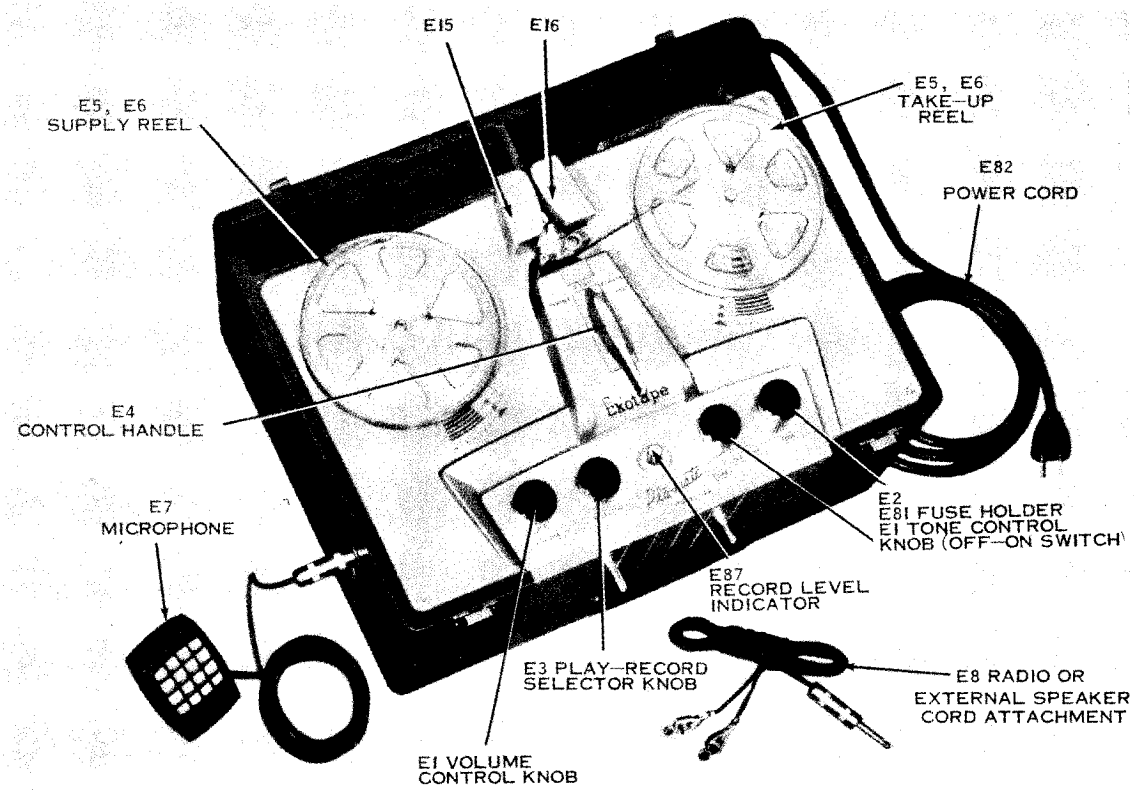
Service Instructions



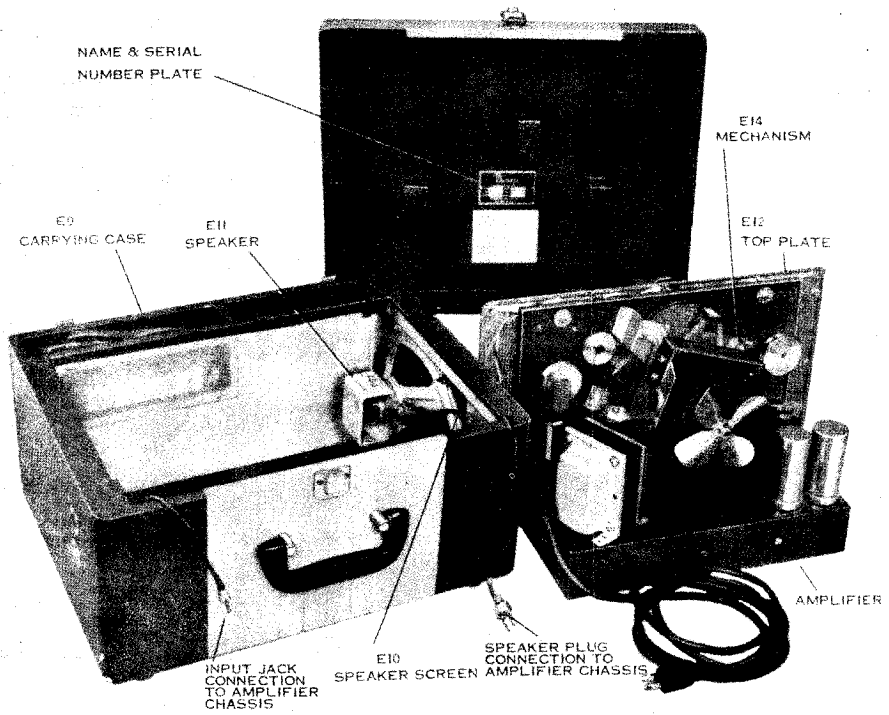


Figure 1.

Unit Removed From Case

351A 241-15215

MODELS 109, 110, 111, 112

2. DESCRIPTION OF MODELS.

The EKOTAPE models 109, 110, 111 and 112 described in this manual are all of the same basic design and construction. All are portable models and include the same accessories. Model 109 is the basic unit; all other models have slight variations and are described in the following paragraphs.

Model 109 operates on 117 volts at 60 cycles per second with a tape speed of 3-3/4 inches per second. Different tube compliments have been used as follows:

Serial No. 5202 and Below - See figure 8.

Rectifier	5Y3GT
Input (Playback only)	6AU6
Amplifier	12AT7
Output	6V6GT
Oscillator	6V6GT

Serial No. 5203 to 12249 - See figure 9.

Rectifier	5Y3GT
Input (Playback only)	5879
Amplifier	12AX7
Output	6V6GT
Oscillator	6V6GT

After Serial 12250 the type 12AX7 is replaced by two type 6AV6.

MODEL 110. Operates on 115/230 volts at 50 cycles per second. Tape speed is 3-3/4 inches per second. The amplifier is the same as Model 109 except a larger power transformer is used which incorporates a tapped primary for selection of 115 or 230 volt operation as shown in the schematic, figure 9. Units are shipped connected for 115 volt operation. For 230 volt operation it is necessary to move one wire in the amplifier, see paragraph 20. The motor pulley is larger and the flywheel tire is smaller on this model than on Model 109. After Serial 12250, the type 12AX7 tube is replaced by two type 6AV6.

MODEL 111. Operates on 117 volts at 60 cycles per second. Tape speed is 7-1/2 inches per second. Mechanically, this model is the same as Model 109 except motor pulley to flywheel tire ratio is different to give faster tape speed. The amplifier has some differences from Model 109 to accommodate the increased tape speed (see schematic, figure 10.) After Serial 12250, the 12AX7 is replaced by two type 6AV6 tubes.

MODEL 112. Operates on 115/230 volts at 50 cycles per second. Tape speed is 7-1/2 inches per second. The amplifier is the same as Model 111 except a larger power transformer is used which incorporates a tapped primary for selection of 115 or 230 volt operation as shown in the schematic, figure 10. Units are shipped connected for 115 volt operation. For 230 operation, it is necessary to move one wire in the amplifier, see paragraph 20.

NAMEPLATE. The model number, serial number and power requirements of each unit are stamped on the nameplate in the cover of the carrying case.

3. REMOVING UNIT FROM CASE.

All service work except cleaning the head assembly requires removal of the unit from the carrying case, figure 1. To remove the chassis, remove the screws in the corners of the top plate and carefully lift out the complete unit. Disconnect the speaker and the input plugs; then lift the unit free. When replacing the unit, connect the plugs and be sure the power cord is looped under the speaker to clear all moving parts and is in the slot in the case before lowering the unit in place.

4. TROUBLE CHART.

No matter how well equipment is designed and manufactured there are faults which normally occur in service. This section is designed to aid in quick location and correction of the troubles.

Before starting disassembly of the unit and actual point to point testing for troubles in the amplifier, it is often possible to localize the trouble to a particular circuit or component by simple preliminary tests and checks. Set the power switch to its ON position and make sure that power is being supplied to the unit. Lift up the top plate and inspect tubes. If one or more tubes do not light up, test the tubes. If tubes are in working condition, remove bottom cover of amplifier and check for loose connections or other visual signs of troubles.

Troubles which are not listed in this chart or which cannot be corrected by normal procedure should be referred to the factory or an Authorized Ekotape service station, giving the model and serial number of the unit.

TROUBLE	CAUSE	REMEDY
1. Motor and amplifier inoperative with switch ON.	Blown fuse. Power supply source. Damaged power cord assy. Broken OFF-ON switch.	Replace fuse, par. 5. Check for correct voltage as shown on nameplate. Repair or replace. Replace tone control and switch assembly.
2. Sound is fuzzy, faint, distorted, or no sound.	Dirty head. Over-recorded or under-recorded tape. Amplifier defect. Pressure pad not functioning. Worn or dirty pressure pad. Record head not operating.	Clean head, par. 6. Do not remove or change position of head. See Operating Guide. Check amplifier, par. 16. Check action of pressure pad lever. Replace or clean pressure pad lever assembly. Check oscillator bias voltage to record head, par. 11.
3. No sound, but motor operates and tubes light.	Amplifier trouble. Open circuit to speaker.	Check amplifier, par. 16. Check continuity through plug to speaker.

4. Not erasing.	Dirt on face of head. Oscillator coil assy or tube not operating. Defective erase coil in head.	Clean head, par. 6. Replace oscillator coil or tube, par. 11. Replace head, par. 11.
5. Erasing incomplete - background of old recording audible.	Erase head not operating properly. Pressure pad worn or not properly adjusted.	Check erase voltage with AC vacuum tube voltmeter. Should be approximately 45 volts, par. 11. Check erase head continuity. Adjust pressure pad or replace.
6. Does not record.	Record coil open. Insufficient bias voltage.	Replace head unit. Check bias voltage across record head with AC vacuum tube voltmeter. Should be approximately 100 volts. If low, check bias oscillator circuit, par. 11.
7. Does not reproduce. Sound of amplifier only.	Open coil in head. Open in input circuit.	Replace head unit, par. 11. Check circuit, par. 16.
8. No drive, noisy or irregular drive on REWIND.	Rewind belt broken, dirty or defective. Control knob loose. Motor mount misaligned. Drive pulley loose. Bent or damaged motor bracket or engagement bracket lever. Lift lever out of adjustment.	Replace rewind belt, par. 8. Tighten control knob setscrew. Realign motor mount, par. 14. Tighten pulley set screw. Adjust or replace bracket lever to normal operating position, par. 14. Adjust lift lever, par. 13.
9. Tape rewinds slowly (creeps) at stop position.	Motor mount misaligned. Bent or damaged motor engagement bracket lever.	Realign motor mount, par. 14. Replace or adjust bracket lever, par. 14.
10. No drive, noisy or irregular drive on FAST forward.	Drive belt broken, dirty or Broken fast forward spring. Trip brake spring not clearing rewind belt. Motor out of alignment.	Replace drive belt, par. 8 Replace spring. Adjust trip brake spring, par. 14. Align motor, par. 14.
11. Supply reel over runs on fast forward.	Broken brake spring or unhooked trip spring. Trip brake tension to light.	Replace brake spring or fasten trip spring. Adjust trip brake, par. 14.
12. Take-up reel does not take up tape on PLAY position.	Broken or defective take-up drive belt. Dirt under take-up disc or dirt in reel spindle. Lift lever out of adjustment. Broken or defective lift lever spring.	Replace belt, par. 8 Clean and lubricate reel spindle, par. 7 and 8. Adjust lift lever, par. 13. Replace spring, par. 13.
13. Tape overruns from rewind to stop.	Brake lever spring E31, fig. 4, broken. Take-up pulley and shaft E60, fig. 4, out of adjustment. Pads on brake yoke, E30, missing.	Replace spring. Adjust take up disc and shaft assy, par. 8. Replace brake yoke, E30, fig. 4.
14. Uneven sound, wows causes by tape slipping.	Foreign substance caked on pinch roller or capstan. Worn or damaged pinch roller. Broken or defective pinch roller spring. Uneven pull on supply reel due to gummy or dirty bearing. Excessive pressure pad tension on heads.	Clean roller and capstan, par. 6. Replace pinch roller assembly. Replace spring. Clean supply reel spindle, par. 7 and 8. Relieve pressure pad tension.
15. Howl or ringing sound.	Microphonic tube.	Replace defective tube, par. 17.
16. Troubles common to radio receivers.	Defective components.	Check and replace in accordance with standard practice, par. 16.

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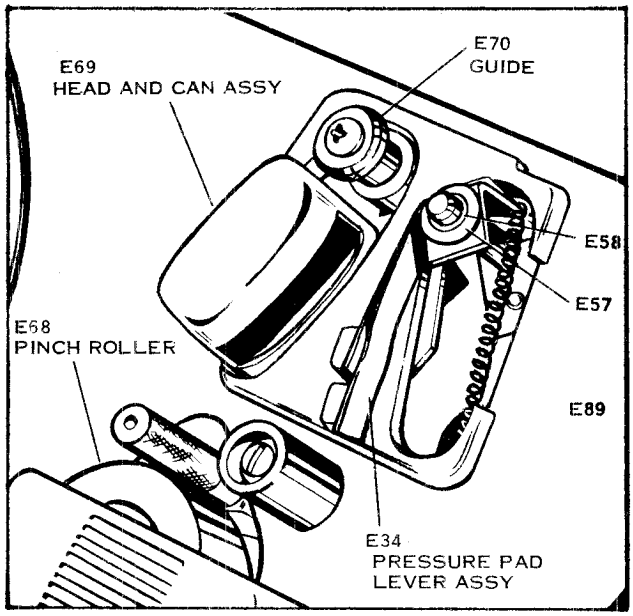

Figure 2. Record Head and Pressure Pads

5. FUSE.

Before replacing the fuse, determine cause of fuse failure. A standard cartridge type 3AG 2-ampere fuse is installed in a fuse holder at the right side of the top panel.

6. CLEANING.

When operation of the unit indicates cleaning is required (see Trouble Chart), wipe off the record and erase head contact surfaces (figure 2) carefully with a clean dry cloth. If dirt is caked or hard and will not come off with a dry cloth, dampen the cloth slightly with carbon tetrachloride.

NOTE

Do not use a brush or excessive amount of solvent on the pole surfaces.

Also clean the capstan and guide roller in the same manner.

7. LUBRICATION.

In normal use, the EKOTAPE requires no lubrication. Motors, flywheel shaft and spindles operate in oilite bearings. When unit is disassembled for repair, clean all bearings and lubricate with light oil. If cam and lever actions become sluggish and slow to respond, it may be due to gum or dirt in the pivots and under the levers. To clean and lubricate the levers, remove the top plate, paragraph 9. Clean off all old lubricant, accumulated dirt and gum with a clean cloth and cleaning solvent. Apply lubricant in thin film on working surfaces only. Do not over lubricate.

LUBRICANTS TO USE.

Oilite bearings only - Light machine or spindle oil.

Moving parts - Wadhams BRB#1 or Lubriplate.

8. REPLACING SPINDLE DRIVE BELTS.

The FAST FORWARD and REWIND spindle drive belts, figure 3, can be replaced without disassembly other than removing chassis from the carrying case, figure 1. Use care in handling the drive belts to prevent distortion or contact with grease or oil. Be sure there is no grease or oil on pulleys.

Start installing either belt by working it over the drive pulley under the motor mount. With the belt in the drive pulley groove, carefully work it over the spindle pulley flange to prevent distortion.

The FORWARD take-up spindle drive belt is located under the top plate, figure 4. Remove the top plate, paragraph 9. Loosen set screw in fast forward drive pulley, figure 6, and remove reel shaft assembly. Remove pulley assembly and work belt over pinch roller.

Clean and lubricate bearing and shaft with light machine oil. Work new belt over pinch roller; then reassemble reel shaft, FORWARD drive pulley and FAST FORWARD drive pulley. With control knob in FORWARD position, tighten FAST FORWARD drive pulley set screw E63, figure 6, at point where there is 0.010 to 0.015 inch clearance between pulley and bearing.

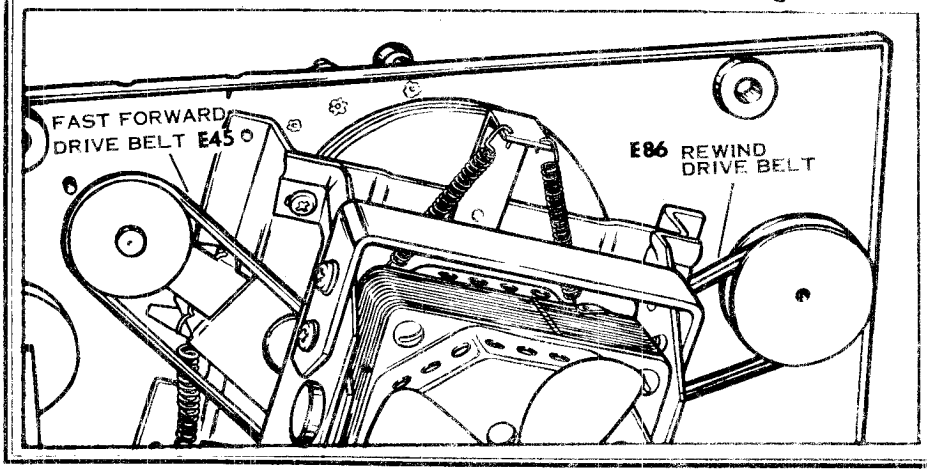

Figure 3.

Reel Drive Belts

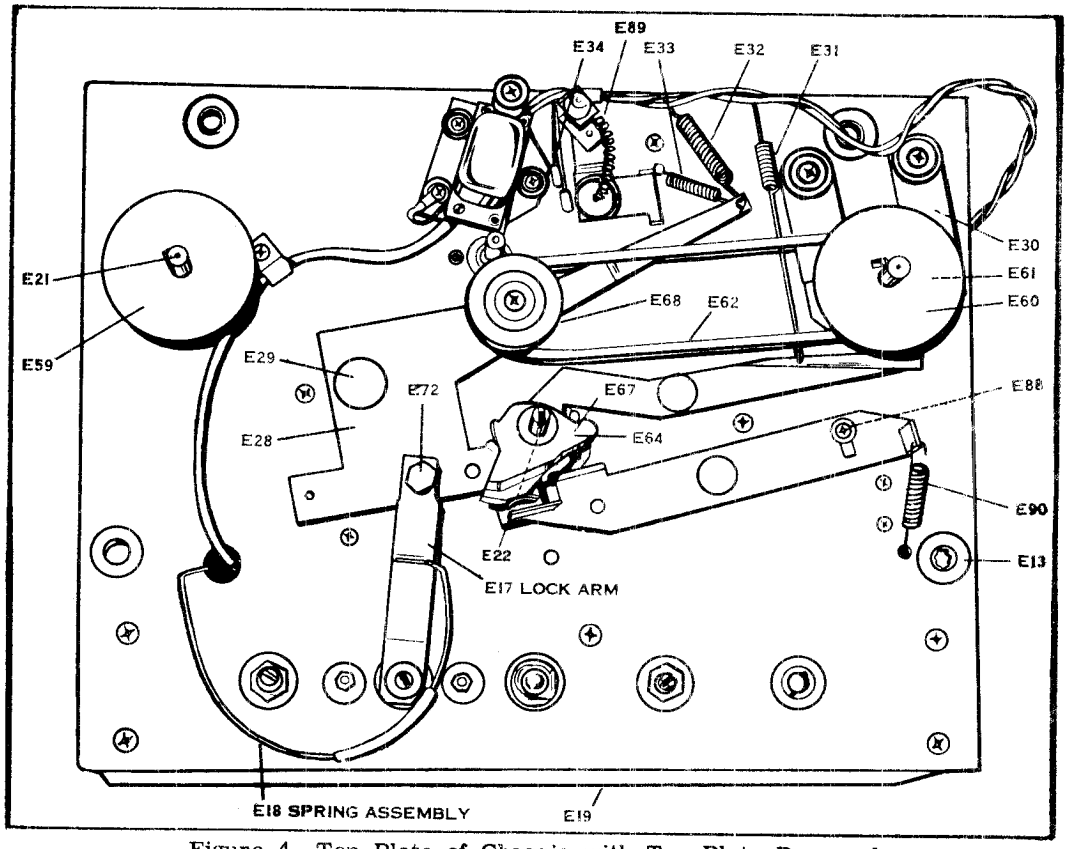

Figure 4. Top Plate of Chassis with Top Plate Removed

9. REMOVING TOP PLATE.

Removal of the top plate is required for access to the operating mechanism, figure 4. This plate is rubber mounted on the mechanism mounting plate and held in place by four screws and large washers installed from the back of the chassis. Remove the fuse holder cover, and pull off the VOLUME and TONE control knobs. The selector knob and control knob each have a socket head set screw which must be loosened before removing the knob. Remove the cover over the pressure pads; then remove the retaining ring, tension washer and lift off the pressure pad assembly. Remove the top plate attaching screws and washers, and carefully work the top plate off the rubber mounts. Whenever the top plate is removed, clean and lubricate the mechanism, paragraph 7, and check its action. Replace the top plate with the attaching screws, washers and lockwashers. The lower right hand screw (from rear) also attached the grounding strap.

Install the pressure pad assembly, tension washer, retaining ring, spring and cover. Replace knobs and fuse holder.

10. REPLACING FLYWHEEL.

Irregularities on the flywheel drive tire or capstan require replacement of the flywheel assembly, figure 5.

Place the control knob at STOP. Remove the chassis from the case, figure 1, and remove the top plate, paragraph 9.

Unhook the motor springs, fast forward spring and remove rewind belt from reel shaft spindle. Remove five screws attaching the flywheel support bracket and pull off the bracket and flywheel.

When installing a new flywheel, check fit in bearings carefully and be sure bearing is snug in mount. If bearing fit is sloppy or binds, replace the bearings. After the flywheel and bracket are reinstalled, check for free operation while rotating before turning on motor. If flywheel is tight, tap flywheel to align bearings. Connect motor springs, fast forward spring and rewind belt. Check operation on REWIND, STOP, FORWARD and FAST before completing reassembly, paragraph 14. Be sure fast forward drive is in proper position before attaching springs, see figure 6.

11. RECORD HEAD AND OSCILLATOR.

Check oscillator bias voltages with a-c vacuum tube voltmeter, referring to L, of figures 8, 9 and 10, for rated erase and record voltages. When tests indicate record or erase coil in the record head and can assembly is defective, replace the assembly. Remove the top plate, paragraph 9; then remove three screws and washers attaching the assembly to the mounting plate and lift off the head.

When installing the new head, connect wires to the head terminals as indicated in the following sketch. Be sure plastic tubing covers the shielded lead. The

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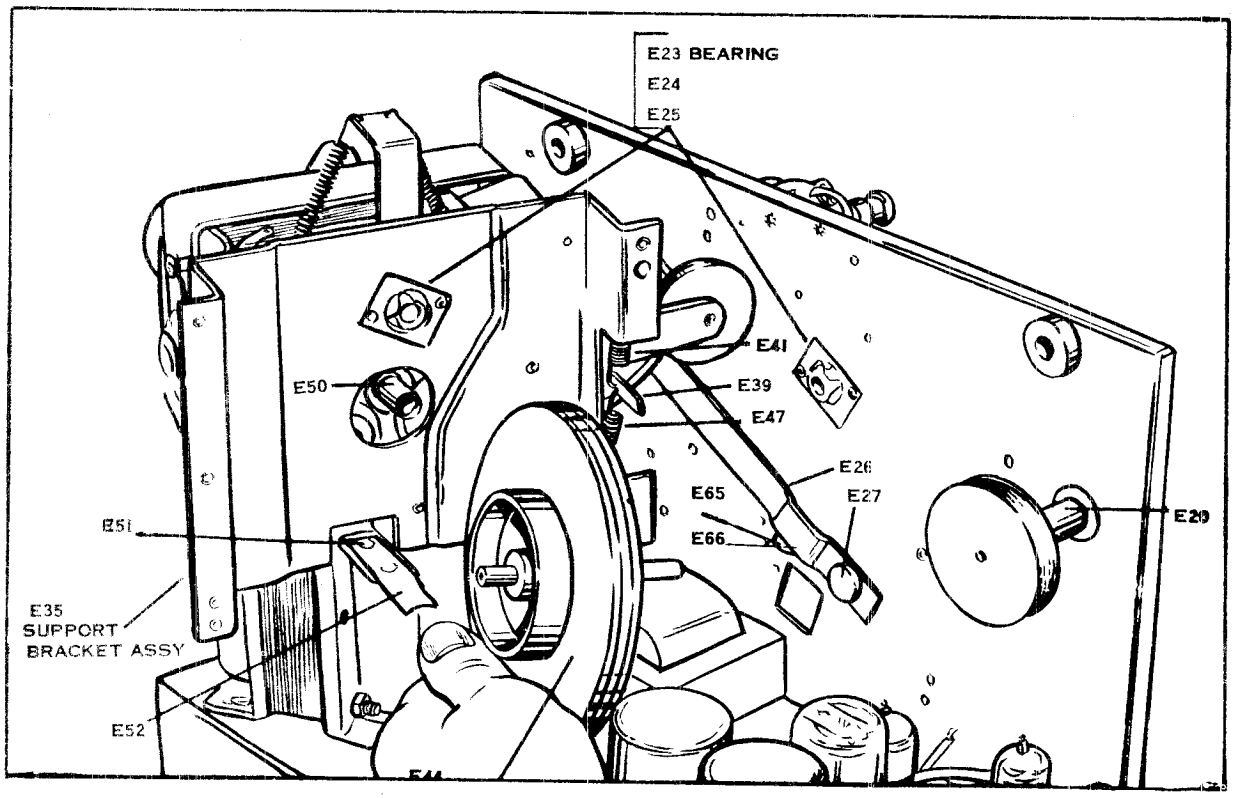
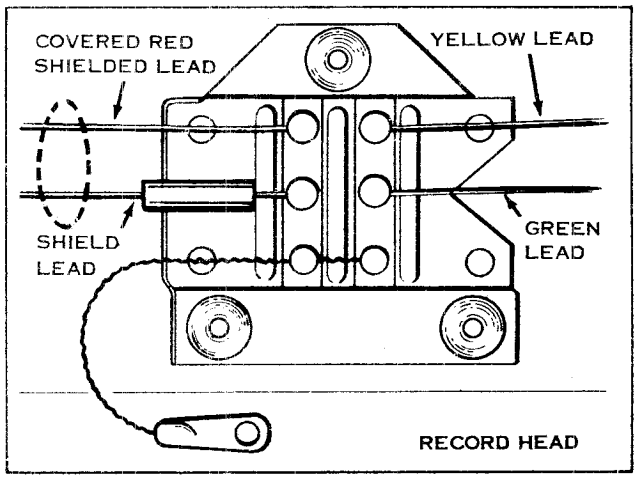


Figure 5. Replacing Flywheel Assembly

ground strap terminal goes between one of the mounting screw heads and washers. After the head is replaced, it will be necessary to align it for optimum output level and maximum high frequency response. If a constant frequency tape is not available, play back a tape previously recorded. Adjust the three head mounting screws for maximum high frequency response.



12. RECORD LOCK ARM.

The record lock arm, E17, figure 4, interlocks RECORD position of the selector knob in FORWARD position only. It is an indexing arm which automatically returns selector knob to PLAY position when the control knob is moved to any other position.

To remove the arm, remove the spring assembly first; then loosen two socket head set screws in the hub.

To install the arm, set the control knob at FORWARD and turn the selector shaft to its extreme counterclockwise position; install the arm with indexing ball in the index hole in the pinch roller lever and shaft assembly; then move arm approximately 1/16 inch farther counterclockwise tighten set screws in place and replace spring assembly, E18.

The PLAY-RECORD switch shaft has been previously drilled and the cone point set screw should go into this indentation in the shaft.

If a new PLAY-RECORD switch or record lock has to be installed, position the record lock arm as instructed in the previous paragraph, then with the cone point set screw removed, drill a 1/32 inch indentation in the switch shaft with a No. 38 drill. Install the spring as shown in figure 4. Check operation by turning control knob to STOP. The record lock arm should move counterclockwise and turn selector knob to PLAY position.

NOTE

On record lock arm assembly, E17, figure 4, loosen adjusting screw in slot of arm and adjust steel ball in hole in pinch roller lever in record position and tighten screw.

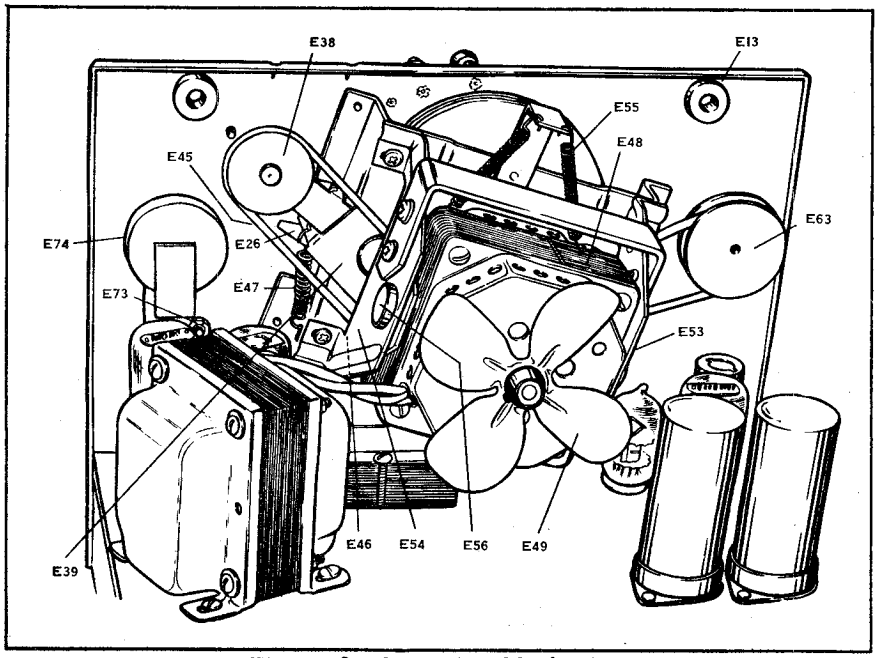


Figure 6. Operating Mechanism

13. FAST FORWARD - REWIND LIFT LEVER ADJUSTMENT.

The top plate must be removed to adjust the lift lever clearance, paragraph 9. Place control knob in FORWARD position and turn adjusting screw, E88, figure 4 holding lock nut, E73, figure 6, until clearance between lever and ball in pulley is 1/16 to 1/32 inch. Turn control knob to REWIND position and check to be sure lever lifts take-up spindle. Hold adjustment screw in position with a screw driver from the top and tighten the lock nut.

14. REPLACING MOTOR.
When replacing motor, it is necessary to adjust the drive clearance carefully so the mechanism will function properly in all control knob positions. Two different styles of motors are used, one with a square frame and the other with a round. Consult the parts list for proper type of motor as well as mounting brackets when ordering replacements.

With all springs attached check the following:

a. FAST FORWARD position - the fast forward drive belt should engage the motor drive pulley and fast forward drive pulley, E38, with kick out lever, E26, clear of fast forward plate and pulley assembly, E39, figure 6. The trip pin on the fast forward drive mechanism should engage the brake trip of the trip assembly passing beyond the "dog" of the brake trip not exceeding 1/16 inch. This prevents overrun or looping of the tape in going from "Fast Forward" to "Forward." To correct any misalignment of above, loosen the four mounting screws and with all springs attached and mechanism in "Fast Forward" position, make adjustments by shifting motor bracket in slotted mounting holes. After proper adjustment is made, hold bracket in position and tighten the four mounting screws.

NOTE

Check fast forward brake spring to see that a clearance of approximately 3/64 inch exists between, spring and rewind belt in "Fast Forward" and "Forward" positions.

b. REWIND and STOP position - motor drive pulley should not touch anything at STOP position. At REWIND, motor drive should engage the rewind belt. Adjustment is made by slightly bending the rocker arm bracket on the motor mounting bracket E51, figure 5.

c. FORWARD position - motor should engage flywheel tire only. Adjustment is made by moving motor bracket in slotted mounting holes.

15. OPERATION MECHANISM.
Removal of top plate, paragraph 9, and disassembly for replacement of the flywheel, paragraph 10, are sufficient to make all parts accessible for replacement. Illustrations throughout the manual are keyed to the parts list at the back of the book for replacement purposes.

Spindles can be replaced by loosening set screws in the drive pulleys on the bottom. Replace the brake yoke assembly, E30, figure 4, when pads are worn or otherwise ineffective. The assembly is held in place by two rubber mounts and screws and is easily replaceable. Refer to paragraph 8 for adjusting.

The pinch roller is replaced by removing the center attaching screw. When installing a new roller, be sure it fits without play but revolves freely.

If any of the mechanism levers are bent, damaged or excessively worn, replace the complete mounting plate assembly or return the complete unit to the factory for repair.

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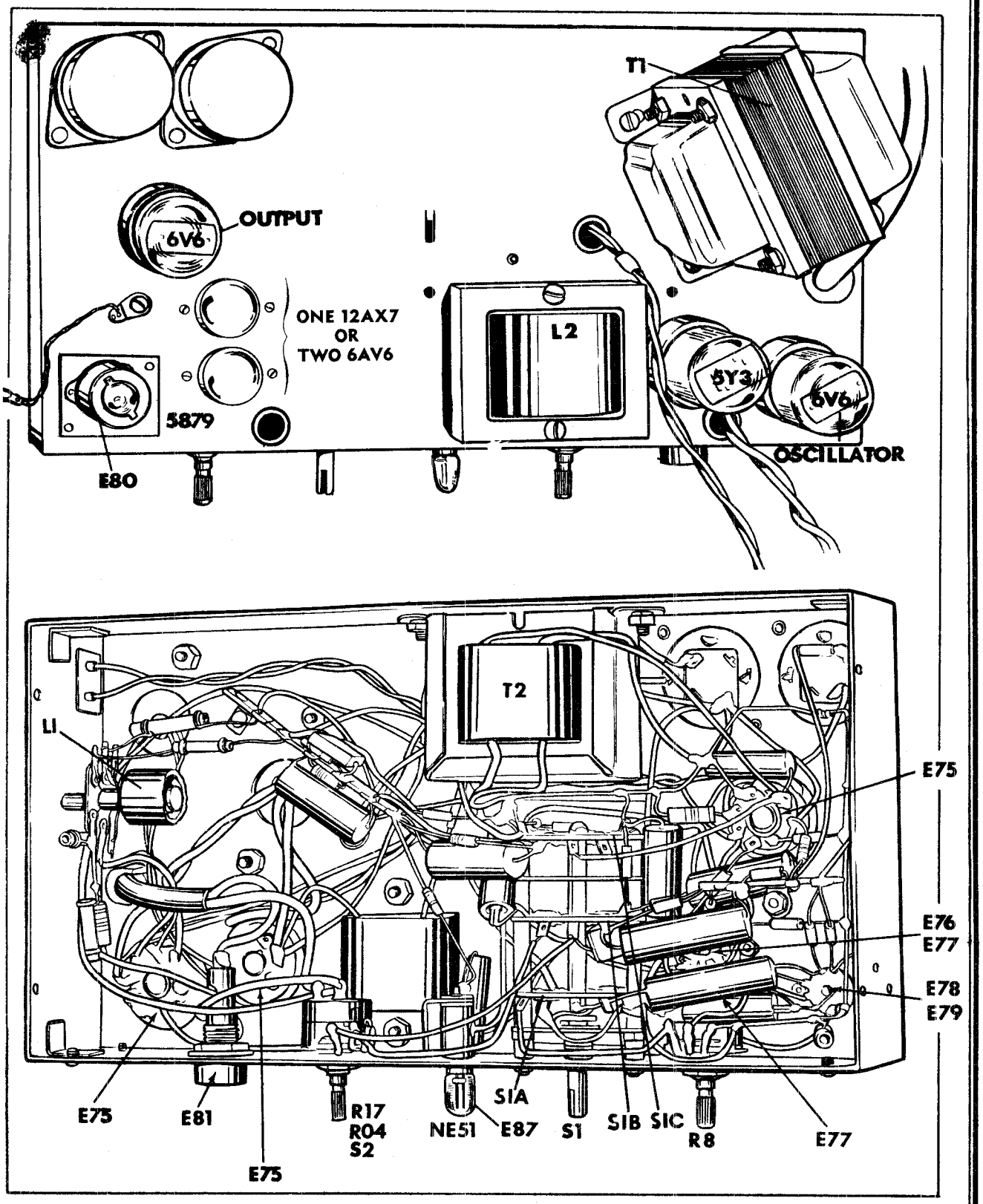


Figure 7. Top and Bottom Views of Amplifier

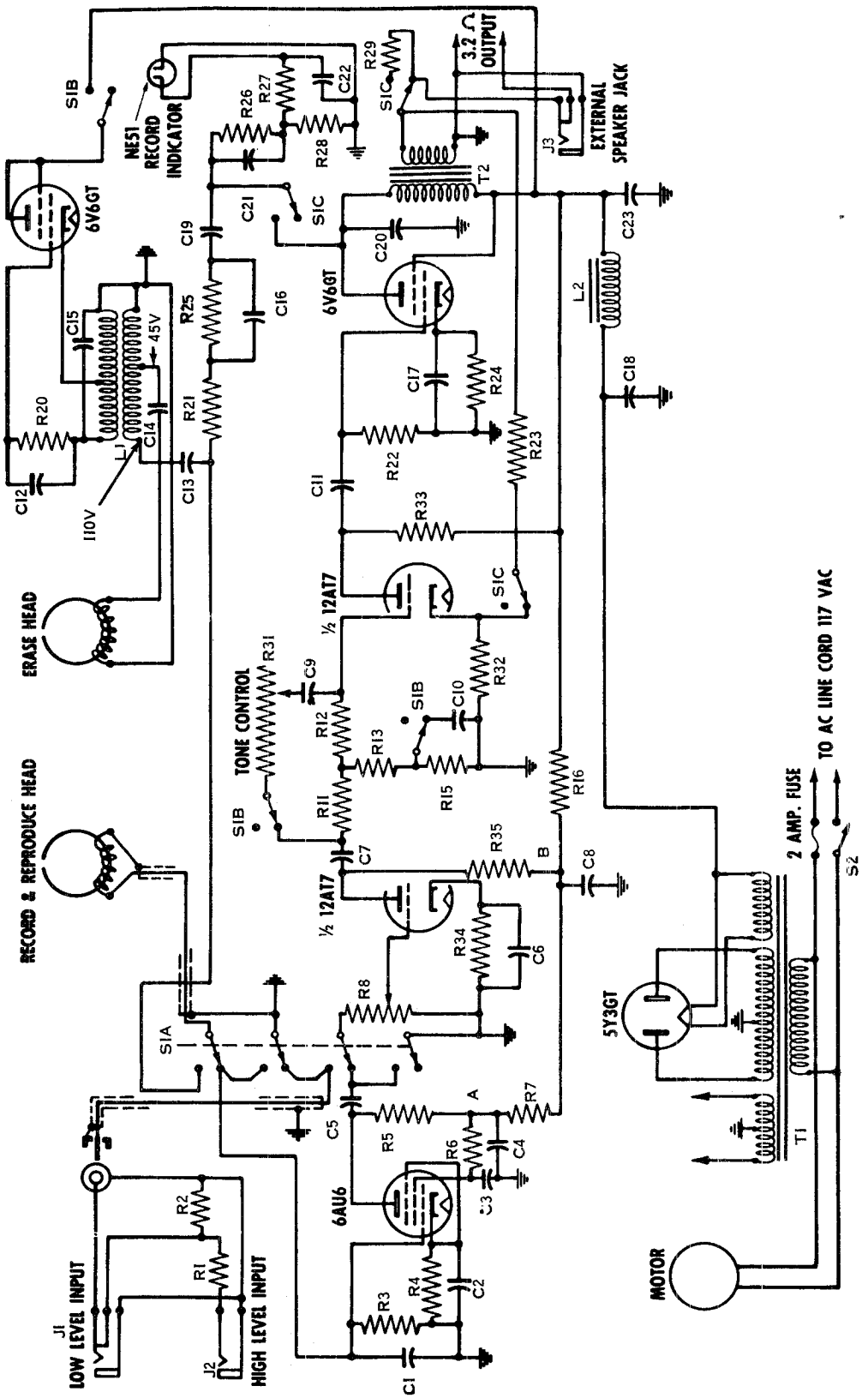


Figure 8. Schematic - Model 109 (Up to Serial No. 5202)

MODEL 109

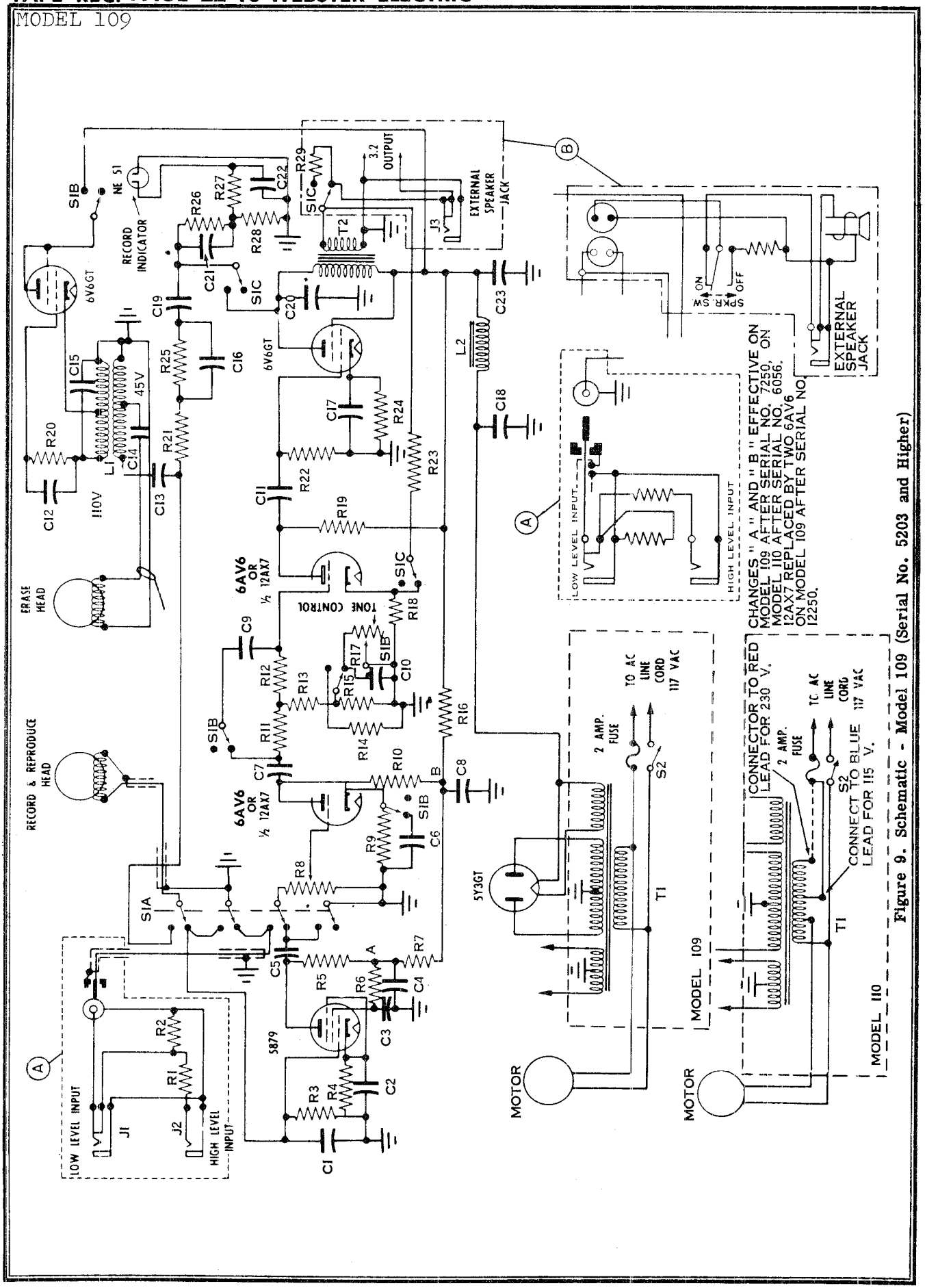


Figure 9. Schematic - Model 109 (Serial No. 5203 and Higher)

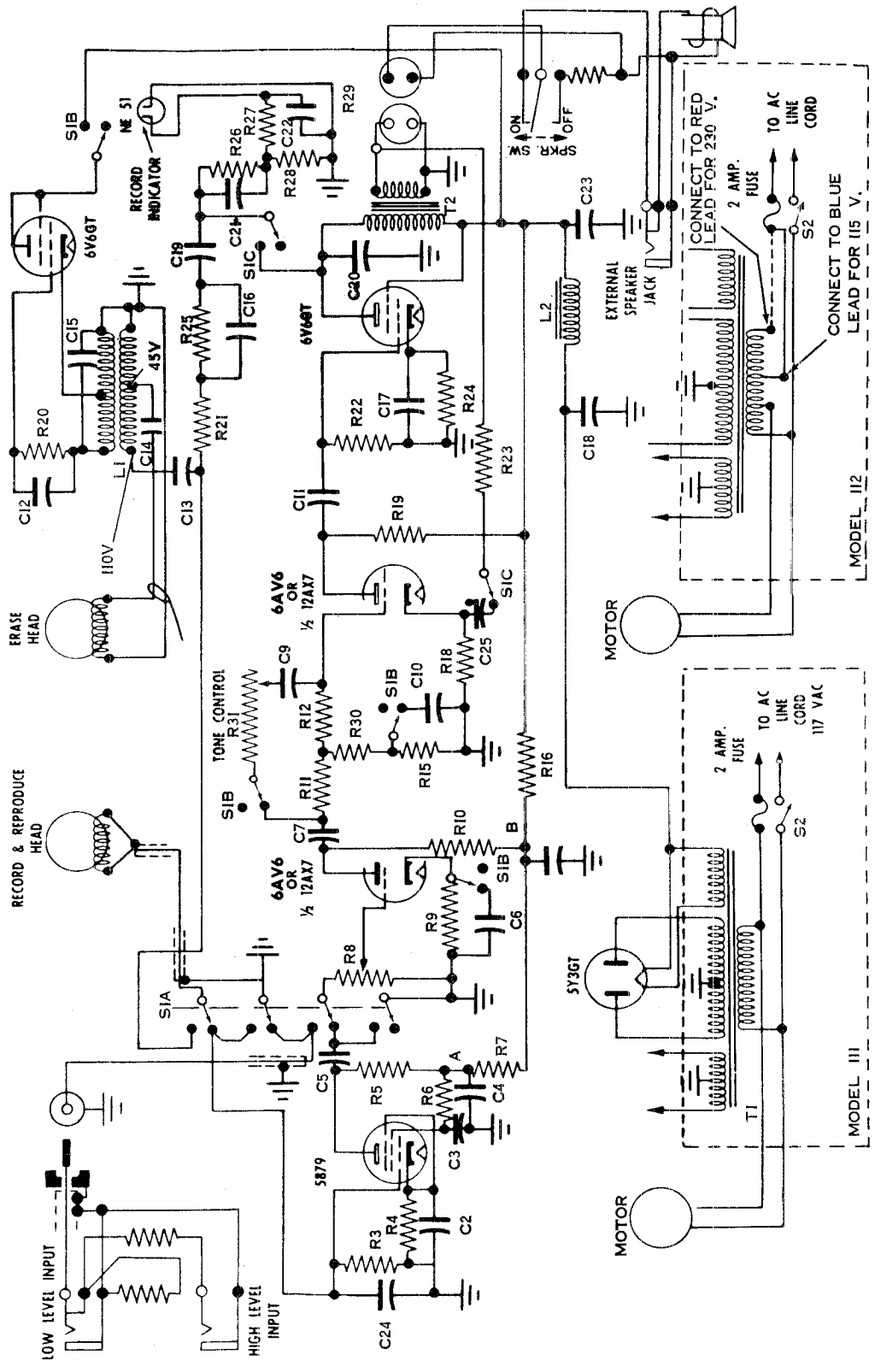


Figure 10. Schematic - Models 111 and 112

MODELS 109,
110, 111, 112

Tube	Pin Voltages 1	2	3	4	5	6	7	8	9
				Model 109 (Up to Serial No. 5202)					
6AU6		.55	6.2 AC	6.2 AC	75	25	.55		
12AT7	130		1.7	6.2 AC	6.2 AC	110		1.7	6.2 AC
6V6		6.2 AC	230	250			6.2 AC	12.5	
6V6 (OSC.)		6.2 AC	250	250	-50		6.2 AC		
5Y3GT		4.95 AC		270 AC		270 AC		4.95 AC	
				Models 109 (Serial No. 5203 and up) 110, 111, & 112					
5879			.75	6.2 AC	6.2 AC		30	50	.75
12AX7	118		1	6.2 AC	6.2 AC	102		.95	6.2 AC
6AV6 (1st)		.95	6.2 AC	6.2 AC			102		
6AV6 (2nd)		1.5	6.2 AC	6.2 AC			118		
6V6		6.2 AC	245	265			6.2 AC	14	
6V6 (OSC.)		6.2 AC	265	265	-75		6.2 AC		
5Y3GT		4.95 AC		270 AC		270 AC		4.95 AC	

All voltages DC unless otherwise indicated. Point A - 198 volts
Point B - 220 volts
Measurements made from point indicated to chassis using 20,000 ohm per volt meter with RECORD - LISTEN switch in RECORD position and unit operating at rated line voltage.
Refer to Schematics, figures 8, 9, and 10

Figure 11. Voltage Measurements

16. AMPLIFIER.

As shown in the schematic diagrams, figure 8, 9 and 10, there are several variations in the basic amplifier used on EKOTAPE models. Use of the schematics, voltage tables (figure 11) and views of the amplifier (figure 7) should be made in trouble shooting and repairing the amplifier.

For tube replacement and access to the top of the amplifier only, refer to paragraph 3.

For access to the bottom of the amplifier, remove the amplifier bottom plate which is held in place by two screws at each end of the amplifier. When troubleshooting on the amplifier, always be sure the power is of correct voltage and frequency indicated on the nameplate in the cover of the carrying case. Also be sure to use the voltage values in the schematics and charts which apply to the model being tested. Before starting troubleshooting procedure, make a careful visual check for loose connections or other obvious defects.

17. TUBES.

Location of tubes is shown in figure 7. For access to the tubes, remove four screws, and lift the top plate carefully from the case, paragraph 9. Tube complements for the various models are listed in paragraph 2. When removing tubes, excessive movement of the tube in its socket weakens socket pins and spreads the contacts in the sockets, so remove carefully. Insert new tubes so that key in the tube base lines up with keyway in tube socket, and push down firmly until tube locks in the socket.

18. VOLTAGE MEASUREMENTS.

All voltage measurements indicated in figure 11 are made from points indicated to chassis with a 20,000 ohm-per-volt meter and with RECORD-PLAY switch in RECORD position. Power supply must be same as indicated on nameplate in cover of carrying case.

19. RESISTOR AND CAPACITOR MEASUREMENTS.

All resistors and capacitors are keyed to the schematics, figures 8, 9 and 10 and are listed with their values in the parts list. The same reference numbers are also used in the top and bottom views of the amplifier, figure 7.

20. CHANGING FROM 115 VOLTS TO 230 VOLTS.

Models 110 and 112 have a power transformer tapped for 115 or 230 volt operation. Both models are shipped connected for 115 volt operation. To change from 115 to 230 volt operation, change one connection in the amplifier as follows:

The black wire coming from the fuse holder is connected to a lug on a terminal strip in the chassis. This lug is connected to a blue wire coming from the power transformer. This is the 115 volt connection. There is another lug on the terminal strip which is connected by a red wire to the power transformer. For 230 volt operation remove the black wire from the lug with the blue transformer wire and resolder it on the lug with the red transformer wire.

After changing to 230 volt operation, mark the nameplate in the cover of the carrying case for future reference when servicing is required.

21. IMPORTANT ORDERING INSTRUCTIONS.

Most of the parts listed in the following parts lists are illustrated in various illustrations in this instruction manual. Parts are indicated on the illustrations with reference numbers which also appear in the parts lists.

When ordering parts always refer to the model and serial number stamped on the name plate inside the top cover of the unit for which the parts are required.

It is preferable to replace complete sub-assemblies both from the standpoint of saving time on the repairs and for better performance of the equipment after it has been repaired.

ELECTRICAL PARTS
See schematics, figures 8, 9 and 10

SYMBOL	PART NAME	PART NO.
C1	CAPACITOR, CERAMIC, .0017 MFD 500V (USED ON MODELS 109 & 110 ONLY. MODELS 111 & 112 USE C24 IN PLACE OF C1.)	241-14260-2
C2	CAPACITOR. ELECTROLYTIC, 50 MFD 6V	S6063
C3	CAPACITOR, PAPER, .1 MFD 400V	S3595
C4	CAPACITOR, ELECTROLYTIC, 40-40 MFD 450V, 40 MFD 25V (INCLUDES C4, C8 & C17)	241-14238
C5	CAPACITOR, PAPER, .05 MFD 400V	S4261
C6	CAPACITOR, ELECTROLYTIC, 50 MFD 6V	S6063
C7	CAPACITOR, PAPER, .1 MFD 400V	S3595
C8	(SEE C4)	
C9	CAPACITOR, MICA, .00005 MFD 500V	29670-2
C10	CAPACITOR, PAPER, .05 MFD 400V	S4261
C11	CAPACITOR, PAPER, .05 MFD 400V	S4261
C12	CAPACITOR, CERAMIC, .003 MFD 500V	241-14260-1
C13	CAPACITOR, CERAMIC, .001 MFD 500V	S6065-5
C14	CAPACITOR, CERAMIC, .0017 MFD 500V	241-14260-2
C15	CAPACITOR, CERAMIC, .003 MFD 500V	241-14260-1
C16	CAPACITOR, MICA, .0002 MFD 500V	29670-4
C17	(SEE C4)	
C18	CAPACITOR, ELECTROLYTIC, 40-40 MFD 450V (INCLUDES C18 & C23)	241-14236
C19	CAPACITOR, PAPER, .05 MFD 400V	S4261
C20	CAPACITOR, CERAMIC, .003 MFD 500V	241-14260-1
C21	CAPACITOR, PAPER, .05 MFD 400V	S4261
C22	CAPACITOR, PAPER, .0005 MFD 600V	S4556
C23	(SEE C18)	
C24	CAPACITOR, CERAMIC, .0005 MFD 500V (MODELS 111 & 112 ONLY. OTHER MODELS USE C1)	S3750
C25	CAPACITOR, PAPER, .25 MFD 150V (MODELS 111 & 112 ONLY)	241-14974
J1	LOW LEVEL INPUT JACK BRACKET AND CONNECTOR ASSY (MICROPHONE)	242-14190
	MICROPHONE JACK ONLY	S4323
J2	HIGH LEVEL INPUT JACK (RADIO/PHONO)	S4323
J3	EXTERNAL SPEAKER JACK	S4324
L1	OSCILLATOR COIL ASSY	242-14603
L2	FILTER CHOKE	811A-1
R1	RESISTOR, 510,000 OHM 1/2 WATT	29501-53
R2	RESISTOR, 22,000 OHM 1/2 WATT	29501-29
R3	RESISTOR, 510,000 OHM 1/2 WATT	29501-53
R4	RESISTOR, 1,000 OHM 1/2 WATT	29501-11
R5	RESISTOR, 240,000 OHM 1/2 WATT	29501-48
R6	RESISTOR, 1 MEGOHM 1/2 WATT	29501-57
R7	RESISTOR, 22,000 OHM 1/2 WATT	29501-29
R8	VOLUME CONTROL, 500,000 OHM	241-14233
R9	RESISTOR, 2,000 OHM 1/2 WATT (MODEL 109 UP TO NO. 5202 USES R34 IN PLACE OF R9)	29501-14
R10	RESISTOR, 240,000 OHM 1/2 WATT (MODEL 109 UP TO NO. 5202 USES R35 IN PLACE OF R10)	29501-48
R11	RESISTOR, 100,000 OHM 1/2 WATT	29501-41
R12	RESISTOR, 100,000 OHM 1/2 WATT	29501-41
R13	RESISTOR, 5,100 OHM 1/2 WATT (MODELS 109 AND 110 ONLY, MODELS 111 AND 112 USE R30)	29501-21

SYMBOL	PART NAME	PART NO.
R14	RESISTOR, 51,000 OHM 1/2 WATT (MODEL 109 NO. 5203 AND HIGHER AND MODEL 110 ONLY)	29501-35
R15	RESISTOR, 1 MEGOHM 1/2 WATT	29501-57
R16	RESISTOR, 22,000 OHM 1/2 WATT	29501-29
R16	RESISTOR, 5,100 OHM 1/2 WATT (USED WHEN 6AV6 TUBE REPLACES 12AX7	29501-21
R17	TONE CONTROL WITH OFF-ON SWITCH S2 (MODEL 109 NO. 5203 AND HIGHER AND MODEL 110 ONLY, OTHER MODELS USE R31)	241-14234
R18	RESISTOR, 2,000 OHM 1/2 WATT (ALL MODELS EXCEPT 109 UP TO NO. 5202 ONLY WHICH USES R32)	29501-14
R19	RESISTOR, 240,000 OHM 1/2 WATT (USED ON ALL MODELS EXCEPT MODEL 109 UP TO NO. 5202 WHICH USES R33)	29501-48
R20	RESISTOR, 10,000 OHM 1 WATT	29501-76
R21	RESISTOR, 240,000 OHM 1/2 WATT	29501-48
R22	RESISTOR, 240,000 OHM 1/2 WATT	29501-48
R23	RESISTOR, 8,200 OHM 1/2 WATT	29501-23
R24	RESISTOR, 300 OHM 1 WATT	29501-98
R25	RESISTOR, 240,000 OHM 1/2 WATT	29501-48
R26	RESISTOR, 390,000 OHM 1/2 WATT	29501-51
R27	RESISTOR, 51,000 OHM 1/2 WATT	29501-35
R28	RESISTOR, 51,000 OHM 1/2 WATT	29501-35
R29	RESISTOR, 10 OHM 1/2 WATT	29501-94
R30	RESISTOR, 3,600 OHM 1/2 WATT (USED ON MODELS 111 & 112 ONLY, OTHER MODELS USE R13)	29501-19
R31	TONE CONTROL WITH OFF-ON SWITCH S2 (USED ON MODEL 109 SERIAL NO. UP TO 5202 AND ON MODELS 111 & 112 ONLY, ALL OTHER MODELS USE R17)	241-14234-1
R32	RESISTOR, 1,000 OHM 1/2 WATT (USED ON MODELS 109 SERIAL NO. UP TO 5202 ONLY ALL OTHER MODELS USE R18)	29501-11
R33	RESISTOR, 51,000 OHM 1/2 WATT (USED ON MODELS 109 SERIAL NO. UP TO 5202 ONLY. ALL OTHER MODELS USE R19)	29501-35
R34	RESISTOR, 1,000 OHM 1/2 WATT (USED ON MODEL 109 UP TO SERIAL NO. 5202 ONLY, ALL OTHER MODELS USE R9)	29501-11
R35	RESISTOR, 51,000 OHM 1/2 WATT (USED ON MODEL 109 UP TO SERIAL NO. 5202 ONLY, ALL OTHER MODELS USE R10)	29501-35
S1	SELECTOR SWITCH ASSY	
	MODEL 109 UP TO SERIAL NO. 5202	242-14555
	MODELS 109 & 110	242-14555-3
	MODELS 111 & 112	242-14555-4
S2	OFF-ONNSWITCH (PART OF TONE CONTROL R17 & R31)	
T1	POWER TRANSFORMER	
	MODELS 109 & 111	242-14228
	MODELS 110 & 112	242-15004
T2	OUTPUT TRANSFORMER	242-14230

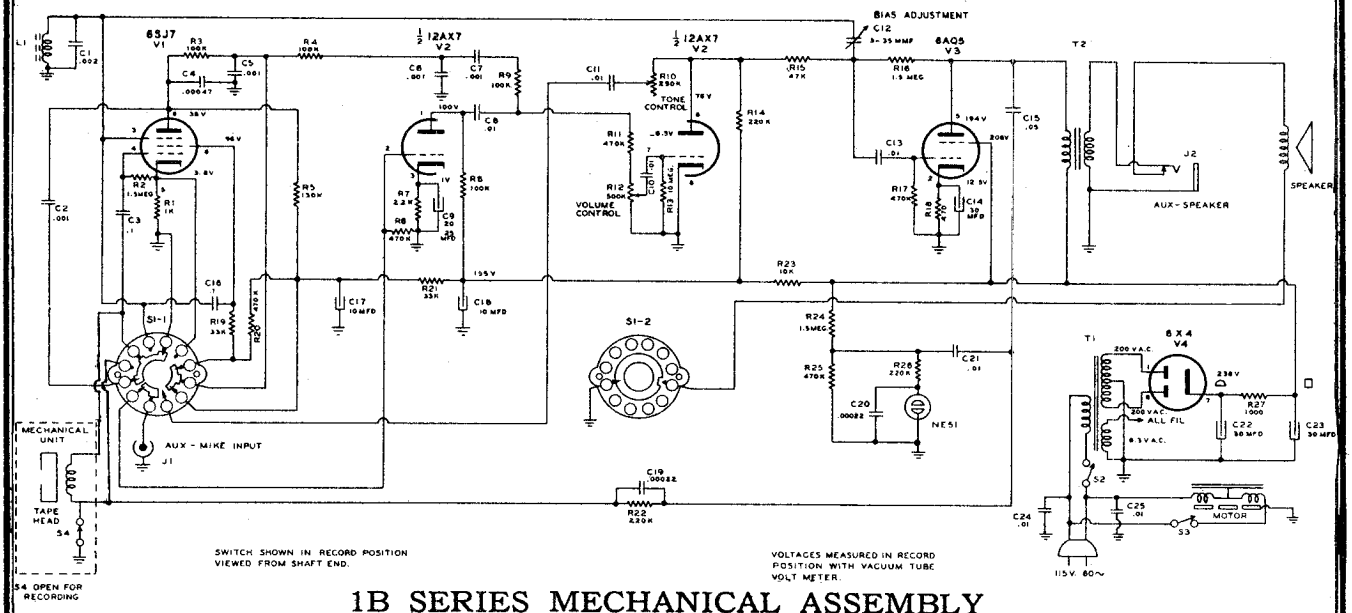
MECHANICAL PARTS

See schematics, figures 2 to 6

SYMBOL	PART NAME	PART NO.
E1	TONE CONTROL KNOB	241-14066
E2	FUSE ASSEMBLY KNOB	242-14054
E3	SELECTOR KNOB	241-14071
	SELECTOR KNOB SET SCREW, CONE POINT, SOCKET HD. NO. 8-32 X 1/4 IN.	29542-1
E4	CONTROL HANDLE	241-14072-1
	CONTROL HANDLE SET SCREW, CONE POINT, SOCKET HD. NO. 8-32 X 1/4 IN. SPECIAL	241-15116
E5	REEL, 5 IN.	241-14067
E6	REEL AND TAPE, 5 IN.	241-14068
E7	MICROPHONE ASSEMBLY	242-14069
E8	EXTERNAL SPEAKER CORD AND PLUG ASSY	242-14288
E9	CARRYING CASE	241-14053
E10	SPEAKER SCREEN	241-14057
E11	SPEAKER	241-14070
E12	TOP PLATE ASSEMBLY	242-14147
E13	TOP PLATE MOUNTING GROMMET	241-14221
E14	OPERATING MECHANISM ASSEMBLY	242-14051
E15	RECORD HEAD COVER, LEFT	241-14062-3
E16	RECORD HEAD COVER, RIGHT	241-14062-4
	COVER SCREW, RECESSED OVAL HD, NO. 4-40 X 3/8 IN.	29528-5
E17	RECORD LOCK ARM ASSEMBLY	242-14073
E18	RECORD LOCK ARM SPRING ASSEMBLY	242-14762
E19	MOUNTING PLATE ASSEMBLY	242-14079
E20	SUPPLY REEL SPINDLE BEARING	241-14081
E21	TAKE UP REEL SPINDLE BEARING	241-14082
E22	CONTROL SHAFT BEARING	241-14083
E23	SELF ALIGNING BEARING	241-14084
E24	BEARING RETAINER	241-14085
E25	BEARING RETAINER EYELET	P9551-3
E26	FAST FORWARD RELEASE LEVER	241-14088
E27	PIVOT	241-14089
E28	PINCH ROLLER LEVER AND SHAFT ASSY	242-14090
E29	PINCH ROLLER PIVOT	241-14093
E30	BRAKE YOKE ASSEMBLY	242-14095
E31	BRAKE LEVER SPRING	241-14099
E32	PINCH ROLLER SPRING	241-14187
E33	BELL CRANK SPRING	241-14116
E34	PRESSURE PAD LEVER ASSY ON UNITS BELOW SERIAL 5550	242-14200
E34	PRESSURE PAD LEVER ASSY ON UNITS ABOVE SERIAL 5550	242-15154
E35	SUPPORT BRACKET-ASSEMBLY	242-14123
E36	REWIND PULLEY ASSEMBLY	242-14103
E37	REWIND PULLEY SHAFT	241-14107-1
E38	FAST FORWARD ARM AND PULLEY ASSY	242-14108
E39	FAST FORWARD PLATE AND PULLEY ASSY	242-14111
E40	PULLEY PLATE PIVOT	241-14115
E41	FAST FORWARD PULLEY SPRING	241-14116
E42	FAST FORWARD TRIP ASSEMBLY	242-14117
E43	FAST FORWARD BRAKE SPRING	241-14119
E44	FLYWHEEL ASSEMBLY	*242-14124
E45	FAST FORWARD BELT	241-14129-2
E46	TRIP MECHANISM SPRING	241-14130
E47	FAST FORWARD MECHANISM SPRING	241-14131
E48	MOTOR (SQUARE FRAME)	241-14133
E48	MOTOR (ROUND FRAME)	241-15306
E49	MOTOR FAN	241-14134
E50	MOTOR PULLEY	*241-14135-2
E51	MOTOR MOUNTING BRACKET AND SPRING ASSY (SQUARE FRAME)	242-14136
E51	MOTOR MOUNTING BRACKET AND SPRING ASSY (ROUND FRAME)	242-14136-1
E52	MOTOR ROCK SPRING	241-14139
E53	MOTOR SUSPENSION BRACKET, R. H.	241-14140
E54	MOTOR SUSPENSION BRACKET, L. H.	241-14141
E55	MOTOR RETURN SPRING	241-14220
E56	MOTOR SHOCK MOUNT	241-13665-1
E57	PRESSURE PAD WAVE WASHER	241-12059
E58	PRESSURE PAD RETAINING RING	29651-1
E59	SUPPLY SHAFT AND DISC ASSEMBLY	242-14142
E60	TAKE UP SHAFT AND DISC ASSEMBLY	242-14145
E61	TAKE UP PULLEY AND DISC ASSEMBLY	242-14148
E62	TAKE UP DRIVE BELT	241-14129-3
E63	SUPPLY PULLEY	241-14152
E64	CONTROL CAM AND SHAFT ASSEMBLY	242-14153
E65	CONTROL CAM WASHER	29602-133
E66	CONTROL CAM RETAINING RING	29650-2
E67	CONTROL CAM INDEX SPRING	241-14154
E68	PINCH ROLLER ASSEMBLY	242-14155
E69	RECORD HEAD AND CAN ASSEMBLY	242-14159
E70	TAPE GUIDE ASSEMBLY	242-14181
E71	TAPE GUIDE TOP	241-14205
E72	INDEX BALL (CONTROL CAM & LOCK ARM)	241-13609
E73	LIFT LEVER ADJUSTING LOCK NUT	241-12035
E74	FAST FORWARD PULLEY ASSEMBLY	242-14785
E75	TUBE SOCKET, 8 PRONG OCTAL	S4530
E76	TUBE SOCKET ASSY (12AT7 & 12AX7)	242-14541
E77	TUBE SOCKET - 6AV6 - 7 PIN MINATURE	241-12175
E77	TUBE SOCKET, 12AT7 & 12AX7 9 PIN MINATURE	241-13119
E78	TUBE SOCKET AND PLATE ASSY (5879)	242-14830
E78	TUBE SOCKET AND PLATE ASSY (6AU6)	242-14746
E79	TUBE SOCKET (5879)	241-14846
E79	TUBE SOCKET (6AU6)	241-14226
E80	TUBE SHIELD (5879)	241-14845
E80	TUBE SHIELD (6AU6)	241-14227
E81	FUSE HOLDER	241-14245
E82	AC LINE CORD AND PLUG ASSEMBLY	241-14240
E83	INPUT CORD AND PLUG ASSEMBLY	241-12001-1
E84	BRACKET & MOTOR ASSY (SQUARE FRAME)	*242-14132
E84	BRACKET & MOTOR ASSY (ROUND FRAME)	242-15304
E85	CHASSIS BOTTOM COVER	242-14242
E86	REWIND DRIVE BELT	241-14129-1
E87	RECORD LEVEL INDICATOR	241-14225
E89	PRESSURE PAD SPRING ON SERIAL 5550 AND HIGHER	241-14219
E90	LIFT LEVER SPRING	241-15210

*PARTS SHOWN FOR MODEL 109. OTHER MODELS AS FOLLOWS

FLYWHEEL (MODEL 110)	242-14124-2
FLYWHEEL (MODEL 111)	242-14124-1
FLYWHEEL (MODEL 112)	242-14124-3
MOTOR PULLEY (MODEL 110)	241-14135-3
MOTOR PULLEY (MODEL 111)	241-14772-1
MOTOR PULLEY (MODEL 112)	241-15032-1
BRACKET AND MOTOR ASSY (MODEL 110) SQUARE	242-14132-2
BRACKET AND MOTOR ASSY (MODEL 110) ROUND	242-15304-1
BRACKET AND MOTOR ASSY (MODEL 111) SQUARE	242-14132-1
BRACKET AND MOTOR ASSY (MODEL 111) ROUND	242-15304-2
BRACKET AND MOTOR ASSY (MODEL 112) SQUARE	242-14132-3
BRACKET AND MOTOR ASSY (MODEL 112) ROUND	242-15304-3



1B SERIES MECHANICAL ASSEMBLY OPERATION

Precautionary Service: Unnecessary service to correct supposedly defective recording equipment frequently is due to operational errors on the part of the recordist. Here are a few typical examples from factory service files:

1—Improper feed-in of the disc pick-up arm; incorrect operation of the mercury switch; erratic operation of the tape reel clutch plates.—All may result from failure to level the 1B10 TAPE RECORDIO.

2—Failure to record or play tape, operation normal in other positions.—(a) Wind all slack tape on the take-up reel before attempting to record or play; (b) Tape threaded on the wrong side of the mercury switch actuating lever. Occurs when tape is threaded with the turntable removed. Tape must pass around the lever on the side nearest the control knob.

The ability to recognize such errors promptly is an important asset in servicing this equipment. Paragraphs following are intended to familiarize service personnel with the mechanical functions of the tape assembly and thereby facilitate quick and accurate trouble-shooting.

Mercury Switch: The mercury switch, with its mounting assembly, acts as an off-on switch and is held open when the control knob is in the off position. If recording tape has not been threaded around the capstan drive and the mercury switch lever, the turntable will operate in only the Phono, Reverse, and Forward positions of the control knob; and the tape reels will operate only in the Reverse and Forward positions. In Off position, a cam section of the function shift lever contacts the stud portion of the mercury switch assembly—the rod that protrudes through the base plate. This cam tilts the mercury switch assembly so that the switch circuit is opened. In Phono, Reverse, or Forward positions the function shift lever, through the switch actuator lever, contacts the stud portion of the mercury switch assembly and holds the switch in a closed position. Thus, voltage is applied to the motor.

Automatic Shut-Off: Note that in Record and Playback positions the function mechanism does *not* hold the mercury switch closed. The switch is closed by the tension of the tape against the switch lever as it passes from the capstan to the take-up reel. This arrangement permits automatic shut-off in Record and Playback. When all of the tape has been wound on the take-up reel, the tension against the mercury switch lever is released and the switch tilts to open the motor circuit.

Pressure Pad and Pinch Roller: When the control knob is in either Record or Playback Position, the function shift lever contacts the pressure pad and pinch roller assembly actuating spring. This brings the pinch roller in firm contact with the tape and the driving capstan. The pressure pad at the same time contacts the recording tape and holds it firmly against the recording head.

The driving capstan is located on the turntable center spindle. The large 10″ turntable acts as a flywheel to minimize any flutter or wow effect that might result from fluctuation in tape velocity. The recording head is a very short distance from the driving capstan, thus lessening the possibility of the tape whipping as it passes across the recording head and causing flutter in the recording. The net result of this driving arrangement is excellent frequency response with a minimum of distortion.

MODEL 1B-10

Reel Clutch Assemblies: With the control knob in the Reverse or Forward position, the function shift lever actuates the pressure pad and pinch roller assembly spring, and this assembly is pulled from contact with the tape by the coil tension spring. In Reverse position, the function shift lever depresses one end of the front lift lever, which in turn lifts the front (take-up) reel assembly off the clutch. Now there is no restraining force applied to the front reel, and the back (supply) reel rewinds the tape rapidly.

The opposite condition is true when the control knob is placed in the forward position. Here the function shift lever depresses the rear lift lever to disengage the rear reel from the clutch assembly. The front reel then is free to wind the tape in a forward direction.

Erase Head: In the Record position the erase head contacts the tape, and erases the lower track only, just before it passes over the recording head. Thus, tapes may be re-recorded as often as desired.

The Bias Switch is opened, in Record position, by an actuating sleeve in the shifting mechanism. In all positions, other than Record, the bias switch is connected directly across the recording head through the amplifier function switch. This short-circuit condition is opened by the function switch in playback position.

ADJUSTMENTS

Model 1B10 TAPE RECORDIO is completely adjusted for satisfactory operation when shipped from the factory. In the event that adjustments may become necessary, the following procedure should be followed.

Adjustment of Lift Lever, Control of Reel Pan: In the Forward speed position, the rear reel pan must be raised to a position that clears the clutch plate. At the same time the front pan must be lowered to contact the clutch plate, and the lift lever must clear the lower end of the reel pan shaft by approximately 1/32″ to 1/16″. Adjustment of the lift lever is made by bending the short unflanged section of the lever immediately under the reel pan shaft.

To adjust in the Reverse speed position, the opposite of the above conditions are true.

In the Record and Playback positions the lift levers must clear both reel pan shafts so that both pans contact the clutch plates.

Tracking of the tape through the recording head is controlled by tipping the tape capstan slightly with the two adjusting screws located under the mounting flange of the auxiliary shaft housing, and under the base plate. The capstan should be adjusted so that the tape tracks in the center, or toward the top of the guide slot in the recording head—never towards the bottom of the guide slot.

Pressure Pad Adjustment: Remove the pinch roller cover plate to reach the lock nut on the pressure pad adjusting screw. Set the function knob in the Record position. Turn the adjusting screw in against the pressure pad spring until the pad just contacts the recording head. Then turn the screw one-half to three-quarters of a turn clockwise and tighten the lock nut.

LUBRICATION

Reel Pan Shaft, Reel Sheave, Reel Sheave Bearing, and Reel Pan Clutch Springs.

(a) Remove Truarc "E" ring on lower end of reel pan shaft; lift reel pan and clutch plates off machine to expose parts to be lubricated. (In removing "E" ring, be careful that no burr is turned up on the shaft at the edge of the ring slot.)

(b) Use SAE 10 oil on reel pan shaft and on the inside only of the reel sheave bearing.

(c) Use SAE 10 oil between reel sheave bearing and the hub of the reel sheave. It is not necessary to remove the sheave since there is a countersink well at the top of the reel sheave hub into which the oil may be placed and allowed to run down through the bearing.

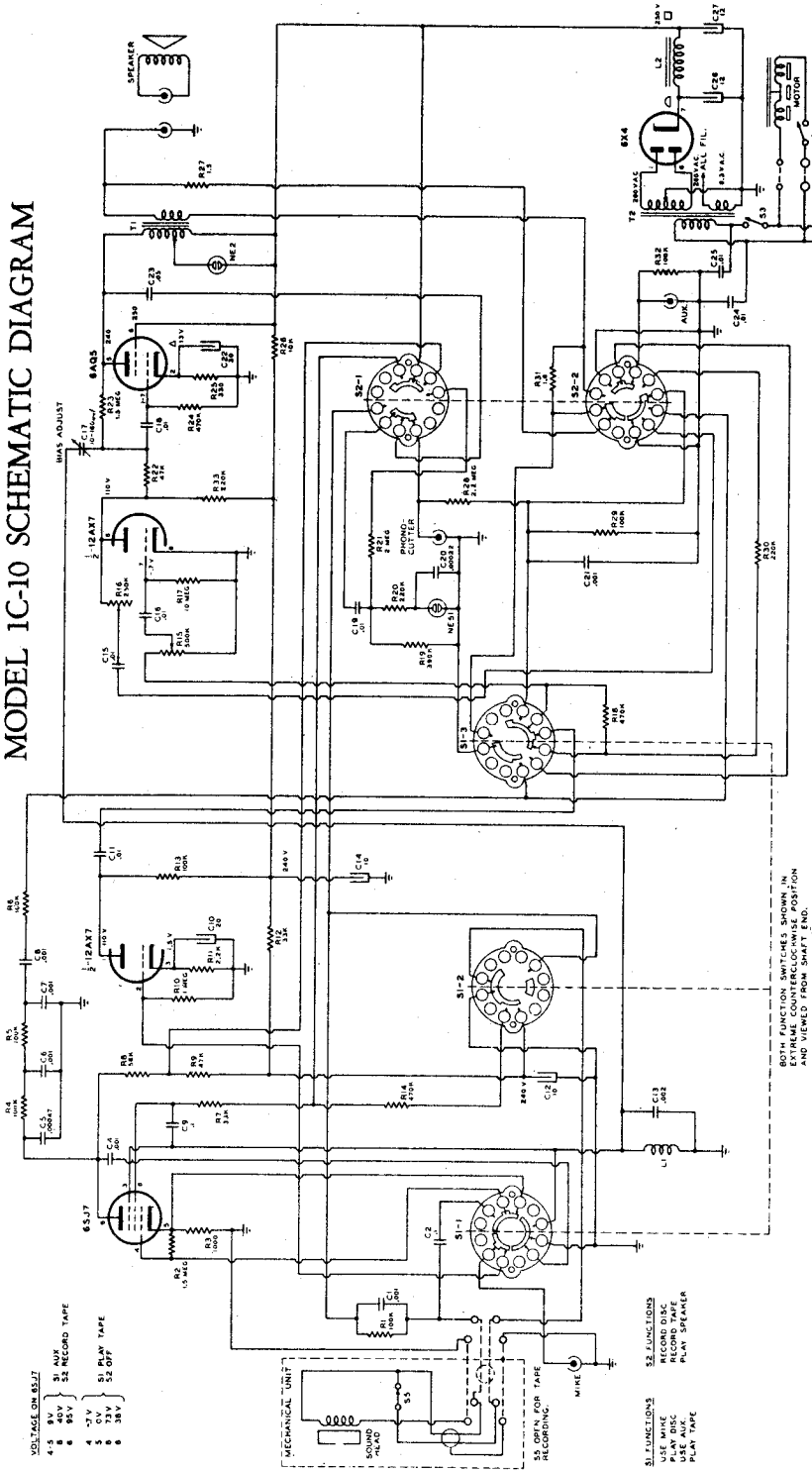
NOTE: DO NOT OVER-LUBRICATE IN PARAGRAPHS B & C. Excessive oil will throw out onto the base plate or belt. Recommended amount is 2 or 3 drops on the reel pan shaft, and 5 or 6 drops on the sheave. The bearing is porous bronze and will hold a reasonable amount of oil to afford continuous lubrication.

(d) The felt pads on the clutch plates are saturated with SAE 10 oil. Here, again, do not over-lubricate. Do not add oil unless it is absolutely necessary, and then sparingly. The shearing of the oil in the pads is partially responsible for the drive of the clutches. Therefore, do not over-saturate the felt. There is sufficient oil in the felt when medium finger pressure causes a small bead of oil to appear along the edge of the felt. When the finger pressure is released, all oil should be reabsorbed by the felt.

Turntable Drive Wheel Shaft and Bearing: Set the tape assembly on edge and raise the rubber tire drive wheel in the bearing as far as it will go. There will be sufficient room to apply 2 or 3 drops of SAE 10 oil to the shaft on top of the bearing. Bearing is porous bronze and will hold sufficient oil to afford continuous lubrication. *CAUTION:* No oil can be tolerated on the rubber tire drive wheel.

The Motor Bearings are fed by an oil wick and should not require new lubrication. If they are lubricated, a few drops of SAE 10 oil may be placed on the rotor shaft so as to run down into the bearing assembly.

Pinch Roller: Remove cover plate and apply not more than one (1) drop of #10 oil to the stud holding the pinch roller. Extreme care should be exercised to prevent any oil reaching the rubber section of the pinch roller.



November 15, 1950 82-2473

SERIES 1C TAPE-DISC RECORDIO

OPERATION

Failure to level the instrument may result in improper feed-in of the pickup arm (85), incorrect operation of mercury switch (76), erratic operation of tape reel clutch plates (96) (97), and an unbalanced condition of disc recording arm (85) when in disc record position.

The mercury switch (76) and its mounting assembly (51) acts as an off-on switch, and is held in an off position when the control knob (82) is in the off position. Without recording tape being threaded around the drive capstan, the turntable (99) will operate in only the "Phono", "Reverse", and "Forward" positions of control knob (82) and the tape reels will operate only in the "Reverse" and "Forward" positions of control knob (82). When in "off" position, a cam section of function shift lever (80) contacts the stud portion of mercury switch assembly (51), which protrudes through base plate (32). This cam section tilts the mercury switch assembly (51), to which is attached mercury switch (76) to such an extent that the circuit of the mercury switch (76) is opened and held in this position until control knob (82) is again moved. When moving the control knob (82) to "Phono", "Reverse", or "Forward" positions, the function shift lever (80), which is attached to control knob (82) lets the switch actuator lever (71) contact the stud position of the mercury switch assembly (51) which in turn holds the mercury switch (76) in a closed position and voltage is applied to the motor.

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A reel (3" or 5" diameter) of either plastic or paper base recording tape is placed on the rear reel pan (45) and over reel sleeve bushing (41) with one slot of the reel engaging key (42). A second but empty reel, is placed on the front reel pan (45) and locked in position with key (42). The rear reel is to be turned so the tape will be taken from the rear side.

With the control knob (82) in "off" position, unwind approximately three feet of tape. If plastic tape is used, the dull side should be on the inside; if paper, the oxide (black or red) side on the inside. The tape is placed around the turntable and the end is fastened to the front reel. The slack in the tape is taken up by turning the front reel. When tape is tightened, it will slide under the turntable and contact the rubber capstan. The recorder is now ready for operation, and with proper amplifier control selection, the tape can be recorded or played back. To record tape the control knob (82) is moved forward slightly, and then to the right until it is aligned with the record position. The control knob (82) is then pushed forward and at the same time, the record lock button (86) is pulled toward the operator to permit full engagement of control knob (82) in the record position.

When in record position, erase head (52) contacts the recording tape and erases the lower track only at the instant just prior to passing over the recording head.

Bias switch (60) is opened by sleeve (12) when in record position. In all positions other than record, the bias switch (60) is connected directly across the recording head (66) through the amplifier's function switch.

When in either the record or playback position the tape always travels from the rear reel to the front reel. Only the lower track of the tape is recorded or played back. Upon the completion of the transfer of tape from the rear reel to the front reel, to continue recording or playback it is necessary to remove the front reel, inverting it and placing it on the rear platform and at the same time putting the empty reel from the rear platform onto the front platform. The tape is again threaded in accordance with procedure outlined above. In this manner, one hour full recording time or playback time is available from a 5" reel of tape. Recording speed or playback speed is 3¾" per second.

When control knob (82) is in either record or playback position, the function shift lever (80) contacts the pressure pad and pinch roller assembly actuating spring (101). This brings the pinch roller (103) in firm contact with the tape and the driving capstan. The pressure pad (102) which is also a part of this assembly, is brought into contact with the recording tape and holds it firmly against the recording head (66). This assures firm contact between the driving capstan and the tape, as well as holding the recording tape firmly against the recording gap which is a part of the recording head (66). The driving capstan is in turn driven by the large 10" turntable which acts as a flywheel, thus minimizing any flutter or wow effect as a result of changing velocity of the tape. The recording head is only a very short distance from the driving capstan, thus minimizing the possibility of whipping of the tape as it travels across the recording head which would result in flutter.

With control knob (82) in reverse or forward position, the function shift lever (80) actuates spring (101), and the pinch roller and pressure pad assembly is pulled out of contact with the recording tape by spring (98). In reverse position, the function shift lever (80) depresses one end of lift lever (56) which in turn lifts the front reel assembly off the clutch. When this happens, there is no restraining force applied to the front reel; consequently the back reel rewinds tape very rapidly. The opposite condition is true when the control knob (82) is placed in the forward position. Here the function shift lever (80) depresses the rear lift lever (56) which disengages the rear reel from the clutch assembly. The front reel will then rapidly wind tape in a forward direction. The fast forward or fast reverse speed is approximately 20 to 1 over the 3¾" per second normal recording or playback tape speed.

To play standard 78 RPM phonograph records, it is only necessary to position the control knob (82) in the phono position. With the control knob (82) in the phono position, the function shift lever (80) depresses both the front and rear lift levers (56) thus disengaging both the front and rear reel clutches. This eliminates the driving of the tape, and the only function the unit performs is to actually turn the turntable. In playing phonograph records, the rear portion of the pickup arm (85) is depressed, and a standard playback needle is inserted in the pickup cartridge (65), and it is held in position with the thumb screw.

It is possible to cut disc recordings from recorded information on the tape or any external source which might be fed into the amplifier. To cut home recordings, it is necessary to remove the playback needle from pickup cartridge (65) and insert a standard ⅝" recording stylus. The recording blank is placed on the turntable, being sure that the off-center hole of the recording blank is inserted over the drag pin (30), thus assuring the disc to revolve constantly with the turntable. The pickup arm (85) is lifted off the tone arm rest (83) and the point of the cutting stylus is placed on the outer edge of the recording blank at the approximate location at which the recording is to start. These operations are performed with the control knob (82) in the off position. The rear of the pickup arm is lifted by the finger extending to the right side. At a certain point, there will be a definite feeling of the pickup arm locking into position; and at this location, the follower arm (61) engages the lead screw (23). It is now only necessary to move the control knob into the phono position if the recording is being done from some source other than the tape. Place knob into the playback position if it is desired that information on the tape be recorded on a recording blank. With the proper setting of the amplifier controls the information will be recorded on the disc, and it is desirable that occasionally the thread from the cutting operation of the cutting stylus be wiped toward the center of the turntable so as to wrap around the turntable spindle. Upon completion of the disc recording, it is only necessary to apply a slight downward pressure to the lift finger of the pickup arm, and it will be disengaged from the holding lock, thus permitting it to be lowered to its normal position and will then be ready for phono playback by exchanging needles.

The 1C series tape-disc Recordio incorporates features for automatic shutoff upon the completion of the recording or playback of a reel of tape. This is accomplished by the tension of the tape holding the mercury switch assembly (51) in a position so that the mercury switch (76) is closed, thus permitting power to be supplied to the motor. When in the record or playback position and the tape tension is released as a result of all the tape being wound on the forward reel, the switch assembly which includes the mercury switch is permitted to tip in a manner opening the motor circuit, thus automatically stopping the unit.

Frequently, it is desirable to record a full half-hour program of uninterrupted music and this can be accomplished by recording music from records to tape. So as to eliminate any interruptions between records, it is possible to, at the conclusion of one record, stop the forward reel by hand, thus releasing the tape tension and permitting the mercury switch assembly (51) to open the motor circuit. At this time, the records can be interchanged on the turntable, the pickup arm again placed on the second record, and the tape tension tightened by a slight clockwise rotation of the forward reel. This will again position the mercury switch assembly so as to close the motor circuit, thus starting the recording process. This procedure can be continued until the entire reel of tape is recorded; and when it is played back, there will be no apparent interruptions from one record to the next.

GENERAL ADJUSTMENTS

It is seldom necessary to make any adjustment on the 1C series tape-disc Recordio in the field, as it is shipped from the factory completely adjusted for satisfactory operation. In the event that adjustments may become necessary, it is recommended that the following procedure be followed.

Adjustment of lift lever (56), Control of reel pan (45). Adjustment is easily made in the forward and reverse positions. In the forward speed position, the rear reel pan (45) must be raised to the position that it clears the clutch spring (97). At the same time the front pan (45) must be lowered to contact the clutch spring (96) and the lift lever must clear the lowef end of the reel pan shaft (43) by approximately 1/32" to 1/16". The adjustment of the lift lever (56) is made by bending the short unflanged section of the lever immediately under the reel pan shaft (43). To adjust in the reverse speed position, the opposite of the above condition is true. In the record and playback positions the lift lever (56) must clear both reel pan shafts (43) so that both the pans will contact the clutch springs (96-97).

Tracking of the tape through the recording head (66) is controlled by tipping the tape capstan (53) slightly with the two adjusting screws (27) located under the mounting flange of the auxiliary shaft housing (55) under the base plate (32) of the machine. The capstan (53) should be so adjusted that the tape tracks in the center or toward the top of the guide slot in the recording head (66) - never toward the bottom of the guide slot.

To adjust the pressure pad (102) against the tape recording head (66), it is necessary to remove the pinch roller cover plate (104) to reach the lock nut (107) on the pressure pad adjusting screw (106). To adjust the pad (102) for proper pressure against the tape recording head (66), set the speed shift lever (82) in the record position. Turn the adjusting screw (106) in against the pressure pad spring (102) until the pressure pad just contacts the recording head (66). Then turn the screw one-half to three-quarters of a turn clockwise and tighten the lock nut (107).

Engagement of follower arm (61) to lead screw (23) during disc recording operation. When lifting the rear section of pickup cutter arm assembly (85), the follower arm (61) should engage the lead screw (23) before the rear of the pickup arm locks in the up position. This engagement should be at a point of between ⅛ and ¼ inch before the pickup arm locks. If it is necessary to adjust this point of engagement, it can be accomplished by slightly bending follower arm (61). If the follower arm engages the lead screw too tightly, an excessive load will be put on the lead screw, thus injecting wow in the recording. If the engagement is not sufficiently heavy, there is a possibility of grouping which is the result of the follower arm lifting up on the threads of the lead screw (23) rather than moving along in a smooth and continuous pattern.

GENERAL LUBRICATION

To lubricate reel pan shaft (43), reel sheave (36), reel sheave bearing (33), and reel pan clutch springs (97-96).

a. Remove TRUARC "E" ring (75) on lower end of reel pan shaft (43) and lift reel pan (45) and clutch springs (96-97) off machine to expose parts to be lubricated. In removing "E" ring (75), care must be exercised to see that no burr is turned up on the shaft (43) at the edge of the ring slot.

b. Use SAE10 oil on reel pan shaft (43) and the inside only of the reel sheave bearing (33).

c. Use SAE20 oil between reel sheave bearing (33) and the hub of the reel sheave (36). It is not necessary to remove the sheave from the machine since there is a countersink well at the top of the reel sheave hub into which the oil may be placed and allowed to run down through the bearing. Do not over-lubricate in paragraphs B and C, as excessive oil may throw out onto the base plate or belt of the machine. On the reel pan shaft, two or three drops, and on the sheave, five or six drops is sufficient. The bearing is porous bronze and will hold a reasonable amount of oil to afford continuous lubrication.

d. The felt pads on the clutch springs (96-97) are saturated with SAE60 oil. The shearing of the oil in the pads is partially responsible for the drive of the clutches; therefore, do not over-saturate the felt. There is sufficient oil in the felt when medium finger pressure on the felt causes a small bead of oil to appear along the edge of the felt. With a release of the pressure, all the oil should be reabsorbed by the felt.

Turntable drive wheel shaft (47) and bearing (48). It should not be necessary to disassemble the drive in order to lubricate. If the machine is set on edge and the rubber tire drive wheel raised in the bearing as far as it will go, there is sufficient room to apply two or three drops of SAE10 oil to the shaft on top of the bearing. This bearing is of porous bronze and will hold a reasonable amount of oil to afford continuous lubrication. No oil can be permitted on the rubber tire drive wheel.

The motor (29) bearings are fed with an oil wick and should not require new lubrication. If they are to be lubricated, use only SAE10 oil and it can be accomplished by placing a few drops of oil on the rotor shaft so as to run down into the bearing assembly.

The auxiliary shaft housing assembly (55) is packed with Torrington Houghton twister ring grease and SAE20 oil at the factory and should not need lubrication.

Pivot post (63) and bushing (74) may be lubricated by raising the tone arm to its highest position and putting two or three drops of SAE20 oil on the post. It is well then to move the post up and down several times so as to secure equal distribution of the oil over the entire bearing surface.

Pinch roller (103). Remove cover plate (104) and use not more than one drop of No. 10 oil to the stud holding the pinch roller (103). Extreme care should be exercised to assure no oil reaching the rubber section of the pinch roller.

MODEL 1C-10

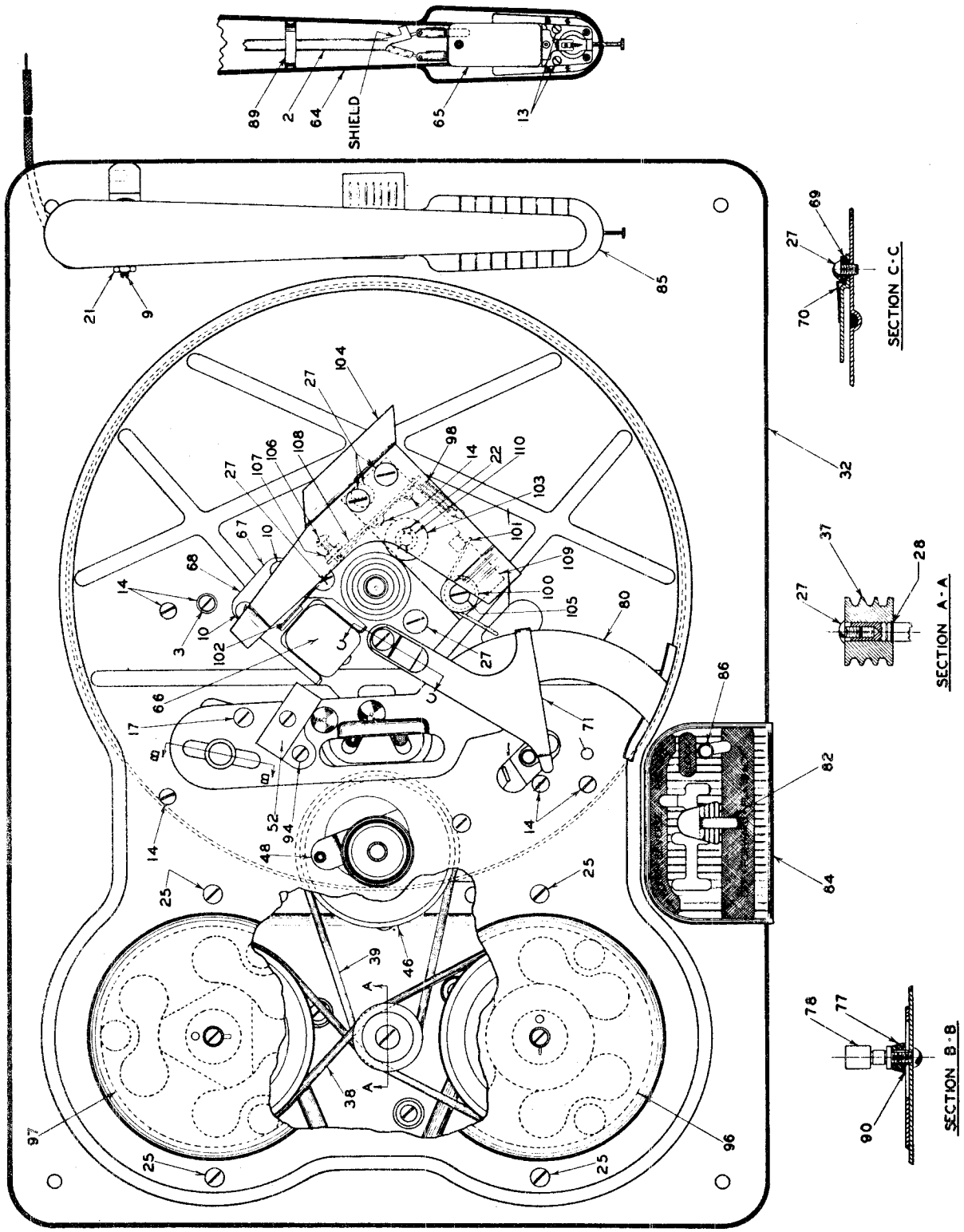

Figure 1 — Top View

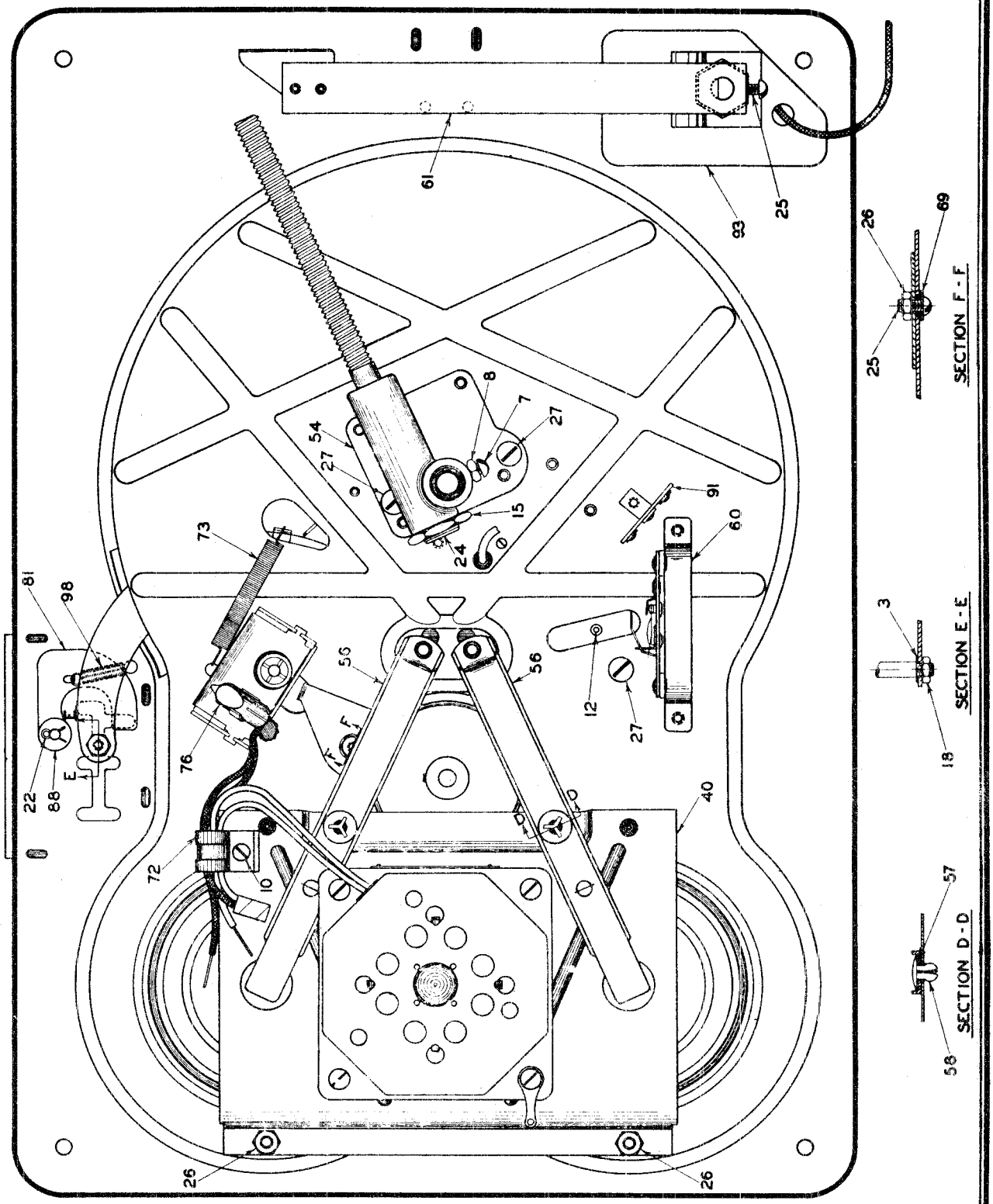

Figure 2 — Bottom View

MODEL 1C-10

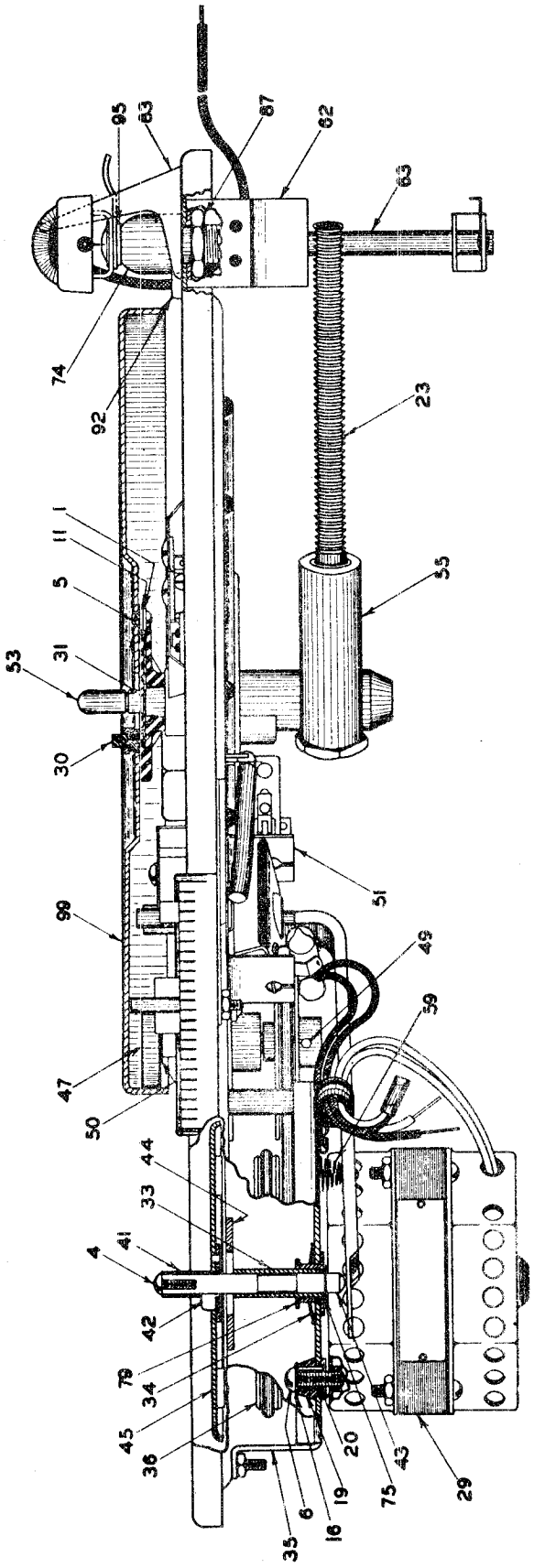

Figure 3 — Front View